N2 ARDEE TO CASTLEBLAYNEY
ROAD SCHEME

FEBRUARY 2021

OPTION SELECTION REPORT

VOLUME 4 - PHASE 2 STAGE 1 ASSESSMENT WORKING PAPER REPORT

An Roinn Iompair
Department of Transport

Tionscadal Éireann
Project Ireland
2040

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Transport Infrastructure Ireland

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N2 Ardee to Castleblayney Road Scheme

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Project Manager:	Gerry Healy
Author:	Tomás Cleary
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Jacobs Engineering Ireland Limited

Merrion House
Merrion Road
Dublin 4, D04 R2C5
Ireland
T +353 1 269 5666
F +353 1 269 5497
www.jacobs.com

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Overarching Structure of Option Selection Report

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Foreword

Note 1: This Report documents the Stage 1 Assessment for the N2 Ardee to Castleblayney Road Scheme which was undertaken in September 2019. The content of this document is reflective of this date.

Note 2: Following completion of Stage 1 Assessment in September 2019, and the identification of 6 No. Stage 1 Route Corridor Options for progression to Stage 2 as per Chapter 6 (Conclusions & Recommendation) of this Report, the naming and colouring changes listed in Table F.1below were undertaken for ease of presentation to the public for Public Consultation 2 (Route Corridor Options), which was undertaken in November and December 2019.

Ref. No.	Stage 1 Assessment Naming / Colouring Convention	Naming /Colouring Convention for Public Consultation 2 and the Stage 2 Assessment
1	Yellow	Option A (Yellow)
2	Yellow+Blue	Option B (Yellow + Blue)
3	Green	Option C (Green)
4	Orange	Option D (Orange)
5	Orange + Green 1 [Orange+Link A-B(Grey)+Green]	Option E [Orange + Link 1 (Grey) + Green]
6	Orange + Green 2 [Orange+Link L-M(Grey)+Green]	Option F [Orange + Link 2 (Pink) + Green]

Table F.1: Naming and Colour Changes of Route Corridor Options between the Stage 1 Assessment (September 2019) and Public Consultation 2 (November & December 2019)

1. Introduction

Monaghan County Council is working in association with Transport Infrastructure Ireland (TII) to develop a scheme to upgrade a 32km section of the N2/A5 Dublin-Derry Road. The proposed project is in the Counties of Monaghan and Louth between Ardee and Castleblayney. This project is called the N2 Ardee to Castleblayney Road Scheme.

1.1 Purpose of Report

In accordance with the TII *Project Management Guidelines (PMGs) PE-PMG-02041 (*January 2019*), TII's Project Manager's Manual (PMM) for Major National Road Projects PE-PMG-02042 (February 2019*) and *TII's Project Appraisal Guidelines (PAG) for National Roads,* a Stage 1 Assessment Working Paper Report has been prepared for the proposed N2 Ardee to Castleblayney Road Scheme.

The purpose of the Stage 1 Working Paper Report is to outline the rationale and summarise the findings of the first assessment stage of the Option Selection Process and provide a recommendation of a short-list of options to be progressed to the next assessment stage. As per TII's PMM, the first assessment stage is defined as *Stage 1 (Preliminary Options Assessment)* which forms part of TII's PMG Phase 2 (Option Selection), which is a three-stage process to identify and select a Preferred Option.

As part of the Stage 1 Assessment, the options/alternatives identified as reasonable and feasible were considered, developed and assessed; including the Do-Nothing Option, Do-Minimum Option, Do–Something Alternative - Public Transport, the Traffic Management Option and the Do-Something Option – Feasible Route Corridor Option. The details and outcomes of the assessment of these options/alternatives are provided in this Stage 1 Assessment Working Paper Report.

1.2 History of Project

In 2017, arising from a number of road safety reviews of the existing N2 between Ardee and Castleblayney, the Minister of Transport, Tourism, and Sport (DTTaS) and TII announced the activation of planning and design work for a major roads scheme on this existing 32 km section of the N2 (i.e. *N2 Ardee to Castleblayney Road Scheme*). At the same time, the re-activation of a previous road scheme on a 28km section of the existing N2 between Clontibret and the Northern Border Road Scheme (i.e. N2 Clontibret to Border Road Scheme) was announced.

Following the activation of the scheme, Westmeath National Roads Office (WNRO) undertook the initial scoping stage (TII's PMG Phase 0 – Scope and Pre-Appraisal) for both the N2 Ardee to Castleblayney and N2 Clontibret to the Border Road Schemes. During the same period in 2018, Project Ireland 2040, comprising of the National Planning Framework (NPF) 2040 and the National Development Plan (NDP) 2018 – 2027 was finalised. The NDP 2018 – 2027 specifically identified the prioritisation of both schemes to support investment in the border region and to support the NPF 2040 objective of enhanced regional accessibility to the North-West through the upgrading of the N2/A5 route. Along with proposed improvements to the N2, the Northern Ireland Executive and the Department for Infrastructure (DfI) Roads as part of a separate project aims to upgrade 85km of the A5 route to dual carriageway standard from the Northern Ireland Border at Aughnacloy to South of Derry. This project is named the A5 Western Transport Corridor (A5WTC).

In October 2018, following completion of TII's PMG Phase 0 and the procurement process, Jacobs Engineering Ireland Ltd. ('Jacobs') was commissioned by Monaghan County Council to progress the planning and design of both schemes in accordance with the TII's PMG from Phase 1 (Concept and Feasibility) to Phase 4 (Statutory Processes). Each scheme is a separate scheme, however both schemes are being progressed through Phase 1 and 2 concurrently.

Following Jacobs appointment, TII's PMG Phase 1 was successfully completed in February 2019, with both schemes progressing to TII PMG Phase 2 (Options Selection) thereafter.

1.3 Overview of Scheme

The N2/A5 Dublin to Derry route is a national primary road linking Dublin to Northern Ireland and the north west of the country, passing through the towns of Slane, Ardee and Emyvale, and bypassing Carrickmacross, Castleblayney and Monaghan before becoming the A5 as it passes through Northern Ireland. It provides key North/South and regional connectivity, along with accessibility to other strategic national roads such as the N33, M1, N52 and N53. The significance of the N2 is supported by the fact that the N2 between Ardee and Castleblayney forms part of the Trans-European Network (TEN-T) corridor. This is a network of multi-modal strategic transport corridors identified to improve the mobility of goods and people throughout the European Union (EU). In terms of National Policy, and as outlined in greater detail in Section 1.5 of this Report, Project Ireland 2040 via. the NPF 2040 and NDP 2018 – 2027 has specifically identified the strategic importance of the existing N2 in terms of investment to the Border Region and enhanced regional accessibility between Dublin and the North-West.

The proposed N2 Ardee to Castleblayney Road Scheme is situated between Ardee in County Louth and Castleblayney in County Monaghan. The length of the existing N2 section between Ardee and Castleblayney is approximately 32km. A general location plan of the existing N2 between Ardee and Castleblayney is shown in Figure 1-1 below, whilst a location plan in the context of the other separate N2 Clontibret to Border Road Scheme is shown in Figure 1-2. More detailed maps of the areas are provided in Appendix A, in the context of the options selection process which is outlined in the subsequent sections of this Report.

Figure 1-1: Location plan of existing N2 between Ardee and Castleblayney

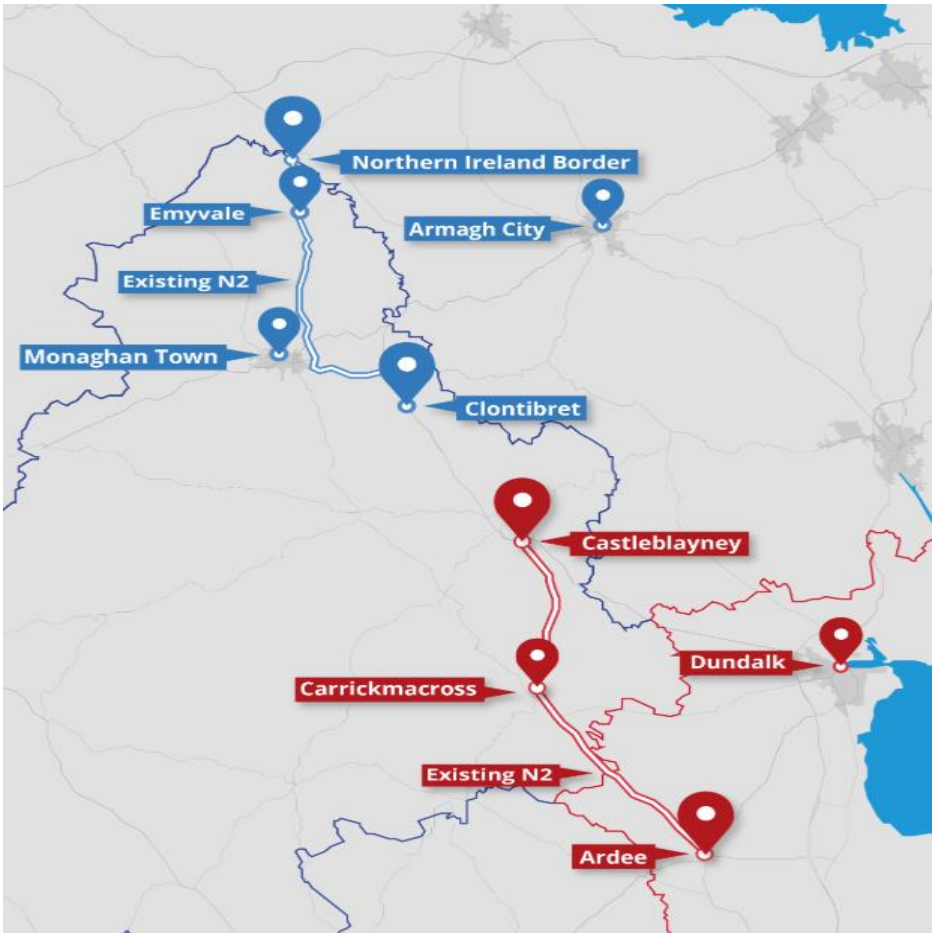


Figure 1-2: Location plan of existing N2 between Ardee and Castleblayney in the context of the N2 Clontibret to Border Road Scheme

The N2 route between Ardee and Castleblayney, and the surrounding N2 has been subject to a number of road improvement schemes in recent years, including:

- The N2 Carrickmacross Bypass (2005)
- The N2 Castleblayney Bypass (Clontibret to Castleblayney 2+1 road realignment) (2007)
- The N2 Monaghan Town Bypass (2006)
- N2 Monaghan to Emyvale Road Improvements
  - Phase 1 (2011)
  - Phase 2 & 4 (2014)
  - Phase 3 (currently ongoing)
- N2 Blackwater Bridge replacement (Monaghan Town – currently ongoing)

There are also a number of schemes currently in the planning and detailed design/procurement stages along and adjoining the N2 including, but not limited to the following:

- N2 Clontibret to Border Road Scheme
- The A5 Western Transport Corridor (Northern Ireland)
- N14 Manorcunningham to Lifford/Strabane/A5 Link Road Scheme (Part of Donegal TEN-T priority route improvement project)
- N52 Ardee Bypass
- N2 Slane Bypass
- N2 Rath Roundabout to Kilmoon Cross

- N53 Hackballcross to Rassan
- N2 Ardee to Aclint Minor improvements scheme
- N2 Tullyvaragh Junction re-alignment scheme (North of Carrickmacross)

In addition to the above, there is a number of proposed schemes which are at scoping, pre-appraisal or feasibility stages, including, but not limited to the following:

- Cavan to Dundalk Strategic Route Improvement Scheme
- Castleblayney (South) - N2/N53 Link Road.

The exact location of the start and end points of the proposed N2 Ardee to Castleblayney Road Scheme will be determined during the later stages of the planning and design of the proposed Scheme. For the purposes of the Stage 1 comparative assessment, a starting point of approximately 600m north of the Carrickmacross Road Roundabout (N2/N233/R171) on the existing N2 in the Townlands of Mullanstown and Glebe was selected. This is the location of the connection point between the existing N2 and the proposed N52 Ardee Bypass Scheme (current design location – See Section 4.1 of this Report for further details on the start point and status of the proposed N52 Ardee Bypass Scheme). The existing N2/N53 roundabout at the Southern end of the Castleblayney Bypass was chosen for the end point.

There is no existing rail network in Monaghan, resulting in a sole reliance on road transport for private, commercial public and freight vehicles. There are also no current plans to introduce railway provision to this part of the northwest as part of the NPF 2040 or within the NDP 2018-2027. Further details on the consideration of existing rail network is outlined in Section 3.4 (Do-Something Alternative – Public Transport) of this Report.

1.4 Scheme Objectives

The objectives of the proposed scheme are outlined below. The objectives are assessed based on multiple criteria headings outlined by the Department of Transport, Tourism and Sport (DTTaS) in the *'Common Appraisal Framework for Transport Projects and Programmes (March 2016)'*. The multi-criteria headings are as follows:

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

It is noted that the Scheme Objectives were originally established during TII PMG Phases 0 and 1 for the proposed scheme. The objectives were subsequently reviewed and updated as part of the Phase 2 Option Selection Process. With reference to the Chapter 2 of this Report and the 'Need for the Scheme', the Scheme Objectives were developed based on the identified deficiencies of the existing conditions and in response to the aims and aspirations of European, national, regional and local strategic policy documentation.

1.4.1 Economy

1) To reduce the costs of travel between the endpoints of the scheme at an investment cost that offers good value for money.

1.4.2 Safety

To reduce the potential for collisions through provision of an improved and safer route between Ardee and Castleblayney, in accordance with current design standards. This scheme will seek to:

1) Provide safe overtaking opportunities for motorists along the entire length of the route in accordance with design standards.

2) Reduce the frequency and severity of collisions by providing improved and safer infrastructure for all users (vehicles and vulnerable road users)
3) Reduce junction numbers and conflict points for N2 traffic.
4) To improve safety for vulnerable road users and provide a better environment for vulnerable road users within the study area.
5) Support the Road Safety Authority's Road Safety Strategy and its objective in the reduction of collisions and fatalities through the provision of a safer, more forgiving and more consistent standard of improved route.

1.4.3 Physical Activity

1) Provide opportunities for vulnerable road users (including pedestrians and cyclists) to pursue more active travel options between Ardee and Castleblayney as part of this scheme.
2) To support the National Planning Framework's National Strategic Outcome 4 (Sustainable Mobility) and other relevant active travel policies by providing safe and accessible routes for vulnerable road users.

1.4.4 Environment

To minimise the environmental impact and the private land take required for the scheme. This scheme will seek to:

1) Implement sustainable development principles and measures to minimise effects on the environment to support the government's carbon and Climate Action Plan and UN Sustainable Development Goals
2) Minimise impacts to Natural Heritage and Cultural Heritage areas (such as environmentally sensitive areas and National Monuments).
3) Reduce/Minimise air quality and climate impacts, and noise impacts on sensitive receptors as far as reasonably practicable.
4) Minimise the impact to agricultural and private land, reducing the impact to people as far as reasonably practicable.

1.4.5 Accessibility & Social Inclusion

1) To reduce social exclusion by enhancing accessibility to services from designated rural zones within the Study Area;
2) To support the National Planning Framework's National Strategic Outcome 3 (Strengthen Rural Economics and Communities) by investing in strategic road improvement projects in rural areas to ensure access to critical services such as education, healthcare and employment.
3) To strengthen and support public transport connectivity between cities, towns and rural areas by improving existing journey times and journey time reliability on this section of N2/A5 Corridor.

1.4.6 Integration

1) To improve the strategic connectivity and overall route consistency of the national road network and on the N2/A5 Corridor.
2) To be compatible with land use objectives as set out in regional and local land use plans.
3) To improve transport links between the Greater Dublin Area and the North West region for all strategic traffic including the transfer of freight and heavy goods, which will support economic resilience post-Brexit
4) To maintain the strategic capacity of the national roads network including planning for future capacity enhancements

1.5 Strategic Fit and Priority

The N2 Ardee to Castleblayney Road Scheme aligns with current EU, national, regional and local policies.

1.5.1 European Policy

The proposed N2 Ardee to Castleblayney Road Scheme is located within the corridor of a Trans-European Network (TEN-T) route. The TEN-T programme has several policy objectives to make Europe more connected and to help the EU come together socially and economically. The TEN-T programme aims to create a single European transport area using the following principles:

- Cohesion: accessibility to remote, outermost and peripheral regions and a reduction of infrastructure quality gaps between member states;
- Efficiency: removal of bottlenecks and bridging missing transport links;
- Sustainability: developing transport solutions that will ensure future transport that is sustainable and economically efficient; and
- Increasing benefits for users: meeting the transport needs of users within the EU and countries sharing a land border with the EU.

1.5.2 National Policy

Project Ireland 2040 is the overarching policy and planning framework for the social, economic and cultural development of the country. It includes a detailed capital investment plan for the period 2018 to 2027, the National Development Plan (NDP) 2018-2027, and the 20-year National Planning Framework (NPF) 2040.

The NDP 2018 - 2027 sets out the investment priorities that will underpin the implementation of the NPF 2040 and support the key goals / objectives (i.e. National Strategic Outcomes) of NPF 2040.

The NDP 2018 - 2027 provides for investment *'to support the ambition for development of the border region'* and specifically references; *'the N2/A5 road, serving Meath, Monaghan and Donegal'*. In its Investment Actions for Inter-Urban Roads, the NDP states the following:

'The following sections of the national road network will be progressed through pre-appraisal and early planning during 2018 to prioritise projects which are proceeding to construction in the National Development Plan.

- *N2 Clontibret to the Border*
- *N2 Ardee to south of Castleblayney'*

The NPF 2040 identifies and outlines 10 No. National Strategic Outcomes. National Strategic Outcome No. 2 is 'Enhanced Regional Accessibility' with the objective of providing:

'Better accessibility between the four cities and to the Northern and Western region will enable unrealised potential to be activated as well as better preparing for potential impacts from Brexit.'

As part of this National Strategic Outcome under the heading of *'Accessibility to the North-West'*, the N2 Road is specifically referenced:

'Upgrading access to the North-West border area, utilising existing routes (N2/N14/A5);

Under the heading of *'Inter-Urban Roads'*, it notes the following objectives:

- *Maintaining the strategic capacity and safety of the national roads network including planning for future capacity enhancements]*

- *Improving average journey times targeting an average inter-urban speed of 90kph;*

In conclusion, it is considered that the proposed N2 Ardee to Castleblayney Road Scheme aligns with National Policy.

1.5.3 Regional Policy

The Regional Spatial and Economic Strategies provide the strategic plan and investment framework to shape the future development of each of the three regional assembly areas in Ireland in the period to 2031 and beyond.

The Eastern and Midlands Regional Assembly Area includes County Louth.
The Northern and Western Regional Assembly Area includes County Monaghan.

Regional Spatial and Economic Strategy (RSES) for the Eastern and Midlands Region (June 2019)

The Strategy contains a series of Regional Policy Objectives, including the following objective for Investment in Improved Strategic Road Connectivity:

'RPO 8.10: The RSES supports appraisal and or delivery of the road projects set out in Table 8.4 subject to the outcome of appropriate environmental assessment and the planning process'. It is noted that the Scheme 'N2 Ardee to south of Castleblayney' (i.e. N2 Ardee to Castleblayney Road Scheme) is listed in Table 8.4.

Draft Regional Spatial and Economic Strategy (RSES) for the North and West Region (November 2018)

The Draft Strategy has the following relevant regional policy objective:

'All these projects are integrated with the targeted development of the major urban centres in the region:

109. The following projects shall be progressed through pre-appraisal and early planning in the short term and shall thereafter proceed to construction and be delivered to an appropriate level of service within the lifetime of the RSES:

- *N2 Clontibret to the Border connecting to the A5*
- *N2 Ardee to south of Castleblayney'*

In conclusion, it is considered that the proposed N2 Ardee to Castleblayney Road Scheme aligns with both RSESs.

1.5.4 Local Policy

Monaghan County Development Plan (2019 to 2025)

The Monaghan County Development Plan (CDP), set-out by Monaghan County Council, prescribes the programme and objectives of County Monaghan through the stated period with Chapter 7 specifically addressing Transport and Infrastructure. It outlines that improved national, regional, county and local infrastructure and services are essential to improve the economic competitiveness and quality of life within the county. Basic infrastructural development and investment in roads are required to promote balanced and sustainable economic development and to improve the quality of the built and natural environment, throughout the county.

References in the context of the N2 in the CDP are outlined below:

Chapter 2 – Core Strategy – Section 2.3.2 (Monaghan Town):
'The draft Regional Spatial and Economic Strategy (RSES) recognises its importance as an economic driver in the Central Border Region and how it is crucial that it continues to expand seamless cross border links, aided by, for example the upgrade of the N2 / A5.'

Chapter 7 – Transport and Infrastructure – Section 7.1 (National & Regional Transport Policy Context):

'*The National Planning Framework 2040 specifically references the N2/A5 (Clontibret to Tyrone/NI border) roads project. It is considered that this route should be prioritised given its strategic importance and the lack of any direct rail infrastructure serving significant urban areas in the northwest along the route of the N2/A5.'*

Chapter *7 – Transport and Infrastructure – Section 7.8 (National Roads):*

With reference to Table 7.2 which lists the strategic national road proposals for the county, where the *'N2 Clontibret – NI Border'* and *'Ardee -Castleblayney Road Upgrade'* are listed, it states: that *'these national road projects that form key routes and linkages with other development centres, sea-ports and airports will be advanced in partnership with Transport Infrastructure Ireland*.'

Chapter 7 – Transport and Infrastructure – Section 7.8.1 (National Roads Policy)

This section outlines 6 No. National Road Policies. Policies which are considered particularly relevant to N2, are listed below:

- ***'NRP1** – To protect the traffic carrying capacity of national roads, the level of service they deliver and the period over which they continue to perform efficiently, by avoiding the creation of new access points or the generation of increased traffic from existing accesses onto the N-2, N-53, N-54, and N-12 outside the 60 km/h speed limit, in accordance with the DoECLG's publication Spatial Planning and National Roads - Guidelines for Planning Authorities (2012).*

- ***NRP5** – To seek to progress and ensure the upgrade of the N2 in co-operation with Transport Infrastructure Ireland and the relevant adjoining local authorities.'*

<u>Louth County Development Plan (2015 to 2021)</u>

The Louth County Development Plan contains an overall strategy for the proper planning and sustainable development of County Louth over the lifetime of the Plan. It contains the following specific transport relevant element in Chapter 7:

"7.3.3 Louth County Council will continue to implement measures to safeguard the capacity and safety of national routes so that they can continue to perform their strategic role and maintain their importance to the future development of the County."

TC 7
"To provide and maintain a road hierarchy based on motorway, national routes, regional routes and local roads and to maintain the carrying capacity and lifespan of the road network and ensure high standards of safety for road users."

In conclusion, it is considered that the proposed N2 Ardee to Castleblayney Road Scheme aligns with both the Monaghan and Louth County Development Plans.

1.5.5 Additional Support

Road Safety Strategy 2013-2020

The government's strategy for road safety sets out the plan to reduce the number of collisions occurring on Irish roads. The main target of this plan is to provide a reduction of road collision fatalities on Irish roads to 25 per million population or less by 2020. This plan seeks to close the gap between Ireland and the safest countries in the EU. This means reducing deaths from 162 in 2012 to 124 or fewer by 2020. A provisional target for the reduction of serious injuries by 30% from 472 (2011) to 330 or fewer by 2020 or 61 per million population has also been set. The provision of new and improved road infrastructure along this section of the N2 would reduce the number of fatalities occurring annually on this section of road and therefore be consistent with the Road Safety Strategy.

In conclusion, it is considered that the proposed N2 Ardee to Castleblayney Road Scheme aligns with the Road Strategy 2013 - 2020.

2. Overview of Option Selection Process

2.1 General Overview

The proposed N2 Ardee to Castleblayney Road Scheme is being delivered in accordance to TII's *Project Management Guidelines (PMGs) PE-PMG-02041 (January 2019) and TII Project Appraisal Guidelines (PAG) for National Roads. The PMGs* provide a framework for a phased approach to the management, development and delivery of National Road and Public Transport Capital Projects in Ireland. The *TII Project Manager's Manual (PMM) for Major National Road Projects PE-PMG-02042 (February 2019*) provides further supporting information on the deliverables and processes outlined in TII's PMGs, in order to assist with ensuring consistency of approach in the delivery of major national road projects. In addition to the PMGs, TII's *Cost Management Manual (May 2010)* provides guidelines on the management of cost, risk and value on National Road Projects and is to be read in conjunction with TII's PMM.

The PMG's divide the evolution and progression of a Project into an eight-phase process (Phase 0 to Phase 7 inclusive) as shown in Figure 2-1 below.

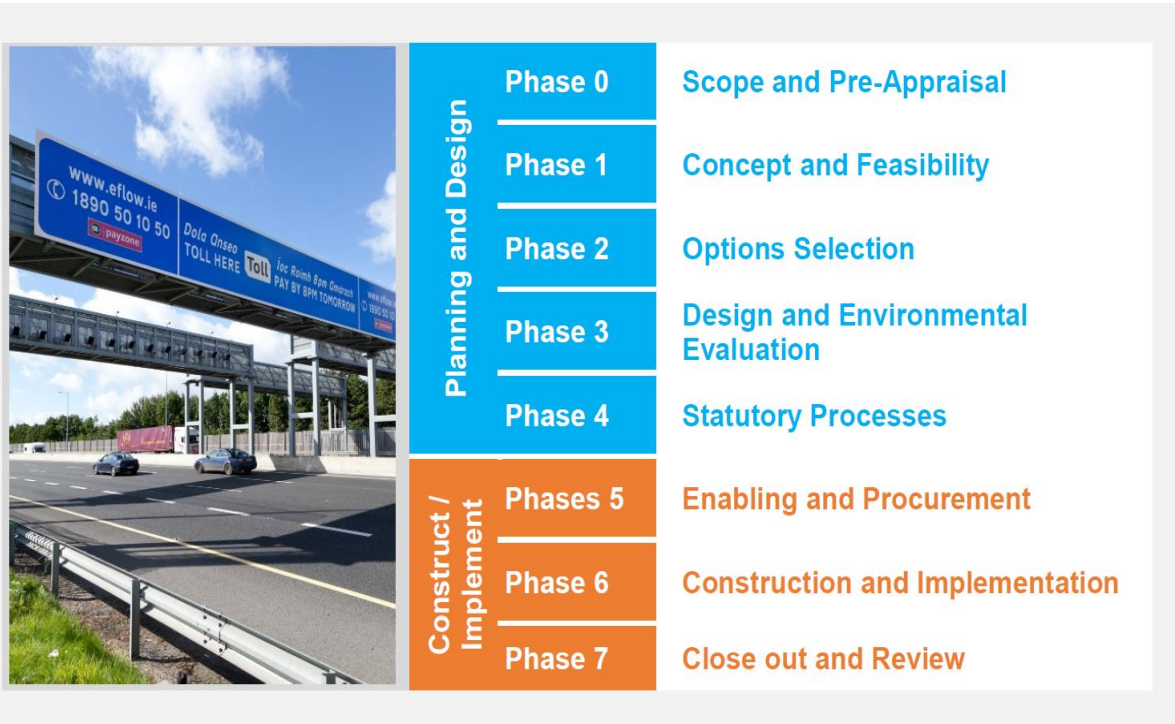


Figure 2-1: TII Project Management Guidelines' Project Phases (Excerpt from TII 2019 PMGs)

Phase 0 (Scope and Pre-Appraisal) for N2 Ardee to Castleblayney Road Scheme was successfully completed in 2018, with the completion of Phase 1 (Concept and Feasibility) in February 2019.

The purpose of Phase 2 (Options Selection) is to examine alternatives/options against the Scheme objectives as defined in the Phase 1 Project Brief, and identify an emerging preferred option, and ultimately select a Preferred Option.

Phase 2 (Option Selection) is a process which seeks to identify and select a Preferred Option through a structured appraisal process. As per the TII 2019 PMGs, PMM, and *PAG Unit 4.0 – Consideration of Alternatives and Options (October 2016)*, the options selection process is split into three distinct stages, as shown in Figure 2-2 below each requiring a greater level of assessment and appraisal.

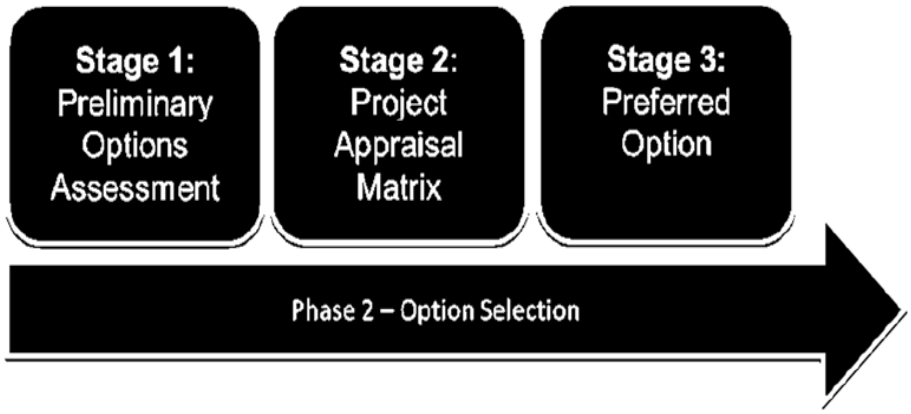


Figure 2-2: Stages of TII Phase 2 Option Selection process (Excerpt from TII PAG Unit 4.0)

A summary of the main activities and the deliverables for each stage is provided below as per TII's PMM and PAG Unit 4.0:

- **Stage 1 – Preliminary Options Assessment** – Identify and develop *'all reasonable / feasible options (Including Do-Nothing, 'Do-Minimum and Traffic Management Alternatives)'*. Undertake a comparative assessment of the potential impacts of the options in achieving the Scheme Objectives, against the assessment criteria of Engineering, Environment and Economy. This assessment is to be undertaken in accordance with the Multi-Criteria Analysis (MCA) approach as outlined in *PAG Unit 7.0: Multi Criteria Analysis (October 2016)*. This will result in a reduced number of options *('Do-Nothing or Do-Minimum, and a least three Do-Something Options'*) being taken forward to Stage 2 (Project Appraisal Matrix).
- **Stage 2 – Project Appraisal Matrix** – The options advanced from Stage 1 will be evaluated by undertaking a full Cost Benefit Analysis (CBA) and MCA of the quantifiable and non-quantifiable impacts of these options against the assessment criteria of Economy, Safety, Environment, Accessibility & Social Inclusion, Integration and Physical Activity (which align with Scheme Objectives). Incremental analysis as per PAG Unit: 4.0 will be undertaken during Stage 2 to determine the most appropriate level of service (incl. road cross-section) for the options being considered during this stage. A non-statutory public consultation of the proposed Stage 2 options will be held to seek feedback. At the end of Stage 2, an emerging preferred option will be identified.
- **Stage 3 – Preferred Option –** After completion of Stage 2, an emerging preferred option will be selected. Following this, a Project Appraisal Balance Sheet (PABs) will be undertaken to summarise the impacts associated with the emerging preferred option. The rationale for the selection of the emerging preferred option will be outlined within the Options Selection Report. A Peer Review will be undertaken by TII of the draft Options Selection Report. A non-statutory public consultation on the emerging preferred option will be held. Following feedback from the consultation and finalisation of the Peer Review Report, the Options Selection Report will be finalised, and a Preferred Option will be selected.

All economic assessments throughout the three stages listed above will be undertaken in accordance with TII's Cost Management Manual (May 2010) and PAGs. The PMG Phase 2 appraisal process aligns with the requirements of the DTTaS' Common Appraisal Framework (CAF, March 2016).

2.2 Options Selection Process – Definition of the Study Area

The first key activity of Phase 2 (Options Selection) is the definition of the Study Area. As per the TII 's PMM, the Study Area is to *'cover an area which will enable appropriate options to be developed and examined.'* Furthermore, the PMM states, *'the term "study area" relates to the area under consideration for the physical location of options and may be different to the macroscopic and microscopic study areas identified in the Project Appraisal Plan for use in transport modelling.'* As is the case for the traffic modelling plan study area, the environmental study area may be different / larger in order to capture and consider the zones of influence of particular sensitive areas/ecosystems/species, which may be considerable distances from the physical location of options but could be potentially impacted by the options.

In defining the Study Area for the N2 Ardee to Castleblayney Road Scheme, the initial Study Area as identified in the N2 Ardee to Castleblayney Road Scheme Phases 0 and 1 Project PAPs (October 2018, February 2019) was reviewed and further refined. The updated Phase 2 Study Area is shown on Drawing Ref. No. N2-JAC-HWG-A2C-DR-OS-0001 in Appendix A. With reference to this drawing, the defining factors identified for the boundaries of the updated Phase 2 Study Area are as follows:

- **Northern and Southern Boundaries**: The overarching start and end points of Ardee and Castleblayney as identified in the Phases 0 & 1 Project Briefs were maintained. In the case of Ardee, the environs of the urban area of the town and the presence of Ardee and Coole Bogs restricted the Southern extents. The South-Eastern end of the boundary was extended to include the interface between the N2 and the N33. Similarly, in the case of Castleblayney, the environs of the urban area of the town and the presence of Muckno Lake restricted the Northern extents, whilst the North-Western end of the boundary was extended to include the Interface between the existing N2 section between Ardee and Castleblayney and the N2 Castleblayney Bypass.

- **Western Boundary**: The significant natural barriers of the Garra and Lagan Rivers and of a series of loughs (Ballyhoe, Rahans, Derry, and Descart), which are in close proximity to each other, restricted the boundary in a Southern direction. Whilst the significant natural barrier of Lough Egish restricted the boundary in a Northern direction.

- **Eastern Boundary:** The relatively large settlements of Tallanstown, Louth Village and Inniskeen and their associated environs, along with the jurisdiction boundary of Northern Ireland restricted the boundary to the East.

- **Carrickmacross Town and Its Environs:** The settlement of Carrickmacross Town and its urban environs were excluded from the Study Area as its centre and environs are relatively densely populated and create a significant built-environment barrier.

2.3 Options Selection Process – Constraints Study

Following definition of the Study Area, and prior to undertaking the three-stage options selection process and development of the options, it is necessary to identify the nature and extent of existing constraints within the Study Area. As part of the Constraints Study, these constraints are to be documented and mapped such that the options/alternatives under consideration can be designed taking cognisance of such constraints, and where feasible and practical avoid these constraints.

As per Clause 2.1.2.6 of TII's PMM, the formal findings of the constraints study are to be outlined in the Options Selection Report, which will be prepared in due course as part of Phase 2 – Stage 3 (Preferred Option).

TII's PMM divide constraints into three principal categories:

- ***Natural Constraints*** *(naturally occurring landscapes and features, including underground features);*
- ***Artificial Constraints*** *(forming part of the built environment including underground features, e.g. disused landfills); and*
- ***External Parameters*** *(design standards, policy, procedural, financial, and legal issues)."*

A further breakdown of items to be considered under these categories is provided in Appendix A2.2 of TII's PMM. As outlined in the PMM, the Constraints Study is to be primarily a desktop study and supplemented by windshield or walkover surveys where deemed necessary and appropriate.

For the N2 Ardee to Castleblayney Road Scheme, constraints were identified in accordance with TII's PMM and with reference to TII's suite of environmental evaluation guidelines. Constraints information was obtained from various readily available sources (both public and private). The data was then processed and categorised using the project specific GIS based software, 'ProjectMapper', and presented across a series of working drawings. A list of the working drawings prepared for the Constraints Study is shown in Table 2-1 below.

Ref. No.	Drawing Categories
1	Ecology - Key Ecological Sites (National & County) Incl. Associated Appendices
2	Ecology - Key Ecological Sites (European and International Sites)
3	Landscape Character
4	Surface Water Features
5	Flood Risk
6	Geology - Bedrock
7	Geology – Subsoils and Karst Landforms
8	Hydrogeology – Locally and Important Aquifers
9	Hydrogeology – Groundwater Vulnerability
10	Specific Hydrogeological and Geological Features
11	Cultural and Archaeological Heritage Incl. Associated Appendices
12	Architectural Heritage Incl. Associated Appendices
13	Population & Material Assets
14	Agronomy
15	Utilities - Water Supply & Wastewater
16	Utilities - Electricity
17	Utilities - Telecommunications
18	Utilities - Gas
19	Planning - Land Zoning
20	Planning - Planning Applications Incl. Associated Appendices

Table 2-1: List of Working Drawings Prepared for the Constraints Study

Constraints which were initially identified as being of particular significance within the Study Area were summarised and presented to the public and key stakeholders at the first non-statutory public consultation which was held back in June and July 2019 (Public Consultation 1 – Study Area and Constraints, See Section 2.4 below).

As the constraints and their associated data are being continually updated (i.e. new planning applications, public feedback, etc.), this information will be monitored and reviewed throughout the three-stage options selection process, in order to appropriately inform the development and assessment of the options. Finalised versions of the Constraints Study Drawings will be provided in the Options Selection Report, which will be prepared in due course as part of Phase 2 – Stage 3 (Preferred Option).

2.4 Option Selection Process – Public Consultation 1 – Study Area and Constraints

In order to generate awareness and initiate the participation of the public and key stakeholders at an early stage in the options selection process, a non-statutory public consultation was held in June and July 2019 in advance of the identification, development and assessment of the options/alternatives. This public consultation process included three information event days held in Castleblayney (Glencarn Hotel), Carrickmacross (Nuremore Hotel) and Ardee (Ardee Parish Centre) between the dates of 25th June and 27th June 2019. The process actively encouraged feedback on the Study Area and initial key constraints mapping, which were presented at the events and made available to the public on the dedicated Project Website[1] (www.N2monaghanlouth.ie). In this regard, a predefined feedback form was made available at the events and on the Project Website.

The feedback form, as well as requesting contact details, posed three questions:

- Do you live in the Study Area?
- If you live/ have property in the Study Area is it farm/agricultural land, residential, commercial or other?
- If you have any information in relation to the Study Area and Key constraints that you want the project team to be aware of when investigating route options please let us know.

The consultation period ran from the launch of the Project Website on 11th June until a deadline date of 25th July 2019. A total of 28 formal submissions were received during the public consultation period.

The feedback received from this first public consultation process was used by the Project Team to further define the constraints (See Section 2.3 above) and inform the identification and development of the options/alternatives.

At the time of writing, a post consultation report is currently being prepared, which will document and categorise the feedback under particular themes. This will be made available to the public and key stakeholders through the project website.

In addition to consulting and receiving feedback on the Study Area and constraints, a Public Consultation Roadmap was presented at the events and made available on the Project Website. This is shown in Figure 2-3 below. The Public Consultation Roadmap was used to explain the proposed public consultation process for the Scheme in terms of indicative timelines, public participation, and its interface with the TII PMGs Phases 1 to 4.

[1] Copies of Public Consultation 1 Brochure and maps are available on the Project Website: https://n2monaghanlouth.ie/a2c-publications

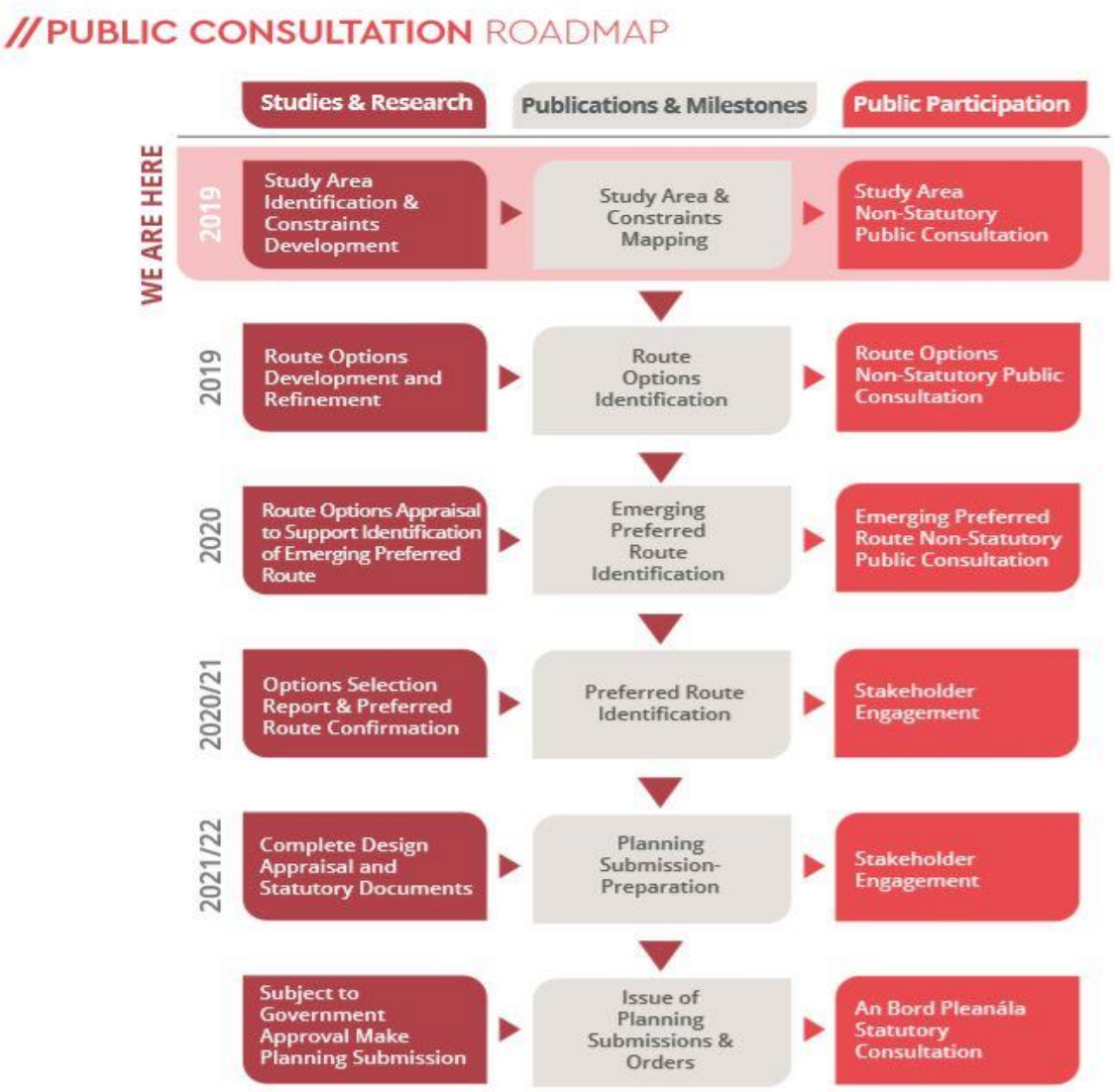


Figure 2-3: N2 Ardee to Castleblayney Road Scheme Public Consultation Roadmap presented at Public Consultation 1 in June and July 2019

With reference to Figure 2-3 above, and following completion of Public Consultation 1 (Study Area and Constraints), it is proposed that a further two non-statutory public consultations will be undertaken during Phase 2 (Options Selection). A non-statutory public consultation of the proposed Stage 2 options is proposed before the end of 2019, and a non-statutory public consultation of the emerging preferred option is proposed in 2020.

2.5 Option Selection Process – Stage 1 Assessment Overview

As outlined in Section 2.1 above and in TII's 2 PMM *'all reasonable / feasible options (Including Do-Nothing, 'Do-Minimum and Traffic Management Alternatives)'* are to be considered, developed and assessed for the Stage 1 Assessment (Preliminary Options Assessment). The conclusion of the Stage 1 Assessment is to result in a reduced number of options *('Do-Nothing or Do-Minimum, and a least three Do-Something Options'*) being taken forward to Stage 2 Assessment (Project Appraisal Matrix).

In considering, developing and assessing the options/alternatives, the following principles of TII's PAG Unit: 4.0, as summarised in the PMGs were applied to N2 Ardee to Castleblayney Road Scheme:

1) *'Options shall respond to the Project objectives.*
2) *Options shall be significantly different, insofar as possible.*

3) *Options shall be designed with environmental considerations in mind from the start.*
4) *An incremental approach to the development of options is to be adopted.*
5) *Management options shall be examined as part of the assessment of alternatives.*
6) *Packages of measures shall be examined as part of the assessment of options.'*

Consideration of the alternatives and options for the N2 Ardee to Castleblayney Scheme is outlined in Chapter 3 of this Report.

The development and description of the Do-Something Option – Stage 1 Feasible Route Corridor Options is outlined in Chapter 4 of this Report, whilst the assessment of these options is outlined in Chapter 5 of this Report.

3. Consideration of Alternatives and Options

3.1 Introduction

In accordance with the *TII's PAG Unit 4.0– Consideration of Alternatives and Options (October 2016)* and Clause 2.1.2.7.3 of *TII's Project Manager's Manual (PMM) for Major National Road Projects (February 2019)*, the following alternatives were identified, developed and assessed as part of the Stage 1 Assessment (Preliminary Options Assessment):

1) Do-Nothing Option
2) Do-Minimum Option ('The Base Case' as per the PAG)
3) Do-Something Alternative – Public Transport
4) Do-Something Option – Traffic Management Option:
    i. Localised Operational and Safety Infrastructure Improvements
    ii. Speed Reduction Measures
5) Do-Something Option – Feasible Route Corridor Option

In identifying, developing and assessing each of the alternatives and options, the six principles of TII's PAG Unit 4.0 as outlined in Section 2.5 of this Report were followed. In particular, and in terms of the assessment, the alternatives and options were assessed against how they would meet and respond to the defined Scheme Objectives. As per Section 1.4 of this Report, the Scheme Objectives Headings are as follows:

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

The assessment of the alternatives and options is described in further detail in the sections below.

3.2 Do-Nothing Option

In defining the Do-Nothing Option, TII's PAG Unit 4.0, states the following:

'Note that the Do-Minimum is distinct from the Do-Nothing. The Do-Nothing assumes that there will be no other investment in the transport network (other than regular maintenance) during the appraisal period beyond that being considered as part of the scheme under appraisal.'

Though now superseded by TII's 2019 PMM and PMG, TII's 2010 PMG defined the Do-Nothing Option in a similar manner:

The 'Do-Nothing' alternative (Option) shall comprise an investigation of the existing road infrastructure and its ability to meet future demands for traffic and safety without any upgrade works, other than routine maintenance.

As part of the assessment of the Do-Nothing Option for this Scheme, proposed regular maintenance works were firstly identified, followed by an investigation of the existing road infrastructure in the Study Area.

In terms of regular maintenance, Monaghan and Louth County Councils, and TII's ongoing and future road maintenance programmes were reviewed. These programmes primarily consist of maintenance of existing facilities and services in the Study Area, including verge/tree cutting, road drainage repairs, and pavement remediation works (resurfacing/overlay of defective sections of the existing carriageway, rutting/jointing/pot-hole repair, and skid resistance works). Although, these works are necessary and beneficial to maintain the existing infrastructure, they do not offer improvements to meet the future demands for traffic and safety, and do not meet all of the defined Scheme Objectives (Incl. Economy, Safety, Physical Activity, Accessibility & Inclusion, and Integration).

In relation to the existing infrastructure, as part of the investigation of existing N2 road network within the Study Area, a number of operational and safety issues were identified. These are summarised in the headings below.

3.2.1 Operational and Safety Issues – Existing Road Layout

The existing N2 section in the Study Area generally has a consistent Type 1 Single Carriageway cross-section for its entire length.

The N2 route has a speed limit of 100kph for the entire section from Ardee to Castleblayney. The road geometry is generally consistent with a 100 kph design speed. In terms of horizontal geometry, the existing bends along this section are generally at or above the desirable minimum radius of 720m as set out in the *TII Design Standard DN-GEO-03031 - Rural Road Link Design (2017)*. However, there are a number of existing bends, as outlined in Table 3-1 below, which are below desirable minimum standard. These characteristics result in a lesser degree of driving comfort for road users, generally result in a reduction of Stopping Sight Distance, and when combined with other existing deficiencies (vertical alignment, proximity and high number of junctions/accesses, and sub-standard visibility from junctions) can lead to Departures in Standards and can further exacerbate operational and safety issues at these locations.

Ref. No.	General Location	Specific Location	Desirable Min. Radius	Approx. Radius (M)	Approx. Length (M)	Comment
1	Townland of Rathory	280m South of N2/L1201 Staggered Junction	720	600	168	1 Step Relaxation
2	Townland of Reaghstown	At N2/L1201 Staggered Junction (Dooley's Restaurant)	720	600	303	1 Step Relaxation
3	Townland of Tullyvaragh (North of Castleross Retirement Village)	350m North of N2/L8100/L4500 Staggered Junction	720	600	396	1 Step Relaxation
4	Townland of Broomfield (South of Broomfield Meeting House)	At N2/L4300 Junction	720	600	328	1 Step Relaxation
5	Townland of Broomfield (Directly North of McCaughey's Filling Station)	At N2/L4110 Junction	720	600	337	1 Step Relaxation

Table 3-1: Existing Horizontal Radii between Ardee and Castleblayney below Desirable Minimum Standard

Typically, hard shoulders of 2.5m-3.0m in width are provided along the route except at locations where ghost islands are provided. At these locations the hard shoulder can reduce to approximately 0.5m. This reduction increases the potential risk of conflict between vulnerable road users and high-speed traffic. Equally, it is noted that there are a number of simple junctions where ghost islands and dedicated right-hand turn lanes are not present. Right turning drivers at these locations on the existing N2 may be exposed to rear shunt collisions, whilst also adding to congestion on the N2 mainline as traffic waits behind or undertakes in the hard shoulder. This may result in risk-taking being executed by right-turning drivers.

In relation to accesses and junctions onto the existing N2, each junction from a regional and local road, and/or a direct private access point (domestic, commercial and agricultural) creates an additional hazard for all road users. A junction or direct access generates a potential conflict area between motorists which may result in collisions. A total of 284 access points (junctions and direct accesses) have been identified on the existing N2 between Ardee and Castleblayney. A figure of 284 access points represents a significant number of potential conflict locations. Combined with expected traffic growth (See Section 3.2.2 below) and identified issues with overtaking opportunities (See Section 3.2.3 below), the high number of access points is considered an operational and safety problem.

In addition to the deficiencies in road layout listed above, it is noted that two site safety inspections were undertaken which observed and reported safety issues at access points along with a number of further issues related to the existing layout.

- A TII Road Safety Inspection (RSI), in accordance with TII Standard *AM-STY-06044 – Road Safety Inspection*, was commissioned by TII in 2016 on the existing N2 across the Counties of Monaghan and Louth. The inspections form part of TII's regular Rod Safety Inspection programme of all existing national roads in the Country and were not specifically commissioned for the N2 Ardee to Castleblayney Road Scheme.
- As part of the Phase 1 Road Safety Impact Assessment (RSIA) for this project, a site inspection was undertaken in December 2018 in accordance with the TII Standard *PE-MG-02001 Road Safety Impact Assessment.*

The RSI highlighted a number of safety issues relating to the mainline and side roads along the N2 within the Study Area, which can be summarised as follows:

- Junction Layout: Issues relating to junction width, longitudinal gradient, confusing layout or see through effect (junction awareness);
- Public Lighting: Poor visibility of pedestrians at night or layout of junction is unclear;
- Sight Distance: Inadequate sight distance exiting side roads due to road furniture, boundary hedges/ trees and parked cars

The Phase 1 RSIA site inspection identified the following road layout and safety issues:

- **Inconsistent Infrastructure Provision**: The general approach to ghost island provision from the mainline to regional and local side roads was considered inconsistent by the RSIA Auditor. Also, at locations where no-dedicated right-hand turn lanes are provided, vehicles turning from the mainline are exposed to rear shunt collisions.

- **Existing Side Road Junctions – Observed Non-Compliance Issues**:

    a) Junctions with stagger of less than the minimum design standard of 50m between centrelines (Including L5199 to Arthurstown/Churchtown and L5203 to Aclint/ Reaghstown).
    b) Presence of direct cross road junction layouts (L4810, L8301 to Taplagh and Edingilrevy, L8170 to Broomfield)
    c) A left right junction layout (L5198/ L52010) with a stagger of 20m between centrelines.
    d) There were a number of junctions which were located on bends or adjacent to a crest which may result in insufficient visibility splays.

e) A number of junctions with wide bellmouths may also lead to high exit/ entry speeds;

- **High Number of Direct Accesses**: There are many direct accesses to residential properties and fields along the route. There is also a section of the N2 between the L4300 and L4110 where a number of commercial premises are located, along with a number of accesses to farms and residential premises and it was considered complex to navigate through due to the number of right turn pockets provided.

In conclusion, when taking account of the high number of access points and junctions, the existing geometry, and other observed and reported safety issues in the recent inspection reports, it is considered likely that road layout in its current arrangement will not serve the future needs of the route safely and efficiently.

3.2.2 Operational and Safety Issues – Traffic Capacity and Composition

There are two existing TII permanent Traffic Monitoring Units (TMUs) on the existing N2 between Ardee and Castleblayney. These TMUs record traffic volumes, in Annual Average Daily Traffic (AADT) flows and can differentiate between cars and Heavy Goods vehicles. Data collected by the TMUs is available to view on the TII Traffic Counter Data Website[2]. Tables 3-2 and 3-3 show Average Annual Daily Traffic (AADT) flows at two locations on the existing N2 between Ardee and Castleblayney:

	2014	2015	2016	2017	2018
AADT	8767	9518	9910	10,195	10,516
% HGV	10.4%	10.6%	10.8%	10.9%	11.1%
Coverage	99.7%	99.7%	99.7%	99.7%	92.4%

Table 3-2: TMU Location 1 - Traffic Count N2 Drumgeeny, between Ardee and Carrickmacross

	2014	2015	2016	2017	2018
AADT	9102	9999	10224	10,410	10,621
% HGV	9.7%	9.4%	9.6%	9.6%	9.7%
Coverage	99.7%	99.7%	99.7%	99.7%	77.4%

Table 3-3: TMU Location 2 - Traffic Count N2 Donaghmoyne, between Carrickmacross and Castleblayney

The data recorded by these counters show that the traffic volumes are increasing year on year and have increased 16% to 20% over the past five years. With reference to the tables above and Table 3-4 below, the TII Design Standard DN-GEO-03031 - Rural Road Link Design (2017) outlines that the AADT capacity for a Level of Service (LOS) D[3] would have to be less than 11,600 AADT for a Type 1 Single Carriageway (As per Section 3.2.1 above, the existing N2 carriageway generally aligns with a Type 1 Single Carriageway).

[2] TII Traffic Counter Data Website: https://www.tii.ie/roads-tolling/operations-and-maintenance/traffic-count-data/

[3] In TII Standard DN-GEO-03031, carriageway cross-sections are categorised on the basis of capacity and level of service (LOS). The capacity of a road is the ability of that section of road to carry the maximum number of vehicles (AADT) in safety at an appropriate LOS. The LOS is an industry standard measure to describe and qualitatively assess the driver experience in terms of operating speed, the ability to overtake in safety, traffic congestion, and overall driver safety comfort. TII Standard DN-GEO-03031 defines a LOS Target of D.

Type of Road Capacity	AADT – LOS D
Type 3 Single Carriageway (6.0m)	5,000
Type 2 Single Carriageway (7.0m)	8,600
Type 1 Single Carriageway (7.3m)	11,600
Type 3 Dual (7.0m + 3.5m)	14,000
Type 2 Dual (7.0m x 2)	20,000
Type 1 Dual (7.0m x 2 with hard shoulder)	42,000

Table 3-4: Road Type and Capacity required for LOS D

Based on the traffic count volumes, sections of the existing N2 carriageway are currently nearing capacity, and based on current trends and expected forecast growth rates at some locations, the N2 traffic volumes are likely to exceed the capacity for a Type 1 Single Carriageway at LOS D in the near future. In conclusion, sections of the existing road are nearing capacity for the required LOS, and it is expected that the level of service of carriageway would continue to reduce and be below standard in the near future.

In terms of defined future traffic flows, it noted that traffic modelling of the scheme is yet to be completed at this stage. Forecasted traffic flows will be derived and assessed as part of the future Phase 2 – Stage 2 Project Appraisal.

In relation to traffic composition, and with reference to Tables 3-2 and 3-3 above, it is noted that Heavy Goods Vehicle (HGV) % of the total varies between 10.4% to 11.1% at TMU Location 1 and between 9.4% to 9.7% at TMU Location 2. This HGV% is considerably high when compared to typical averages on the National and National Secondary Road Network. A sample group of National Secondary and National Secondary Roads, assessed as part of the Phase 0 N2 Ardee to Castleblayney Road Scheme – Project Brief (September 2018), identified an average HGV% of 5.7%.

The high percentage of HGVs on the existing single carriageway section, combined with the lack of an adequate number of overtaking sections (See Section 3.2.3 below), further increases the likelihood of drivers becoming frustrated and attempting inappropriate unsafe overtaking manoeuvres. Also, with reference to the N2 Ardee to Castleblayney Road Scheme – Phase 1 RSIA, it is noted that the practice of HGVs travelling partly in the existing hard shoulder to allow overtaking to occur has been observed. This practice is unsafe as it may encourage drivers to overtake at unsafe locations on the existing N2 and it may compromise the safety of vehicles pulling out of access and junctions on the N2.

In conclusion, when taking account of the existing and expected future traffic demands, the expected reduction in LOS, the high percentage of HGVs and associated observed practices, traffic capacity and composition on the existing N2 is considered an operational and safety issue.

3.2.3 Operational and Safety Issues – Overtaking Opportunities

A lack of safe overtaking opportunities on a single carriageway is likely to lead to driver frustration and to result in drivers undertaking unsafe overtaking manoeuvres. A measure of the provision of overtaking opportunities /sections on a road is the Overtaking Value[4]. TII's Design Standard DN-GEO-03031 - Rural Road Link Design (2017) specifies that a Type 1 single carriageway requires an overtaking value of 30% for online improvements and 50% for newly constructed schemes. With reference to the N2 Ardee to Castleblayney Road Scheme – Phase 0 Project Brief (September 2018), the existing overtaking sections were approximately estimated across the length of the existing N2, and the overtaking values were calculated for individual sections and for the overall length between Ardee and Castleblayney. These values are presented in Table 3-5 below.

Individual Sections	Approximate Lengths	Estimated length of Overtaking Sections (Approx.)	% Overtaking Sections
Ardee to Carrickmacross Bypass	15,500m	2,070m	13.4%
Carrickmacross Bypass	2,800m	660m	23.6%
Carrickmacross Bypass to Castleblayney Bypass	13,500m	4,570m	33.9%
Totals:	31,800m	7,300m	23.0%

Table 3-5: Existing Overtaking Sections on the Existing Single Carriageway on the N2 between Ardee and Castleblayney

The overall overtaking value of 23.0% falls short of the online improvement target of 30% and is considerably lower than the 50% required for newly constructed schemes.

When taking account of the high percentages of HGVs (See Section 3.2.2), the occurrence of slow-moving agricultural vehicles in a rural setting using the existing N2, and the large volumes of traffic (See Section 3.2.2), the lack of an adequate number and combined length of overtaking opportunities on the existing N2 is considered a safety and operational problem.

[4] TII Standard DN-GEO-03031 defines the Overtaking Value as the total length of Overtaking Sections for each direction shall be summed and divided by the total length of the road improvement. The target values of 30% and 50% have been obtained from Table 7.3 of TII Standard DN-GEO-03031.

3.2.4 Operational and Safety Issues – Vulnerable Road Users

As identified in Section 3.2.1 (Road Layout) above, the existing carriageway between Ardee and Castleblayney is generally a Type 1 single carriageway for its entire length, with hard shoulders of between 2.5m and 3.0m reducing to approximately 0.5m at locations with existing ghost islands. The existing cross-section between Ardee and Castleblayney does not have formal dedicated facilities for vulnerable road users (pedestrians and cyclists), also known as Non-Motorised Users (NMUs). Vulnerable road users have been observed using the hard shoulder to walk or cycle, however, there is no formalised segregation/safe separation distance provided between the live trafficked carriageway (which includes the hard shoulders) and the vulnerable road users. It is also noted that this section of the N2 does not provide any formal crossing facilities across existing junctions and accesses along the mainline. In the period from 2005 to 2016 along this section of the N2 the validated RSA data indicates there has been four recorded collisions involving Vulnerable Road Users (three pedestrian and one cyclist). Of these, two resulted in fatalities, one resulted in serious injury and one resulted in non-serious injury.

Regarding the two VRU fatalities recorded on this section of the N2 during the stated period, this represents 1.75% of the total collisions which either resulted in injury or fatalities and 13% of the total collisions resulting in fatalities alone. The national average with regard to collisions involving VRU's in the same period was 1%[5] of the total collisions resulting in injury and or fatalities and 23.8%[6] of the total collisions resulting in fatalities alone.

Pedestrians and cyclists who use these hard shoulders/hardstrips/verges, are considered to be at risk due to the lack of separation distance from high speed traffic, the noted reduction of hard shoulder width at ghost islands, and the observed occurrence of HGVs, slow-moving agricultural vehicles and parked vehicles using the existing hard shoulders.

In conclusion, the lack of formal dedicated facilities for vulnerable road users on the existing N2 and on the adjacent existing regional and local road network between Ardee and Castleblayney is considered an operational and safety issue.

3.2.5 Operational and Safety Issues – Collison Occurrence

Historic road collision data for the route has been gathered from the Road Safety Authority (RSA) and Transport Infrastructure Ireland (TII) for the period 2005 to April 2018, as set out in Table 3-6 below. There was a total of 109 personal injury collisions in this period on the existing N2 between Ardee and Castleblayney. There were 19 fatal collisions, 8 serious injury collisions and 82 minor injury collisions.

[5] Based on the data available on RSA website, between 2005 and 2016 there were nationally 67,813 collisions resulting in injury or a fatality. Of these collisions 690 fatalities were recorded as VRU's which represents 1% of the overall collisions in that period.

[6] Based on the data available on RSA website, between 2005 and 2016 there were nationally 2,901 fatalities resulting from Road traffic collisions. Of these collisions 690 fatalities were recorded as VRU's which represents 23.8% of the overall collisions in that period

Year	Fatal Collisions	Serious Injury Collision	Minor Injury Collision	Total
2005	1	0	5	6
2006	0	1	5	6
2007	1	2	11	14
2008	1	0	7	8
2009	0	0	5	5
2010	2	1	4	7
2011	1	0	7	8
2012	1	0	4	5
2013	3	2	4	9
2014	3	2	7	12
2015*	0	0	8	8
2016*	2	0	6	8
2017*	3	0	5	8
Part of 2018*	1	0	4	5
Total:	**19**	**8**	**82**	**109**

***** = It is noted that the 2015 to 2018 data, obtained from TII, has not yet been through the RSA validation process.

Table 3-6: Accident Collision Data on the N2 between Ardee and Castleblayney 2005 – April 2018

The percentage of fatal collisions of 17.4% (19 of 109) is particularly high when compared with the national average of 3%[7]. From review of the collision data, as part of the N2 Ardee to Castleblayney Road Scheme Phase 1 RSIA (January 2019), it was evident that there are numerous clusters of collisions on the N2 which are generally in the vicinity of the junctions or straight sections, with the full length of the route collectively experiencing a high collision frequency.

An analysis of the 2005 to 2014 data, which has been verified by the RSA, was undertaken as part of the Phase 1 RSIA (January 2019). The following statistics were highlighted:

- The largest defined collision types were 'Rear End on a Straight' and 'Head on Conflict'. Eighteen collisions (22.5%) on the N2 involved a rear end shunt type collision on a straight and fifteen collisions (18.75%) involved a head on conflict.
- Of the thirteen fatal collisions, two occurred at the junction with the L4110 and 6 involved a head on conflict.
- Three (<4%) of all the collisions involved a pedestrian, nine (11.25%) involved goods vehicles, and 1 (<1%) involved a motorcyclist.
- In relation to defined time periods of collisions, 10:00-16:00 contained the largest number of collisions, with 33 (41%).
- Less collisions happened on Tuesday than any other day (6 collisions, 7.5%). All other days were between 12.5 and 16.25%.

TII undertake a Network Safety Ranking of the national road network, based on average collision rates on the various road cross-sections types, to identify high collision locations. The national routes are categorised into four groups ('Twice Above the Expected Collision Rate', 'Above the Expected Collision Rate', 'Below Expected Rate', and 'Twice Below the Expected Rate'). Based on data from 2014 to 2016, the N2 between Ardee and Castleblayney contains a number of sections which are 'Above the Expected Collision Rate' and a number of sections which are 'Twice Above the Expected Collision Rate'.

[7] Based on the RSA website, in 2014 there were 179 fatal collisions, which represents 3% of the overall collisions in that year (5797).

In conclusion, the collision analysis identifies that the existing N2 between Ardee and Castleblayney experiences a high collision frequency, with the percentage of fatal collisions being significantly high. It is considered that this presents a safety problem.

3.2.6 Operational and Safety Issues – Excessive Traffic Speeds on the Existing Road Infrastructure

As stated in Section 3.2.1 above, the existing section of the N2 from Ardee to Castleblayney has a posted speed limit of 100 kph for the entirety of this section, where the road geometry is generally consistent with a design speed of 100kph. With reference to the N2 Ardee to Castleblayney Road Scheme – Phase 1 RSIA (January 2019), a number of speed surveys were undertaken by Monaghan and Louth County Councils at a number of locations in 2016 and 2018. The measured 85th percentile speeds[8] across the majority of the sites were above the posted speed limit, and in some cases recorded maximum speeds were almost twice the posted speed limit.

High and excessive speeds combined with existing infrastructure issues, as stated in the sections above, including a high number of accesses/junctions, lack of an adequate number of overtaking opportunities, and growing traffic demand, presents a safety concern.

3.2.7 Do-Nothing Option – Conclusion

Further to identifying and assessing the operational and safety issues of existing N2 Section between Ardee and Castleblayney under the headings of Existing Road Layout, Traffic Capacity and Composition, Overtaking Opportunities, Vulnerable Road Users, Vulnerable Road Users and Excessive Traffic Speeds on the Existing Road Infrastructure, it considered this existing section of the N2 presents significant deficiencies, and significant operational and safety issues. Furthermore, it is considered that the existing N2 will not meet all of the Scheme Objectives.

Therefore, the Do-Nothing Option has been determined not to meet the Scheme Objectives and has been discounted from further consideration.

[8] The 85th percentile speed is a standard industry measurement, which represents the speed at or below which 85% of the motorists drive on a given road unaffected by slower traffic or poor weather. This speed indicates the speed that most motorists on the road consider safe and reasonable under ideal conditions

3.3 Do-Minimum Option

In accordance with the TII's PAG Unit 4.0 (October 2016), the Do-Minimum Option provides the baseline for establishing the Economic, Integration, Safety, Environmental, and Accessibility & Social Inclusion impacts of all options. The Do-Minimum Option is referred to as the Base Case within the Common Appraisal Framework for Transport Projects and Programmes (March 2016).

As per the TII's PAG Unit 4.0, the Do-Minimum Option should include transportation facilities and services that are defined as ***'committed'*** as opposed to *'planned'*. The definition and differentiation between *'committed'* and *'planned'* schemes as outlined in Clause 4.1 of TII's PAG Unit 4.0 is as follows:

*'**Committed and Planned Schemes***

There are often two possible definitions of complementary projects that should be considered in the appraisal of the scheme in question. Choice among these is determined by the local situation, particularly the degree of certainty that other transportation improvements will be made between now and the horizon year.

The possible definitions include:

a) *"Planned" improvements that are included in the fiscally constrained long-range plan for which the need, commitment, financing, and public and political support are identified and may be reasonably expected to be implemented; and*
b) *"Committed" improvements that have been progressed through planning and are either under construction or are programmed into the capital expenditure budget.*

The Do Minimum option should consider "committed" schemes alone *as the inclusion of "planned" improvements may lead to a set of scheme options that incorporate projects that may not happen.'*

Furthermore, TII's PAG Unit 4.0 further defines the Do-Minimum Alternative/Option and 'committed' schemes, by stating:

'To provide a basis of comparison the Do-Minimum Option must include the following features:

- *The maintenance of existing facilities and services in the study corridor and region;*
- ***The completion and maintenance of committed projects or policies in the study corridor that have successfully completed their environmental review****; and*
- *The continuation of existing transportation policies.'*

In relation to the final statement above, and the definition of the Do-Minimum Option for the N2 Ardee to Castleblayney Road Scheme, it is noted that the *'Maintenance of existing facilities …'* has been defined and assessed in the Do-Nothing Option (See Section 3.2 above), where this option has been discounted from further consideration.

In terms of *'planned'* and *'committed'* schemes, a list of projects within Study Area which have been identified by TII, and Monaghan and Louth County Councils were reviewed, and categorised as *'planned'* and *'committed'* schemes. Schemes outside of the Study Area which would likely impact on scheme appraisal were also considered. A list of the 'committed' schemes for the N2 Ardee to Castleblayney Road Scheme is provided in Table 3-7 below.

Ref. No.	Scheme Name	Authority	General Description	Approx. Length (km)	Status
1	**N52 Ardee Bypass Scheme**	Louth County Council & TII	Single Carriageway link road on the north-eastern environs of Ardee own connecting the existing N52 in the Townland of Mandistown to N2 in the Townland of Mandistown, approximately 700m North of the existing Carrickmacross Road Roundabout (N2/N33/R171/ Carrick Road)	4.5	Advance Fencing and Site Clearance Contract Ongoing. Alternative Junction and pedestrian/ cyclists arrangements are currently being prepared by LCC.
2	**N2 Ardee to Aclint Minor Improvements Scheme**	Louth County Council & TII	Minor localised online safety improvements at 4 No. locations (Approach to Carrickmacross Roundabout, Cookstown Cross, L1201 Reaghstown Junction, & South of Aclint Bridge) on the existing N2 between Ardee and Aclint. Works include additional signage, re-surfacing, and junction re-alignment within the existing carriageway.	3.4	Works are envisaged to be undertaken in 2019

Table 3-7: List of 'committed' schemes for the N2 Ardee to Castleblayney Road Scheme

A number of other schemes within or close to the Study Area were identified as 'planned' schemes in accordance PAG Unit 4.0, as they have not *'fully progressed through planning or are programmed into the capital expenditure budget*', or they have not *'successfully completed their environmental review'*. These projects include, but are not limited to, the following:

- N2 Clontibret to Border Road Scheme – At Option Selection Stage;
- A5 Western Transport Corridor (Northern Ireland) – At Planning Stage / Not successfully completed Environmental and Statutory Orders;
- N14 Manorcunningham to Lifford/Strabane/A5 Link Road Scheme (Part of Donegal Ten-T Project) – At Route Selection Stage;
- N2 Slane Bypass – At Option Selection Stage;
- N2 Rath Roundabout to Kilmoon Cross – At Feasibility Stage;
- N2 Ardee Bypass (East of Ardee Town)– Currently on Hold / At Feasibility Stage
- N53 Hackballcross to Rassan – At Option Selection Stage;
- N2 Tullyvaragh Junction Re-alignment (North of Carrickmacross) – Not successfully completed planning process

With reference to Table 3.7 above, it is noted that the difference between the Do-Nothing Option and Do-Minimum Option, is the addition of two *'committed'* schemes; N52 Ardee Bypass Scheme, and N2 Ardee to Aclint Minor Improvements Scheme. The N52 Ardee Bypass Scheme will not offer capacity, travel time, journey reliability, and safety benefits on the extents of existing section of proposed N2 scheme.

In the case of the N2 Ardee to Aclint Minor Improvements Scheme, this scheme will offer minor safety improvements at a number of localised areas along of section of the N2, but it does not cover the full extents of proposed N2 scheme and will not address all of the Safety Objectives of the proposed N2 Scheme (i.e. improvement to overtaking opportunities, etc.). Also, as in the case of N52 Ardee Bypass Scheme, the N2 Ardee to Aclint Minor Improvement Scheme will not offer capacity, travel time and journey reliability benefits.

Therefore, as previously outlined for Do-Nothing Option, as traffic volumes increase in the future, the performance of the existing section of N2 in terms of Safety and Physical Activity is likely to deteriorate, as will the performance of Accessibility & Social Inclusion and integration, as result of reducing average journey speeds and lower journey time reliability. Hence, it is determined that the Do-Nothing Option has been determined not to meet the Scheme Objectives.

Furthermore, in relation to policy objectives, and with reference to PAG Unit 4.0's definition of the Do-Minimum Option (*'continuation of existing transportation policies', see above)*, it is noted that these existing transportation and road infrastructure policies have been identified and are outlined in Section 1.5 (Strategic Fit and Priority) of this Report. It is considered that the Do-Minimum Option will meet only part of these existing policies, but it will not meet the objectives of National Planning Framework (NPF) 2040 and the National Development Plan 2018 – 2027 in relation to improving accessibility to the North-West and Border Region, improving average travel journey times, and maintaining the strategic capacity and safety of this section of the existing N2.

In conclusion, the Do-Minimum Option has been discounted as a single overall solution as it does not meet the Scheme and National Policy Objectives.

3.4 Do-Something Alternative – Public Transport

Under this Do-Something Alternative, various public transport modes which could present a potential viable alternative to other Do-Something Options (including a new feasible route corridor option), are considered and assessed.

Investment and improvement of sustainable public transport is a key objective of The National Planning Framework (NPF) 2040, and the Regional Spatial and Economic Strategy (RSES) for the Eastern and Midlands Region and North and West Region (Draft). The NPF 2040 outlines the importance of sustainable public transport in a number of its ten National Strategic Outcomes:

National Strategic Outcome 4 – Sustainable Mobility

NPF 2040 introduces sustainable mobility as '*The provision of a well-functioning, integrated public transport system, enhancing competitiveness, sustaining economic progress and enabling sustainable mobility choices for citizens, supports the overall Framework objectives.*'

Under the heading of Public Transport, it outlines the objective to:

'Expand attractive public transport alternatives to car transport to reduce congestion and emissions and enable the transport sector to cater for the demands associated with longer term population and employment growth in a sustainable manner through the following measures:

- *'…Provide public transport infrastructure and services to meet the needs of smaller towns, villages and rural areas;'*

National Strategic Outcome 2 – Enhanced Regional Accessibility

Under the heading of Public Transport, it outlines the objective:

- *'To strengthen public transport connectivity between cities and large growth towns in Ireland and Northern Ireland with improved services and reliable journey times.'*

The NPF recognises that public transport plays a key role in sustaining the vitality and viability of rural communities as well as providing essential inter-urban links.

In the context of assessing the Public Transport alternative for N2 Ardee to Castleblayney Road Scheme, it is noted that the Study Area is largely rural in character with the larger settlement centres of Ardee to the South, Carrickmacross in the middle and Castleblayney to the North. As identified in the Phases 0 & 1 Project Appraisal Plans (PAPs), there is a large variance in the existing transport profile going through and within the Study Area:

- **Strategic** – Traffic using the primary route of the N2/A5 and associated connected roads to link between Dublin to Northern Ireland, and northwest of the country, where the N2/A5 serves the major hubs and towns of Ashbourne, Slane, Ardee, Carrickmacross, Castleblayney, Monaghan Town, Omagh, Strabane and links Letterkenny, Dungannon and Derry.
- **Local** – Local traffic using primarily local and regional roads, along with national and national secondary roads, to access towns, villages and smaller settlements within the study area.

Due to large variance in the existing transport profile and considering that the study area does not interface with sea, the public transport alternatives identified, as per the Phases 0 1 PAPs, are limited to bus, rail and air for this Scheme. These public transport modes are discussed in further detail below.

3.4.1 Public Transport Alternative – Bus

There are currently a number of national public bus services, local community-based initiatives and private operators going through and operating within the Study Area.

In relation to national bus services, Bus Éireann operates services along the existing N2 between Dublin and Letterkenny with stops including Ardee, Carrickmacross and Castleblayney. In addition, Bus Eireann provides links from Ardee and Castleblayney to all other major towns and cities within the region such as Dublin (including Dublin Airport), Dundalk, Drogheda, Cavan, Letterkenny and Belfast. Translink (Ulsterbus) offers similar services within the Study Area.

Regarding local initiatives, 17 National Transport Co-ordination Units (TCUs) were set-up in 2014 on behalf of the National Transport Authority to manage the Rural Transport Programme in Ireland and provide transport services where public services are not readily available. Within the N2 Ardee to Castleblayney Road Scheme Study Area, 2 TCUs operate; 'Cavan Monaghan LocalLink' in the county of Monaghan and 'Louth, Meath and Fingal LocalLink' (Trading as Flexibus) in the county of Louth, which manage services connecting local areas and villages to Ardee, Carrickmacross, and Castleblayney. In addition to the public and local initiative services, there are a number of private operators providing bus services including Collins Coaches (Ballybay-Carrickmacross-Ardee-Dublin).

It is recognised that public transport will be further prioritised in the future with increased investment, as outlined in the NPF 2040, which will lead to potentially greater coverage, accessibility, and frequency of bus services and stops. Notwithstanding this, at this preliminary assessment stage, it is considered due to the dispersed geographical nature of the population across the study area, private vehicle transportation will still be the predominant mode of transport in the Study Area, and bus transportation cannot solely meet the expected increased transport demands in the future. Potential modal shift will be further considered in the subsequent Stage 2 assessment of the scheme. Separately, it is noted that bus transportation cannot reasonably serve the transportation of freight and large goods.

In terms of the Scheme Objectives of Integration, and Accessibility & Social Inclusion, it is recognised that improvements to bus transportation can meet some and/or contribute in part to meeting these objectives (i.e. 'enhancing accessibility from rural zones') but it cannot solely meet all of the objectives (i.e. improvement of journey times). It is apparent that improvements to road infrastructure (including the N2) are necessary to support and realise the potential future investment and improvements in bus transportation. An upgrade of the N2 will facilitate the enhancement of bus services operating through and within the Study Area by improving journey times, journey time reliability and providing safer accessibility onto and off the N2.

3.4.2 Public Transport Alternative – Rail & Air

There are no existing operating rail services within the Study Area. The nearest operating train stations to the Study Area are Drogheda and Dundalk on the Dublin to Belfast line, which are approximately 12km and 19.5km (to the nearest point of the Study Area boundary), respectively.

Historically, there was a passenger and freight line which operated within the Study Area in the Counties of Monaghan and Louth;

- **Dundalk – Enniskillen Line:** This line passed through Inniskeen, Castleblayney, Ballybay, Newbliss and Clones, with branches to Carrickmacross, Cootehill and the Armagh-Castleblayney line.

This rail network was operated by Great Northern Railway (Ireland)/Great Northern Railway Board. Passenger traffic ceased in 1957, and freight traffic ceased in 1959. The assets were transferred to Córas Iompar Éireann (now Irish Rail) at the time. The majority of railway lines were removed, with land on certain sections of the line being sold to adjacent landowners and other sections of land being retained by Irish Rail.

In addition to the above lines, a passenger and freight line existed between Navan in Meath and Kingscourt, in Cavan. The line was withdrawn to passengers in 1963, following which it was used for the transport of gypsum up to 2001 when it was closed. The closed Kingscourt Railway Station is approximately 4.5km to the nearest point of the Study Area boundary. There are currently no immediate proposals by Irish Rail to re-open this line.

The NPF 2040 identifies the importance of enhancing public rail infrastructure in its National Strategic Outcome 4 – Sustainable Mobility, although, there are no specific future plans or objectives to develop a new railway route within or near the Study Area. Instead, the emphasis of the NPF 2040 and the NDP 2018 -2028 is to further develop the existing Dublin to Belfast Rail Line as part of the identified 'Dublin-Belfast Economic Corridor' by *'Examining the feasibility of a high-speed rail connection between Belfast and Dublin and Cork'*. The RSESs for both the North and West Region (NWR), and Eastern and Midlands Region also identify the importance of enhancing public rail infrastructure. Similar to the NPF 2040, the RSESs do not outline any specific future plans or objectives to develop a new railway route within or near the Study Area. Instead, the emphasis is on the 'Dublin-Belfast Economic Corridor', 'Atlantic Economic Corridor (Including the Western Rail Corridor; Athenry-Tuam-Claremorris, enhancing capacity of the Sligo-Dublin Line, and investigating the feasibility of the link between Navan and the M3 Parkway. The NWR RSES identifies that further connectivity to the North-West will stem from the existing Dublin to Sligo line via. Policy Objective 118: *'Investigate the feasibility of extending the rail network to the North West City region from Sligo and Dublin'*.

Regarding Irish Rail's own future infrastructure plans, the *2030 Rail Network Strategy Review (2011)* outlines Irish Rail's future development requirements. There is no reference to any new rail routes within or within close proximity to the Study Area.

With reference to the above, as there is no existing operating rail infrastructure within (or within close proximity) to the Study Area, and no future plans or objectives for new rail infrastructure within (or within close proximity) to the Study Area, it is identified that the primary transport infrastructure for private, commercial and freight is and will be road-based.

In conclusion, a Rail Public Transport Alternative is considered not to meet the Scheme Objectives and has been discounted as per the Phase 0 & 1 PAPs.

In relation to a Public Air Transport Alternative, it is noted that there is no existing or planned commercial passenger/ /freight airport within the Study Area. The nearest main passenger airports are Dublin, Belfast International and Belfast City Belfast, which are approximately 52 km, 81km and 70km (to the nearest point of the Study Area boundary), respectively. In terms to strategic connectivity to the North-West, it is noted there is currently a daily passenger service operating between Dublin Airport and Donegal Airport (Carrickfinn). It is considered that the travel numbers currently using this service and into the future would represent a very minor percentage of numbers using road infrastructure between Dublin and Donegal/North-West.

It is also recognised that this service does not accommodate freight. Outside of strategic connectivity to North-West, it is noted that there is no existing or planned commercial services which would provide transportation linkages to areas within the Study Area.

In conclusion, noting that there are no existing or planned commercial passenger/freight airports within the Study Area, that the nearest airports are considerable distances from the Study Area, and noting the capacity and connectivity limitations, it is considered that a Public Air Transport Alternative does not meet the Scheme Objectives, and has been discounted as per the Phase 0 & Phase 1 PAPs.

3.4.3 Public Transport Alternative – Conclusion

As outlined in the sections above, the Public Rail and Air Transport Alternatives have been considered not to meet the Scheme Objectives and are discounted. In relation to the Public Bus Transport Alternative, though it is recognised that bus transportation is a viable component of an overall solution, which will be accounted for in the future appraisal process, it does not meet all of the Scheme Objectives, and cannot be deemed a sole solution in isolation. Therefore, in conclusion and as per the Phase 0 & 1 PAP, the Do-Something Alternative – Public Transport as a sole solution has been discounted.

3.5 Do-Something Option – Traffic Management Option

In accordance with Clause 2.1.2.7.3 of TII's PMM, the Traffic Management Option is to be identified and assessed as part of the Stage 1 Assessment.

TII's PAG Unit 4.0 defines the Traffic Management Option as *'a realistic near-term package of improvements'* which *'seeks to utilise the existing asset where feasible through on-line improvements, bottleneck removals, road safety works, traffic management measures or Intelligent Systems*'. The alternative is deemed to *'represent the "best" that can be done using the existing infrastructure' and* its components *'tend to be small in scale and widely distributed in location'.*

The existing operational and safety issues, identified under the Do-Nothing Option, in terms of Existing Road Layout, Traffic Capacity and Composition, Collision Occurrence, Overtaking Opportunities, Vulnerable Road Users and Excessive Traffic Speeds on the Existing Road Infrastructure, were used to inform and define the particular Traffic Management Option(s) for this scheme, whilst recognising that the Traffic Management Option is *'near-term'* and utilises *'the existing infrastructure'*. In this regard, the following two Traffic Management Option measures, which potentially could be delivered through smaller targeted investment, were identified for N2 Ardee to Castleblayney Road Scheme:

1) **Localised Operational and Safety Infrastructure Improvements (See Section 3.5.1)**

2) **Speed Reduction Measures (See Section 3.5.2)**

These are defined and assessed in further detail in the sections below.

In terms of an option which consists of substantial on-line widening infrastructure improvements, this option is not considered to fall under or align with the definition of a Traffic Management Option. As per TII PAG Unit 4.0, a Traffic Management Option is to *'utilise the existing infrastructure'*, not substantially replace and widen it, whilst being relatively *'small in scale'*, and *'near-term'*. Substantial on-line widening infrastructure improvements do not align with these criteria. These types of improvements have been considered under the Do -Something Option–Feasible Route Corridor Option (See Section 3.7 and 4).

In addition to substantial on-line widening improvements, it is considered that a proposal to retrofit additional lanes in the form of a Type 3 Dual Carriageway (2+1) or Type 2 Dual Carriageway (2+2) within the existing carriageway width does not fall under or align with the definition of a Traffic Management Option. It is considered that these potential works, whether on the entirety of existing N2 between Ardee to Castleblayney or on certain sections, would require significant infrastructural investment and would be a long-term measure. As potential retrofitting is a form of substantial online improvement, it is noted that this type of improvement is considered under the Do -Something Option–Feasible Route Corridor Option (See Sections 3.7 and 4).

3.5.1 Localised Operational and Safety Infrastructure Improvements

As stated in the introduction to Section 3.5 above, localised operational and safety Infrastructure improvements would be *'small in scale'*, *'near-term*', '*utilise the existing infrastructure'*, and provide interim safety and operational measures in advance of significant strategic investment. The improvements would vary in nature and location, whereby the improvements could consist of:

1) An Individual scheme targeting a particular location on the existing N2 consisting of various aspects of improvements at that location i.e. signage, road markings, pavement re-surfacing, widening within the extents of the existing road boundary, etc.;

2) An individual scheme across the entire length or substantial section of the existing N2 consisting of a single particular aspect of improvement i.e. Signage improvement package across the entire length of the N2 between Ardee and Castleblayney;

3) A combination of the two types above / a package of a number of the individual schemes [item 1)] at a series of locations.

In relation to the section of the N2 between Ardee and Castleblayney, an example of a typical localised operational and safety Infrastructure improvement is the forthcoming N2 Ardee to Aclint Minor Improvements Scheme[9]. This scheme consists of a series of targeted online safety improvements at various locations between Ardee and Aclint, including signage and road marking works, and provision of a new dedicated right-turn within the extents of the existing carriageway. Another example of a typical localised operational and safety Infrastructure improvement scheme, which is currently being developed by Monaghan County Council, is the N2 Tullyvaragh Junction Re-alignment Scheme. This scheme seeks to provide interim safety measures at the existing N2/L8100/L4500 Junction (North of Carrickmacross & Castleross Village) by improving right-turn provision from the mainline and improving visibility from the side road(s).

As part of the Stage 1 assessment, the existing operational and safety issues (Existing Road Layout, Traffic Capacity and Composition, Overtaking Opportunities, Vulnerable Road Users, Collision Occurrence, and Excessive Traffic Speeds on the Existing Road Infrastructure) identified as part of the assessment of the Do-Nothing Option (See Section 3.2) were used to inform the identification of other potential localised operational and safety improvements on the existing N2 between Ardee and Castleblayney. These are outlined and assessed below.

[9] The N2 Ardee to Aclint Minor Improvements Scheme has been provided for the purposes of an example of a localised operational and safety infrastructure improvement scheme only. In the context of specific consideration of Alternatives, it is noted, with reference to Section 3.3, it has been identified as a committed scheme and forms part of the Do-Minimum Alternative.

3.5.1.1 Localised Junction Improvements

With reference to Section 3.2.6 (Collision Occurrence), and further to a review of the historical collisions on this section of the N2, it is noted that a considerable portion of the collisions relate to right-turning movements at existing junctions. Targeted minor safety improvements to particular junctions which have an existing elevated collision rate would likely decrease the frequency / severity of future collisions at these locations. Potential improvements could consist of installation of ghost-island right-turning lanes, minor side road re-alignment to improve visibility, blocking traffic crossing the N2 from low volume local roads at particular sub-standard staggers/direct crossroads through left-in-left-out measures, and local road additional/revised road marking.

It is noted that Monaghan County Council has undertaken a number of similar type improvements on the existing N2 between Carrickmacross and Castleblayney over the last decade, including minor safety improvements at the Carrickmacross Southern and Northern Grade Separated Junctions and at Broomfield.

It also recognised that both Monaghan and Louth County Councils will continue to undertake similar minor and interim safety improvements into the future including the N2 Ardee to Aclint Minor Improvements Scheme, and N2 Tullyvaragh Junction Re-alignment Scheme, as noted in Section 3.5.1 above.

3.5.1.2 Targeted Localised Road Improvements

It is noted that there have been a number of head-on collisions recorded at non-overtaking sections on the existing N2 between Ardee and Castleblayney. With reference to the existing deficiencies identified as part of the Do-Nothing Alternative, it is noted there is an inadequate number of overtaking opportunities on the existing N2 between Ardee and Castleblayney, combined with a number of horizontal bends with radii less than desirable minimum and a high number of accesses. Targeted localised improvements to particular bends and widening of verges may improve forward visibility / stopping sight distances and could have the benefit of increasing the lengths of permitted and safe overtaking sections on the N2.

Though, these improvements may provide a greater percentage of overtaking sections on the existing N2, it is highlighted that these improvements would not provide additional carriageway lanes for the mainline N2 traffic and consequently would not provide additional capacity on the N2 mainline. It is also noted that the number of overtaking opportunities may reduce with the expected traffic growth on the N2.

In terms of head-on-collisions, it also noted that these targeted localised road improvements and any other localised operational and safety improvements would not address the safety issue of an errant vehicles crossing into the path of a vehicle in the opposing lane. The most effective method of preventing these types of collisions from occurring is to install a safety barrier to separate opposing streams of traffic. The installation of a safety barrier/road restraint system is not permitted by TII on a single carriageway. It is permitted only on a new or retrofitted dual carriageway (Type 2 & 3 cross-section). As the consideration of substantial online widening or a retrofitting proposal does form part of the Traffic Management Option, safety barrier/road restraint system cannot be considered.

3.5.1.3 Additional & Improved Road Signage, Marking and Lighting

A number of minor safety improvements to signage, marking and lighting were identified below:

- **Signage and Road Marking:** The TII Road Safety Inspection (RSI) commissioned by TII in 2016 carried out on this section of N2 identified that there was a considerable number of signs which were incorrectly positioned, misleading or missing. Measures to address these findings and findings from a new inspection would potentially contribute to a safer driving environment along the N2.

- **Road Lighting:** The TII Road Safety Inspection (RSI) identified that the lack of public lighting at particular junctions was a safety issue in terms of pedestrian and driver visibility. Measures to address these findings and findings from a new inspection would potentially contribute to a safer driving environment along the N2.

3.5.1.4 Reduction in Number of Accesses

As identified in Section 3.2.2 (Road Layout), the existing N2 between Ardee and Castleblayney contains a significant number of direct accesses (public roads, domestic, commercial and agricultural). Each access point creates a potential conflict point and hazard for all road users, which may result in collisions. Therefore, a reduction in the total number of accesses will provide a safer road environment and likely lead to a reduction in collisions.

Typically, the approach for reducing the number of direct accesses on an existing national primary road is through amalgamating a number of accesses, which are in relatively close proximity to each other, onto a new parallel link road or onto a downgraded section of previous primary road, that then connects to the national primary road at a safe and appropriately designed junction. The approach typically cannot be undertaken within the existing road boundary and requires additional landtake, and consequently may require considerable time and investment to deliver and is not normally a *'near-term'* measure. Therefore, it is considered that it is likely that this approach would not align with Traffic Management Option. Albeit, there may be limited scope to adopt this approach at particular locations at a small scale.

Alternatively, a reduction in conflict points maybe achieved by blocking traffic crossing the N2 from particular local roads through the introduction of left-in and left-out junctions and accesses, where appropriate and feasible. Subject to land negotiation, there may also be an opportunity to reduce agricultural field accesses onto the N2 by amalgamating multiple existing direct accesses into a single direct access where the landowner has substantial land holdings adjacent to existing N2. Notwithstanding the fact that there may be potential safety benefits with these alternative approaches, it is considered that the quantum of these opportunities and associated benefits would be quite low. Consequently, it is determined that they would not make a sizable improvement to the overall safety on this section of the N2.

3.5.1.5 Removal and Set-Back of Existing Road Side Hazards

Both site inspections undertaken for the 2016 TII RSI and N2 Ardee to Castleblayney Road Scheme Phase 1 RSIA (2018) identified that there are a number of existing roadside furniture/features within the clearzone of existing N2 which present a hazard to errant vehicles. The features include existing electricity poles, trees, boundary walls and post and rail fences. In addition, Phase 1 RSIA identified a number of existing safety barrier features which are non-compliant with TII's current standards.

Subject to following the procedures of TII Standard *DN-REQ-03079 Design of Road Restraint Systems (Online Improvements, Retrofitting and Urban Settings, May 2019*), and undertaking the associated TII risk assessment of the existing hazards, it is considered that relocation, replacement, modification and/or removal of these features would potentially contribute to a safer driving environment on the existing N2.

3.5.1.6 Rest Areas for Drivers

The RSA in its Road Safety Strategy 2013-2020 (2011) identifies driver fatigue as one of its key challenges, stating:

'Road traffic collisions often have multiple causes, with the two most frequently cited contributory factors being excessive speed and/or alcohol. However, there is increasing recognition of the effects of fatigue and sleepiness on driver performance….. Although published estimates vary, sleep-related crashes may account for 15—20% of all road traffic collisions.'

There are currently no existing dedicated rest areas / laybys provided by the Road Authority or TII on the existing N2 between Ardee and Castleblayney. However, it is recognised that there are private facilities (filling stations, and restaurants) adjacent to the existing N2 which offer parking facilities.

It is considered that provision of dedicated rest areas / laybys would have potential safety benefits if undertaken as part of a localised operational and safety improvement. Investigation into potential available land within the existing road boundary would firstly need to be undertaken. Having reviewed the corridor of the existing N2 at this initial stage, it is considered that there is very limited area within the existing road boundary for the provision of appropriately located designated rest areas/laybys.

3.5.1.7 Traffic Management Option – Localised Operational and Safety Infrastructure Improvements - Conclusion

For the Localised Operational and Safety Infrastructure Improvements – Traffic Management Option, six specific measures were considered and assessed:

1) Localised Junction Improvements (Section 3.5.1.1)
2) Targeted Localised Road Improvements (Section 3.5.1.2)
3) Additional & Improved Road Signage, Marking and Lighting (Section 3.5.1.3)
4) Reduction in Number of Accesses (Section 3.5.1.4)
5) Removal and Set-Back of Existing Road Side Hazards (Section 3.5.1.5)
6) Rest Areas for Drivers (Section 3.5.1.6)

In general, it is assessed that all of these measures can potentially offer road safety benefits over the existing and assist in reducing the frequency and severity of collisions. Yet, it is determined that none of these measures, whether treated in isolation or in combination, can provide additional traffic capacity to meet expected growing traffic demands, improve journey times and journey reliability (as per the Accessibility & Social Scheme Objective) and improve strategic connectivity and route consistency (as per the Integration Social Scheme Objective). Furthermore, it is considered that measures as a sole solution cannot achieve the National Policy Objectives of the NDP 2018 – 2027 and NPF 2040. Specifically, in relation to the NPF 2040, its National Strategic Outcome 2 (Enhance Regional Accessibility) outlines the following in terms of Inter-Urban Roads, which N2/A5 forms part of;

- *'**Maintaining the strategic capacity** and safety of the national roads network including planning for future capacity enhancements*
- ***Improving average journey times** targeting an average inter-urban speed of 90kph;'*

As stated above, these measures cannot provide additional traffic capacity to meet the expected growing traffic demands, and consequently cannot maintain strategic capacity or improve journey times on the existing N2 into the future.

In conclusion, it is determined that these measures, whether treated separately or in combination, cannot meet all of the Scheme and the applicable National Policy Objectives. Therefore, the Localised Operational and Safety Infrastructure Improvements Traffic Management Option as a sole solution has been discounted.

3.5.2 Traffic Management Options – Speed Reduction Measures

As identified in the Do-Nothing Option, and under the heading of Operational and Safety Issue – Travel Speeds (See Section 3.2.7 above), high and excessive speeds have been recorded on the section of N2 between Ardee and Castleblayney. High and excessive speeds combined with existing infrastructure issues, as identified in the Do-Nothing Option, including a high number of existing accesses/junctions, lack of an adequate number of overtaking opportunities, and growing traffic demand, presents a safety problem. A number of measures to reduce this particular safety problem are listed below, and discussed in further detail in the sections below:

1) **Increased Speed Monitoring and Enforcement**
2) **Reduced Posted Speed Limits**
3) **Average Speed Cameras**

It is recognised that Items 2 and 3 outlined above are interlinked with and require Item 1 (Monitoring and Enforcement). Speed Monitoring and enforcement is accounted for in Items 2 and 3, but it is also separately reviewed in Item 1 for the purposes of this Stage 1 assessment.

3.5.2.1 Increased Speed Monitoring and Enforcement

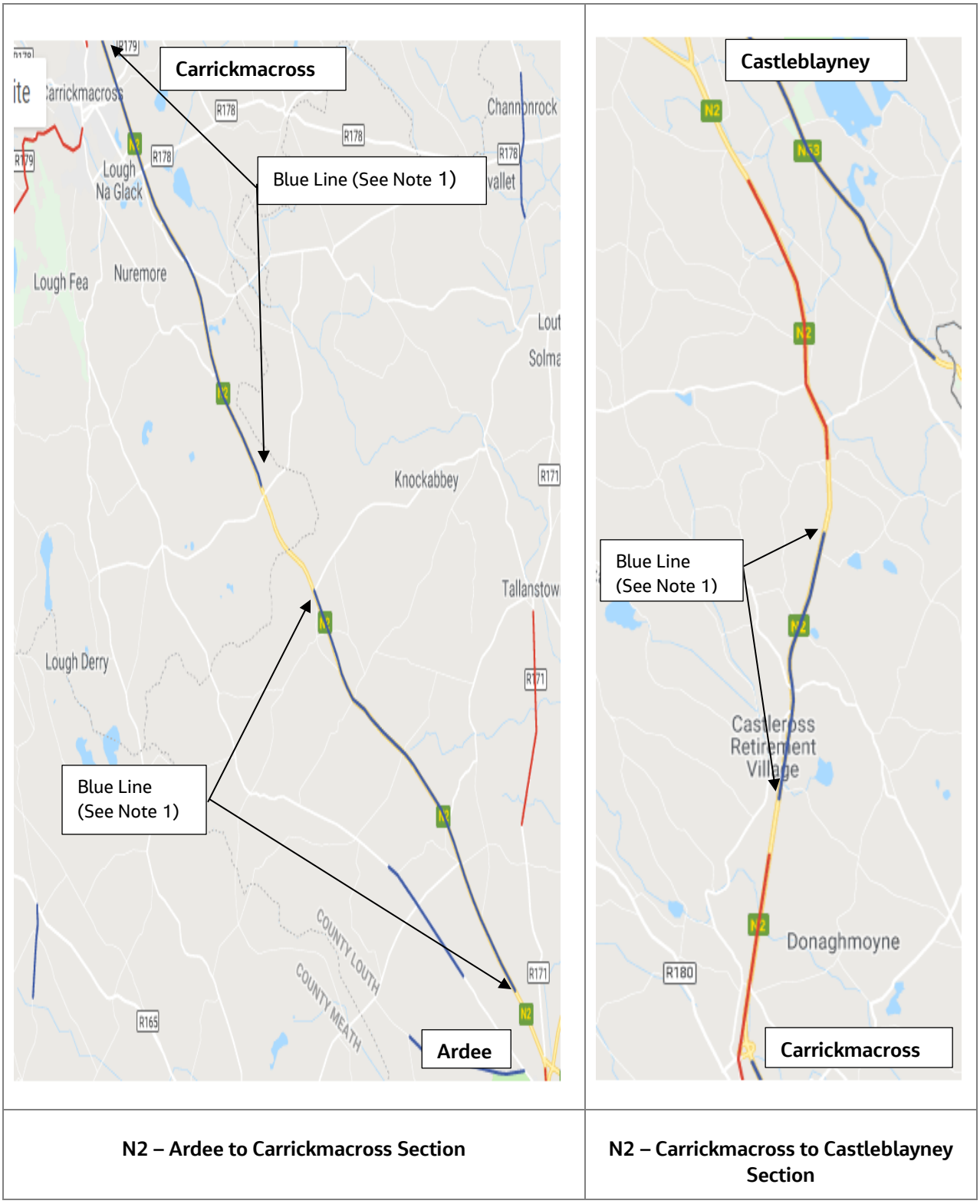
An Garda Síochána outlines that *'excessive or inappropriate speeding is a major factor in road traffic collisions*[10]*'*. An Garda Síochána identifies sections of road where a significant portion of the collisions have occurred and were related to excessive/inappropriate speed. Subsequently, the Garda National Traffic Bureau (GNTB) decide on the specific locations where speed monitoring will operate. In terms of monitoring, the Gardaí use a range of speed monitoring equipment such as:

- Handheld and tripod mounted laser guns;
- Vehicle mounted Puma speed detection equipment, (both marked and unmarked
- vehicles);
- Van mounted automatic speed detection radar (Garda operated);
- Van mounted GoSafe vans (civilian operated).

In relation to GoSafe Programme, the Gardaí have identified 1,031 active Safety Zones (as of 27th May 2016) in the country where they undertake speed monitoring and enforcement. These Safety Zones which are being continually updated are shown on an interactive map on the Garda website (https://www.garda.ie/gosafe.html).

A screenshot of this interactive map showing the Safety Zones on the existing N2 section between Ardee and Castleblayney is shown in Figure 3-1 below.

[10] Source: Garda Safety Camera Website Page: https://www.garda.ie/en/Roads-Policing/Safety-Cameras/



N2 – Ardee to Carrickmacross Section

N2 – Carrickmacross to Castleblayney Section

Figure 3-1: Excerpt of the Garda Síochána Interactive Website Map showing current enforcement and monitoring Safety Zones (Red Zones are zones designated before May 2016. Blue Zones are zones designated since May 2016. Note 1: Regarding the Blue Zones, these appear as black at a larger scale on the interactive map, but as blue at a smaller scale)

With reference to Figure 3-1 above, it is noted that the majority of the existing N2 between Ardee and Castleblayney, when accounting for both the red and blue zones, is within a Garda Síochána Safety Zone. Therefore, in this regard, in terms of increased enforcement and monitoring, there is little further scope to increase number of Safety Zones on this section of the N2. Also, the fact that the vast majority of the existing section between Ardee and Castleblayney has been designated as an existing Safety Zone by the Garda Síochána reinforces the case that there is still an existing speeding issue on this section of the N2.

It is noted that certain safety zones (i.e. Blue Zones) have been designated relatively recently (i.e. since May 2016), where it may take a number of years to see a significant impact on speed and collision reduction in these zones. Though, equally, with reference to Section 3.5 9 (Travel Speeds), and the road traffic speed measurements as documented in the N2 Ardee to Castleblayney Road Scheme – Phase 1 RSIA, where 85th percentile speeds recorded in 2018 were above the posted speed limit at particular blue zone, excessive speed still appears to be an issue in these particular zones.

Outside of the numbers and extents of the safety zones, intuitively, an increase to the enforcement time (i.e. actual hours of enforcement on-site) at the zones and/or on this section of the N2, would have a positive impact on speed reductions. Though, equally, it is recognised that potential increases in Garda and GoSafe enforcement hours are and will be governed by financial and staffing resources/constraints.

In conclusion, notwithstanding any potential increase in Garda monitoring and enforcement time, and its positive impact on speed (& collisions) reduction, it is considered that this alternative, as a sole solution, meets only part of one of the Scheme Objectives (i.e. Safety – *'Reduce the frequency and severity of collisions…'* and *'Support the RSA Road Safety Strategy 2013-2020'*). Also, it is noted that reductions in speed alone is not the only contributor to a reduction in collisions and to a safer road environment. Safety issues as outlined in the Do-Nothing Alternative, such as the high number of accesses/junctions, lack of an adequate number of overtaking opportunities, and growing traffic demand, will still exist if this measure is pursued. Therefore, it is considered that this alternative as a sole solution is discounted.

3.5.2.2 Reduced Posted Speed Limits

Under this measure, reductions to the current posted speed limits between Ardee and Castleblayney on the existing N2 were considered. In implementing lower speed limits with appropriate Garda Síochána enforcement, it is expected that lower traffic speeds would occur on the N2, which would result in a reduction in the number and severity of collisions. Consequently, it is recognised that travel times would increase on this section of the N2.

Currently, there is a constant posted speed limit of 100 km/hr between Ardee and Castleblayney on the existing N2.

With reference to Section 1.5 (Strategic Fit and Priority) of this report, it is noted that this section of the N2, forms part of the overall strategic N2/A5 strategic *'Inter-Urban Road'* connecting Dublin to the North-West of the country, as outlined in the NDP 2018 - 2027. As part of NPF 2040's National Strategic Outcome 2 (Enhanced Regional Accessibility) under the heading of 'Inter-Urban Routes', it states an objective of:

- *Improving average journey times targeting an average inter-urban speed of 90kph;*

An average inter-urban speed of 90km/hr approximately equates to a Level of Service of D for a 100km/hr Design Speed. Therefore, any potential reduction to the existing posted speed limit (say to a proposed 80 km/hr post speed limit) would mean that the NPF 2040 objective of 90km/hr would not be achieved and that there would be a dis-improvement on the overall N2/A5 strategic inter-urban road.

In addition to this option not meeting the National Policy Objectives, it is considered that this option would not meet the similar type Scheme Objectives of Integration (i.e. *'To improve the connectivity and route consistency of the national road network'*) and of Accessibility & Social Inclusion (i.e. '*To improve road based public Transport by improving journey times and journey time reliability'*). Also, as outlined in Section 3.5.2.1 (The Increased Speed Monitoring and Enforcement Alternative) above, reductions in speed limits alone are not sufficient, as other safety issues (i.e. high number of junctions/accesses, etc.) will still persist. Therefore, in conclusion, it is considered that this option as a sole solution is discounted from further consideration.

3.5.2.3 Average Speed Cameras

As a standalone measure or supplementary to an increase in existing enforcement under the Increased Speed Monitoring and Enforcement measure (See Section 3.5.2.1 above), average speed cameras were considered.

Average speed cameras – or point-to-point (P2P) speed cameras – are a relatively new form of speed enforcement that measures persistent or sustained speeding over a certain distance, rather than the transitory speed of a vehicle at a particular point on the road, as detected by the traditional methods outlined in Section 3.5.2.1.

Average speed monitoring consists of the installation of a series of cameras at a minimum of two locations along a road section. Automatic Number Plate Recognition (ANPR) and Optimal Character Recognition (OCR) technology is used to capture and match the vehicle registration details. The average speed of a vehicle is calculated by dividing the distance between the camera sites by the time taken for the vehicle to travel between the two sites. If the average speed of a vehicle exceeds the posted speed limit for that road section, the offence data is forwarded for infringement processing and vehicle owners linked with validated offences are issued a penalty notice.

Although, average speed monitoring is relatively extensive in Great Britain, it is quite limited in the Republic of Ireland. TII and An Garda Síochána installed an average speed monitoring system in Dublin Port Tunnel in May 2017, which has been in operation since then.

As the number of and periods of operation of average speed monitoring systems are quite limited in Ireland, comprehensive data on its effectiveness particular to Irish conditions is unavailable. Notwithstanding this, Great Britain has undertaken a number of extensive studies on their effectiveness, which is considered applicable to Ireland in this regard. The Royal Automobile Club (RAC) Foundation published a report titled; *'The Effectiveness of Average Speed Cameras in Great Britain'* in 2016. The report outlines a study of data obtained from 51 permanent average speed camera sites (Covering 294 km of road) between 2000 and 2015. From this data, the report states:

"On average, the permanent average speed camera sites analysed saw reductions in injury collisions:

- *by 25-46% for fatal and serious collisions;*
- by 9-22% for personal injury collisions."

Roadplan Consulting Ltd. 2017 undertook a cost benefit analysis for the installation of potential average speed cameras on the N2 as outlined in the N2 Drumgeeny to Castleblayney Scheme Feasibility Report *(May 2017, Roadplan)*.

In this report, taking the section of the existing N2 between Ardee and Castleblayney as an example (which is considered applicable to the N2 Clontibret to Border Road Scheme for this purpose), Roadplan estimated an annual cost saving in collisions of between €834,762 and €1,541,714 per annum[11] versus an estimated cost of €2.4m[12] for the installation of an average speed camera system along the same section of the N2. Notwithstanding the additional maintenance costs, based on this analysis by Roadplan and subject to further investigation, it is likely that the implementation of an average speed camera system would be a cost-effective solution in terms of speed and potential collision reduction.

Although, it is recognised that this measure maybe a cost-effective solution in reducing speed and potential collisions, as is the case with the other speed reductions measures stated in Sections 3.5.2.1 and 3.5.2.2, it is considered that this alternative, as a sole solution, meets only part of one of the Scheme Objectives (i.e. *Safety – 'Reduce the frequency and severity of collisions…'* and *'Support the RSA Road Safety Strategy 2013-2020').* Also, as stated in the other sections, reductions in speeds alone are not sufficient, as other safety issues (i.e. high number of junctions/accesses, etc.) will still persist. Therefore, in conclusion, it is considered that this Traffic Management Option measure as a sole solution is discounted.

3.5.2.4 Traffic Management Option – Speed Reduction Measures - Conclusion

For the Speed Reduction Measures Traffic Management Option, three specific measures were considered and assessed:

1) Increased Speed Monitoring and Enforcement (Section 3.5.2.1)
2) Reduced Posted Speed Limits (Section 3.5.2.2)
3) Average Speed Cameras (Section 3.5.2.3)

As per their associated individual conclusions, it was determined that each of these measures as sole solutions address speed and potential collision reduction only. The same applies in terms of a combination of these measures. In relation to addressing the other identified existing safety issues (i.e. high number of junctions/accesses, etc.), reductions in speed alone are not sufficient, as these other safety issues will still persist into the future. In addition, it has been outlined that all three of the measures, as sole solutions, do not meet all the Scheme Objectives, and can only meet part of one of the Scheme Objectives Headings (i.e. Safety). The same applies in terms of a combination of these measures. Furthermore, the measures, as sole solutions or as a combination, do not achieve the National Policy Objectives of the NDP 2018 - 2027 and NPF 2040. Therefore, in conclusion, the Speed Reduction Measures Traffic Management Option has been discounted.

3.5.3 Traffic Management Option – Overall Conclusion

Section 3.5.1 (Localised Safety Infrastructure Improvements) concluded that the six identified measures could offer potential safety benefits, either separately or in combination but would fail to meet all of Scheme and National Policy Objectives. In particular, it was identified that these measures would not provide additional traffic capacity to meet the expected growing traffic volumes, and consequently cannot improve journey times and journey time reliability on the existing N2 into the future. Therefore, the Localised Operational and Safety Infrastructure Improvements Traffic Management Alternative as a sole solution was discounted.

[11] Roadplan Consulting Ltd.'s cost saving estimates were based on historical collisions numbers on the existing N2 between Ardee and Castleblayney during a 5 year period (2011 to 2015). Cost of collisions were based on 2011 values contained in the 2016 CAF. Whilst annual collision reduction percentages were based on the percentages estimated in the RAC 'The Effectiveness of Average Speed Cameras in Great Britain' Report (2016), which are provided in the main body of this report above.

[12] Installation costs were based on estimate of £100,000 per mile obtained from the 2016 RAC Report, by the length of N2 between Ardee and Castleblayney.

Section 3.5.2 (Speed Reduction Measures) concluded that the three identified measures, either separately or in combination, address speed and potential collision reduction only. In terms of addressing the other identified existing safety issues (i.e. high number of junctions/accesses, etc.), a reduction in speed alone is not sufficient, as these other safety issues will still persist into future. It was determined that the Speed Reduction Measures do not meet all of the Scheme and National Policy Objectives. Therefore, the Speed Reduction Measures Traffic Management Option as a sole solution has been discounted.

In terms of combinations of Localised Safety Infrastructure Improvements and Speed Reduction measures, it is noted that various individual measures from both could potentially be combined (i.e. localised junction improvements + average speed cameras) and the entire packages of each could potentially be combined. Notwithstanding the various potential combinations, as stated in the introduction to Section 3.5, these combined Traffic Management Option measures, as defined in TII PAG Unit 4.0, are *'near-term'*, *'small in scale'*, which '*utilise the existing infrastructure'*. These combinations may meet part of Scheme Objectives, including substantial parts of the Safety Objective, but it is considered that these combinations will not meet all of the Scheme Objectives. In particular, similar to individual measures, the combinations will not provide additional traffic capacity to meet the expected growing traffic volumes, and consequently cannot improve journey times and journey time reliability on the existing N2 into the future (i.e. Scheme Objective – Accessibility & Social Inclusion).

Overall, it is concluded that the Traffic Management Option has been discounted.

3.6 Do-Something Option – Feasible Route Corridor Option

With reference to Section 2 of this Report, and as per as per the Section 4.2 of TII's PAG Unit 4.0, a feasible route corridor is defined as *'a corridor improvement (which) can be delivered through a major investment to widen an existing road, or to develop a new alignment'*

As per the TII's PMM (February 2019), feasible route corridor options are to be '*developed to an appropriate level of detail to facilitate a systematic assessment of the potential impacts upon the findings of the constraints study*'. The 'systematic assessment' namely being the Stages 1 to 3 of the Option Selection Process (TII PMG Phase 2) as described in further detail in Section 2 of this Report.

The development and assessment of Stage 1 feasible route corridor options for this scheme is outlined in the subsequent chapters of this Report.

3.7 Consideration of Alternatives and Options – Conclusion

The Do-Nothing Option, Do-Minimum Option, Do-Something Alternative – Public Transport and Do-Something Option – Traffic Management Option have been defined and assessed as part of the Stage 1 assessment. At this current stage, all of these options/alternatives as solutions have been discounted. Notwithstanding this Stage 1 determination, as per Clause 2.2.7.3 of the TII's PMM (February 2019), the Do-Nothing and Do-Minimum Options *'shall be brought forward from the Stage 1 (Preliminary Options Assessment) process'*, and further assessed as part of the Stage 2 assessment.

As per Section 3.6 above, the Do-Something Option –Feasible Route Corridor Option (Stage1) will now be considered. The development of the Stage 1 Feasible Route Corridor Options is outlined in Chapter 4 of this Report, whilst the assessment of these options is outlined in Chapter 5 of this Report.

4. Development of Stage 1 Feasible Route Corridor Options

4.1 Introduction

Following consideration of the Options and Alternatives in Chapter 3 of this Report, it has been identified that the Do-Something Option – Stage 1 Feasible Route Corridor Options are to be considered and developed.

As part of the Stage 1 Option Selection Process, a number of feasible route corridors were identified and developed within the Study Area taking cognisance of the Scheme Objectives, existing constraints (Natural, Artificial and External), which were identified as part of the Constraints Study, and of TII's geometric standards.

For the purposes of the Stage 1 assessment, the corridors which have been developed are 400m in width. Route corridors do not represent the actual width of a proposed road scheme or lands to be acquired. The corridors give an indication of the area within which it is intended to develop a road alignment. As part of the lifecycle of the option selection process, a route corridor option identified in Stage 1 may change in direction and/or increase in size at a particular location in the subsequent Stage 2 to accommodate engineering needs and environmental assessments (which are unforeseen at this stage) or to address future feedback received through the consultation processes.

As per the TII's PMM, the N2 Ardee to Castleblayney Road Scheme Stage 1 feasible route corridor options were *'developed to an appropriate level of detail to facilitate a systematic assessment of the potential impacts upon the findings of the constraints study.'* In order to facilitate the development of the corridors, and to inform Stage 1 assessment criteria in certain instances (i.e. potential earthworks), an indicative draft working road alignment was created for each option in accordance with TII Design Standards. It is highlighted that this alignment was developed for these purposes alone and is subject to change.

4.2 Description of Route Corridor Options

A total of 17 No. Stage 1 Feasible Route Corridors Options were developed for the N2 Ardee to Castleblayney Scheme. Of the 17 No. Route Corridor Options, 6 No. (Brown, Cyan, Yellow, Green, Purple, and Orange) are full-length coloured route options (or *'root'* options as described in TII's PMM). The remaining 11 No. options are *'amalgamated'* options (as described in the TII's PMM), which are combinations of particular sections of the full-length coloured options joined by links in most cases. The locations of start and end points of the links and/or points where the sections are joined are identified with Nodes (A – R).

In relation to the start and end points of the proposed N2 Ardee to Castleblayney Road Scheme, the exact locations are still to be determined and confirmed. The exact locations will be identified as part of TII's PMG Phases 3 & 4, following completion of the TII's PMG Phase 2, and selection of the Preferred Option. At this stage, and for comparative assessment purposes only, it is necessary to identify common start and ends for all the Stage 1 Feasible Route Corridor Options to ensure that an equal and balanced assessment is being undertaken. Therefore, a starting point of approximately 600m north of the Carrickmacross Roundabout (N2/N233/R171) on the existing N2 in the Townlands of Mullanstown and Glebe was selected. This is the location of the connection point between the existing N2 and the proposed N52 Ardee Bypass Scheme (current design location – See paragraph below). The existing N2/N53 roundabout at the Southern end of the Castleblayney Bypass was chosen for the end point.

Regarding the start point and interface with the proposed N52 Bypass Scheme, it is noted that following a review of the Scheme in September 2019, Louth County Council are to prepare alternative junction, and pedestrian and cyclist arrangements for the Scheme. These proposals will be presented to the public and all relevant stakeholders for feedback as part of a future non-statutory public consultation for this scheme. Thereafter, it is intended that the most appropriate technical option will then be progressed through a Part 8 planning process. Therefore, the proposed interface of the N52 Ardee Bypass Scheme with the existing N2 is still to be fully confirmed at this stage. Consequently, for current display purposes and for future design considerations of the N2 Ardee to Castleblayney Road Scheme, an extended corridor area has been applied at this location.

This area is highlighted in grey hatching on the Main Layout Plan (Drawing Ref. No. N2-JAC-HWG-A2C-DR-OS-0002) in Appendix A of this Report. The corridor is approximately 600m in length and extends from the connection point of the current design location of the proposed N52 Bypass Scheme in the townlands of Mullanstown and Glebe to the Carrickmacross Road Roundabout (N2/N233/R171).

Layout Plans of the Stage 1 Feasible Route Corridors are provided in Appendix A. The Appendix includes a Main Layout Plan showing all 17 No. Options (See Drawing Ref. No. N2-JAC-HWG-A2C-DR-OS-0002). In addition, for clarity purposes, the amalgamated options are shown individually in separate drawings (See Drawing Ref. No. N2-JAC-HWG-A2C-DR-OS-003 to 004).

Table 4-1 below provides key details and route descriptions of the N2 Ardee to Castleblayney Road Scheme Stage 1 Feasible Route Corridor Options. The order in which the full-length coloured options/root options are listed in the Table 4-1 and throughout this Report is based on reading from left to right (in the vicinity of the Start Point) on the associated Main Layout Plan.

Table 4-1: N2 Ardee to Castleblayney – Key Details and Route Description of Stage 1 Feasible Route Corridor Options

Ref. No.	Option Ref. Name	Corridor Type/ Short Description	Online / Offline	Length (km)	General Route Description
Full-Length Coloured Route Corridor Option / 'Root' Option					
1	**Brown**	Full Length Coloured Route Option / Root Option	Approx. 95% Offline / 5% Online	35.380	This route option is 35.38km long and is the most westerly of all options. The Brown Option is predominantly an offline option with an approximate distribution of 95% offline and 5% online. Starting at the commencement point, Start, the Brown Option is online up to the townland of Harristown where it goes offline in a north-westerly direction just South of Cookstown. Continuing in a north-western direction, it traverses the townlands of Rathgeenan and Lagan where it crosses the River Lagan/Glyde. At this crossing, the option enters Co. Monaghan and travels along the western extremity of the Study Area, passing to the West of Lough Fea through the townlands of Clonsedy and Drumgoosat, crossing the River Lurgans and the R179 Kingscourt Road. At this point the Blue Option travels in a more northerly direction where it passes Carrickmacross on the western side of the town through the townland of Corrinshigagh. It continues North crossing the R178 Shercock Road as well as the R180 Ballybay Road and continues to the West of Lisdoonan Village. Further North it travels to the East of Lough Egish traversing through the townlands of Corravoo and Knockavolis, terminating at the end point in the townland of Tullyvin.
2	**Cyan**	Full Length Coloured Route Option / Root Option	Approx. 90% Offline / 10% Online	32.660	This route option is 32.66km long and is predominantly an offline option with an approximate distribution of 90% offline and 10% online. Starting at the commencement point, Start, the Cyan Option is online up to the townland of Harristown where it goes offline in a north-westerly direction just South of Cookstown. Travelling in a more northerly direction it crosses the River Lagan/River Glyde and traverses the townlands of Drumboory and Shanmullagh where it crosses the existing N2. As it continues North, it crosses the River Proules and veers to the East of Monalty Lough and Carrickmacross, crossing the R178 Dundalk Road and R179. At this point it takes a westerly direction to the East of Donaghmoyne and avoiding Moylan Lough. Veering northwards again, it crosses the N2 and traverses the townlands of Lisnagunnion, Corlygorm and Corrinshigagh. At this point, it travels along the western side of the existing N2 and Broomfield. The cyan option joins the existing N2 near the townland of Carrickagarvan and terminates at the southern roundabout of the Castleblayney Bypass.

Ref. No.	Option Ref. Name	Corridor Type/ Short Description	Online / Offline	Length (km)	General Route Description
3	**Yellow**	Full Length Coloured Route Option / Root Option	Approx. 3% Offline / 97% Online	31.160	This route option is 31.16km long and is predominantly an online option with an approximate distribution of 3% offline and 97% online. Starting at the commencement point, Start, the Yellow Option is online along the existing N2 passing through Cookstown, Edmondstown, Reaghstown, Aclint Bridge and online through the Carrickmacross By-pass and the existing N2 section from Creevy to Tullyvaragh Upper. At this point, there is a slight offline improvement at Tullyvaragh Lower where it re-joins online again at the townland of Corlygorm. The Yellow Option continues online along the N2 passing through the townlands of Garranroe, Brackagh, Drumganus Upper and Lower and passing through Broomfield, Mullaghanee, Clonavogy, Carrickgarvan, Tullyvin and terminating at the southern roundabout at Castleblayney.
4	**Green**	Full Length Coloured Route Option / Root Option	Approx. 85% Offline / 15% Online	29.755	This route option is 29.755km long and is predominantly an offline option with an approximate distribution of 85% offline and 15% online. Starting at the commencement point, Start, the Green Option is online up to the crossroads at Cookstown. Running in a north western direction this option continues towards Arthurstown and to the East of Reaghstown/ Edmondstown. At this point it follows a north easterly direction and crosses the River Glyde and enters Co. Monaghan. Following onwards adjacent to the River Proules, it traverses the townland of Tullygowan and to the East of Killanny. To the West of Essexford, it crosses the R178 Dundalk Road and the R179 passing through the townlands of Cordrummans to the East of Donaghmoyne. From this point, it veers in a more westerly direction to cross the existing N2 at the townlands of Garranroe and Cornamucklagh. Running in a more northerly direction and running parallel to the existing N2, the Green Option passes through the townlands of Clonavogy, Brackagh and Cornahawla to the West of Broomfield. The Green Option continues northwards where it re-joins online with the existing N2 at Clonavogy and Carrickgarvan and terminates at the southern roundabout at Castleblayney.

Ref. No.	Option Ref. Name	Corridor Type/ Short Description	Online / Offline	Length (km)	General Route Description
5	**Purple**	Full Length Coloured Route Option / Root Option	Approx. 65% Offline / 35% Online	31.620	This route option is 31.62km long and is predominantly an offline option with an approximate distribution of 65% offline and 35% online. Starting at the commencement point, Start, the Purple Option is online up to the crossroads at Cookstown. Running in a north western direction this option continues towards Arthurstown and to the East of Reaghstown/ Edmondstown. To the East of Aclint Bridge, it crosses the River Glyde and enters Co. Monaghan. Going through the townlands of Ballyregan and Corradoran it re-joins the N2 as an online option at Clonturk at the southern end of the Carrickmacross By-pass. It continues North along the online section of the N2 as far as North of Carrickmacross by-pass where it goes offline at the townland of Creevy. Continuing in a northerly direction, the purple option passes through the townlands of Laragh, Corlea and to the East of Lisdoonan Village. It continues further North on the West of the existing N2 where it re-joins the N2 online at Carrickgarvan and terminates at the southern roundabout at Castleblayney.
6	**Orange**	Full Length Coloured Route Option / Root Option	Approx. 95% Offline / 5% Online	30.290	This route option is 30.29km long and is the most easterly of the route corridors. The Orange Option is predominantly an offline option with an approximate distribution of 95% offline and 5% online. Starting at the commencement point, Start, the Orange Option is offline passing through the townlands of Glebe and Mullacloe and running parallel to the R171 Dundalk Road. Following a northerly direction, it passes to the West of Pepperstown and to the East of Charlestown, crossing to the East of Arthurstown Crossroads. From here it runs to the West of Thomastown and Philipstown where it crosses the River Glyde. Continuing in a northerly direction, the Orange Option passes through the townlands of Tully and Drumgowna and to the East of the Red Bog where it crosses the R178 Dundalk Road. Following a more north westerly direction, the option passes through the townlands of Drumgristin Upper, Kiltybegs and Drumneil where it crosses the R179. Further North, it traverses the townlands of Feegavla, Lisnamoyle, Drumaconvern, Knockreagh Lower and Drumganus Upper where it passes to the West of Annalittin. From this point the Orange Option re-joins the N2 online at Clonavogy and terminates at the southern roundabout at Castleblayney.

Ref. No.	Option Ref. Name	Corridor Type/ Short Description	Online / Offline	Length (km)	General Route Description
Amalgamated Route Corridor Options					
7	**Yellow + Blue**	Yellow to Node N + Blue till End	Approx. 15% Offline / 85% Online	31.150	This route option is 31.15km long and is made up of the Yellow and Blue Options. The Yellow + Blue Option is predominantly an online option with an approximate distribution of 15% offline and 85% online. Starting at the commencement point, Start, the Yellow + Blue Option follows the Yellow Option to Node Point N. It then transfers to the Blue Option to the West of Broomfield going through the townlands of Corrinshigagh, Taplagh, Brackagh, Lisaquil, Cornahawla, Drumganus Lower, Aghadreenan, Mullaghanee, and Annalitten. In the townlands of Mullanghanee and Annalitten, the Blue Option returns to the existing N2, and follows the existing N2 (similar to the Yellow Option) and terminates at the southern roundabout at Castleblayney.
8	**Cyan+ Yellow + Blue**	Cyan (Start to Node C) + Yellow (Node C to N) + Blue till End	Approx. 45% Offline / 55% Online	31.975	This route option is 31.975m long and is made up of the Cyan Option, Yellow and Blue Options. The Cyan + Yellow + Blue Option is a predominantly an online option with an approximate distribution of 45% offline and 55% online. Starting at the commencement point, Start, this option follows the Cyan Option to Node Point C where it connects to the Yellow Option. This option then continues along the Yellow Option to Node Point N where it then transfers to Blue Option West of Broomfield, going through the townlands of Corrinshigagh, Taplagh, Brackagh, Lisaquil, Cornahawla, Drumganus Lower, Aghadreenan, Mullaghanee and Annalitten. In the townlands of Mullanghanee and Annalitten, the Blue Option returns to the existing N2, and follows the existing N2 (similar to the Yellow Option) and terminates at the southern roundabout at Castleblayney.
9	**Yellow + Purple**	Yellow till Node F + Purple till End	Approx. 40% Offline / 60% Online	30.985	This route option is 30.985km long and is made up of the Yellow Option and the Purple Option. The Yellow + Purple Option is predominantly an online option with an approximate distribution of 40% offline and 60% online. Starting at the commencement point, Start, this option follows the Yellow Option to Node Point F. From this node point, the option then follows the Purple Option where it terminates at the southern roundabout at Castleblayney.

Ref. No.	Option Ref. Name	Corridor Type/ Short Description	Online / Offline	Length (km)	General Route Description
10	**Purple + Yellow + Blue**	Purple till Node F + Yellow (Node F to N) + Blue till End	Approx. 45% Offline / 55% Online	31.790	This route option is 31.79km long and is made up of the Purple, Yellow and Blue Options. The Purple + Yellow + Blue Option is a predominantly an online option with an approximate distribution of 45% offline and 55% online. Starting at the commencement point, Start, this option follows the Purple Option to Node Point F. From this node point, the option then follows the Yellow Option to Node Point N, where it then transfers to Blue Option West of Broomfield, going through the townlands of Corrinshigagh, Taplagh, Brackagh, Lisaquil, Cornahawla, Drumganus Lower, Aghadreenan, Mullaghanee and Annalitten. In the townlands of Mullanghanee and Annalitten, the Blue Option returns to the existing N2, and follows the existing N2 (similar to the Yellow Option) and terminates at the southern roundabout at Castleblayney.
11	**Yellow + Cyan+ Green**	Yellow till Node J + Link J-K + Cyan (K to O) + Link O-P + Green (P to End)	Approx. 25% Offline / 75% Online	31.020	This route option is 31.02km long and is made up of the Yellow Option, J to K Link, Cyan Option, O to P Link and the Green Option. The Yellow + Cyan + Green Option is predominantly an online option with an approximate distribution of 25% offline and 75% online. Starting at the commencement point, Start, this option follows the Yellow Option to Node Point J. From this node point, it then connects to the Cyan Option using the J to K Link and going through the townlands of Tullyvaragh Lower and Corlygorm at Node Point K on the Cyan Route. This option then follows the O to P Link from Node Point O to connect to the Green Option at Node Point P going through the townlands of Cornagall, Cornahawla, Agheeshal and Drumharriff North. From Node Point P, this option follows the Green Option where it terminates at the southern roundabout at Castleblayney.
12	**Yellow + Purple + Green**	Yellow till Node F + Purple (Node F to Q) + Link Q-R + Green (R to End)	Approx. 35% Offline / 65% Online	31.085	This route option is 31.085km long and is made up of the Yellow Option, Purple Option, Q to R Link and the Green Option. The Yellow + Purple + Green Option is predominantly an online option with an approximate distribution of 35% offline and 65% online. Starting at the commencement point, Start, this option follows the Yellow Option to Node Point F. From this node point, it then connects to the Purple Option. The option then follows the Purple Option to Node Point Q and uses the Q to R Link to connect to the Green Option and going through the townlands of Corrateean, Agheeshal, Drrumharriff North and Cornalough. From Node Point R, the option follows the Green Option where it terminates at the southern roundabout at Castleblayney.

Ref. No.	Option Ref. Name	Corridor Type/ Short Description	Online / Offline	Length (km)	General Route Description
13	**Brown+ Purple**	Brown (Start to Node G) + Link G-H + Purple (Node H to End)	Approx. 90% Offline / 10% Online	35.760	This route option is 35.76km long and is made up of the Brown Option, G to H Link and the Purple Option. The Brown + Purple Option is predominately an offline option with an approximate distribution of 90% offline and 10% online. Starting at the commencement point, Start, this option follows the Brown Option to Node Point G. From this node point, the option then connects to the Purple Option using the G to H Link and going through the townlands of Barndonagh, Lossets, Titagarvan, Beagh, Lisnaguiveragh, Drumbroagh, Greaghdrumneesk, Cornasleeve, Cormoy, Corlea, Cashlan East, Drumlurg, and Beagh. From Node Point H, this option then follows the Purple Option where it terminates at the southern roundabout at Castleblayney.
14	**Cyan + Yellow + Purple**	Cyan (Start to Node C) + Yellow (Node C to F) + Purple (F to End)	Approx. 75% Offline / 25% Online	31.805	This route option is 31.805km long and is made up of the Cyan Option, Yellow Option and Purple Option. The Cyan + Yellow + Purple Option is predominantly an offline option with an approximate distribution of 75% offline and 25% online. Starting at the commencement point, Start, this option follows the Cyan Option to Node Point C. From Node Point C, the option follows the Yellow Option to Node Point F. From Node Point F, the option then follows the Purple Option where it terminates at the southern roundabout at Castleblayney.
15	**Green + Cyan**	Green (Start to Node D) + Link D-E + Cyan (Node E to End)	Approx. 85% Offline / 15% Online	31.185	This route option is 31.185km long and is made up of the Green Option, D to E Link and the Cyan Option. The Green + Cyan Option is predominately an offline option with an approximate distribution of 85% offline and 15% online. Starting at the commencement point, Start, this option follows the Green Option to Node Point D. From this node point, the option then connects to the Cyan Option using the D to E Link and going through the townlands of Garlegobban, Ballinagarry, Kinallybrane and Rossdreenagh. From Node Point E, this option then follows the Cyan Option where it terminates at the southern roundabout at Castleblayney.
16	**Orange+ Green 1**	Orange (Start to Node A) + Link A-B + Green (Node B till End)	Approx. 95% Offline / 5% Online	30.055	This route option is 30.055km long and is made up of the Orange Option, A to B Link and the Green Option. The Orange + GREEN 1 Option is predominately an offline option with an approximate distribution of 95% offline and 5% online. Starting at the commencement point, Start, this option follows the Orange Option to Node Point A. From this node point, the option then connects to the Green Option using the A to B Link and going through the townlands of Thomastown, Nicholastown and Tully. From Node Point B, this option then follows the Green Option where it terminates at the southern roundabout at Castleblayney.

Ref. No.	Option Ref. Name	Corridor Type/ Short Description	Online / Offline	Length (km)	General Route Description
17	**Orange+ Green 2**	Orange (Start to Node L) + Link L-M + Green (M till End)	Approx. 95% Offline / 5% Online	30.430	This route option is 30.43km long and is made up of the Orange Option, L to M Link and the Green Option. The Orange + Green 2 Option is predominately an offline option with an approximate distribution of 95% offline and 5% online. Starting at the commencement point, Start, this option follows the Orange Option to Node Point L. From this node point, the option then connects to the Green Option using the L to M Link and going through the townlands of Mullanavannog, Lisamoyle Etra, Coolcair and Drumillard. From Node Point M, this option then follows the Green Option where it terminates at the southern roundabout at Castleblayney.

5. Stage 1 Assessment – Methodology & Assessment

5.1 Introduction

Following the identification and development of the Do-Something Option – Stage 1 Feasible Route Corridor Options, as outlined in previously in this Report, and with reference to TII's PAG Unit 4.0, these options are to be assessed in accordance with TII's PAG Unit 7.0 – Multi Criteria Analysis PE-PAG-02031 (October 2016) and TII's PMM.

With reference to Section 2.1 (Options Selection Process – General Overview), the objective of the Stage 1 Assessment (Preliminary Options Assessment) is to determine a short-list of Stage 1 Options, which will be appraised in greater detail in the subsequent Stage 2 Assessment (Project Appraisal Matrix), where the Emerging Preferred Option will be identified.

In order to determine a short-list of options, a Multi-Criteria Analysis approach, as defined TII PAG Unit 7.0, is undertaken, where a preliminary assessment (i.e. option-sifting) is carried on the Stage 1 Options against a defined set of criteria. For the Stage 1 Assessment, TII's PMM and PAG Unit 7.0, has listed these *'Headline'* or *'Main'* Criteria as:

- **Engineering**
- **Environment**
- **Economy**

Below each of these Main Criteria, a list of Sub-Criteria is defined for each of the Main Criteria, in order to provide a more detailed basis for the assessment. In the case of Engineering, one defined Sub-Criterion is *'Traffic Assessment'*. Further information on these Sub-Criteria is provided in Section 5.2 below.

As part of the MCA approach, a performance matrix is used as a tool to determine and show how each option performs against the set of Main Criteria and Sub-Criteria. As part of the performance matrix, an Impact Scoring System is established to assign an impact level ('*Highly Positive'* to *'Highly Negative'*) to a particular option against the defined Main Criteria and Sub-Criteria, following the completion of a quantitative or qualitative assessment of these criteria. As per TII PAG Unit 7.0, each impact level is then assigned a performance score based on a seven-point scale (i.e. *'7 – Highly Positive, '1 – Highly Negative'*). For Stage 1, the appropriateness of adopting a quantitative or qualitative assessment for a particular Criteria or Sub-Criteria is dependent on the level of data and investigation available, and design undertaken for that particular Criteria or Sub-criteria at the time of the assessment. The same extends to level of detail which forms the basis of a particular sub-criteria. Further information on the Impact Scoring System and the scoring procedure is provided in Section 5.2 below.

Upon completion of performance scores for each individual Sub-Criteria, as per TII PAG Unit 4.0, the scores of these sub-criteria for each option are added together to provide a total score for each of three Main Criteria (Engineering, Environment, Economy). Thereafter, the total score of each of the three Main Criteria is added together to provide an overall performance score for each option. Following which, the performance matrix ranks the options based on their overall individual scores, and hence their overall impact. Further information on ranking is provided in Section 5.6 of this Report.

Upon completion of the ranking, the Options which have the highest performance scores, and lowest impact, are selected for recommendation to be appraised in further detail in Stage 2. Whilst the options which have the lower performance scores, and higher impact, are not assessed further and removed from the options selection process in advance of Stage 2.

5.2 General Methodology

As outlined in Section 5.1 above, under the defined Main Criteria of Engineering, Environment and Economy , a list of defined Sub-Criteria is to be identified in advance of undertaking the Stage 1 performance matrix. Table 5-1 below shows TII's PMM suggested outline of Sub-Criteria to be considered as defined Sub-Criteria for a Stage 1 Assessment.

Ref. No.	Item
	Stage 1 – Main Criterion 1 - Engineering
1	**Traffic assessment** including proposed level of intervention (cross-section) and existing traffic conditions.
2	Evaluation of compliance with **technical standards** (TII Publications, for example in the case of road Projects compliance with minimum horizontal radii, maximum vertical gradients, relaxations, departures etc.)
3	Examination of **junction strategy**, access control and interaction with existing transportation networks.
4	Examination of **structures** (river, road & rail bridges, culverts, underpasses and other structures, and their clearances and maintenance requirements).
5	**Geology** and its potential impacts on construction (underlying ground conditions, sensitive areas / areas of poor ground including karst, caves, peat etc.).
6	**Groundwater** (aquifers, springs, wells and their vulnerability to major earthworks).
7	**Earthworks** (cut and fill volumes, comparative earthworks balance, maximum depth of cuttings and height of embankments).
8	**Road Safety Impact Assessment** (assessment of alternative options).
9	**Drainage** (carriageway drainage, crossing of watercourses, specific drainage requirements through high vulnerability areas).
10	**Construction** (comparative ease of construction and traffic management).
11	**Comparative service conflicts** (electricity, telecommunications, gas, broadband, cable TV, water, wastewater etc.).
12	Comparisons on **land & property** (land take, land severance, land use, residential acquisitions, accommodation works requirements).
	Stage 1 – Main Criterion 2 - Environment
1	**Ecology**
2	**Soils and Geology**
3	**Hydrogeology**
4	**Hydrology**
5	**Landscape and Visual**
6	**Archaeological, architectural, and cultural heritage**
7	**Material assets – agricultural**
8	**Material assets – non-agricultural**
9	**Air quality and climate**
10	**Noise and vibration**
11	**Human beings**
12	**Interrelationship considerations**

Ref. No.	Item
	Stage 1 – Main Criterion 3 – Economy
1	Preparation of **Option Comparison Estimates** in line with TII CMM.

Table 5-1: TII's PMM Outline List of Stage 1 Assessment Sub-Criteria for Engineering, Environment, and Economy (Appendix A2.4 of TII's PMM)

As per TII's PMM, the list above *'is not to be taken as a conclusive exposition of requirements. Project particulars / features will be examined to determine the most appropriate criteria via which options will be compared and evaluated during Stage 1 (Preliminary Options Assessment). It may be possible to 'scope out' non-environment related criteria, for example where potential impacts will be negligible for all options, thereby simplifying assessment. Where this approach is adopted the Project Manager will clearly outline the rationale thereof within the Stage 1 (Preliminary Options Assessment) working paper and the Option Selection Report. All environmental effects must be considered and where these are negligible or equivalent across all option types this shall be stated as such.*'

In the case of the Stage 1 Assessment for the N2 Ardee to Castleblayney Road Scheme, all Sub-Criteria outlined in Table 5-1 were considered and initially assessed. Although, in some instances, the criteria were determined to be equivalent or have a negligible difference across all options for this initial stage of options selection process. In these instances, the rationale was outlined (See Sections 5.3 and 5.4), and the sub-criteria were noted as non-applicable (N/A) in the performance matrix didn't contribute to the overall performance scores.

In terms of the basis of the comparative assessment of the Route Corridor Options, for the Main Criterion of Environment, all options were comparatively assessed against the Do-Nothing Option i.e. using the existing environment as the baseline. In the case of the Main Criteria of Engineering and Economy, all Route Corridor Options, with the exception of the Sub-Criteria of Traffic Assessment and Geology, were comparatively assessed against each other in terms of determining their impact and performance scores. Traffic Assessment was compared to the Do-Minimum Option, and Geology, similar to the environmental Sub-Criteria was assessed against the existing baseline conditions (i.e. Do-Nothing Option). Further description of the basis of the comparative assessment for the engineering sub-criteria is provided in Section 8.5 (Engineering Assessment) below.

As noted in Section 5.1 above, as per TII's PAG Unit 7.0, an Impact Scoring System is established to assign an impact level ('*Highly Positive'* to *'Highly Negative'*) to a particular option against the defined Main Criteria and Sub-Criteria. Then, each impact level is assigned a performance score based on a seven-point scale (i.e. *'7 – Highly Positive, '1 – Highly Negative'*). Table 5-2 below outlines the full Impact Scoring System as per TII's PAG Unit 7.0. This Impact Scoring System was used throughout the N2 Ardee to Castleblayney Road Scheme Stage 1 Assessment.

Level of Impact	Performance Score
Major or highly positive	7
Moderately positive	6
Minor or slightly positive	5
Not significant or neutral	4
Minor or slightly negative	3
Moderately negative	2
Major or highly negative.	1

Table 5-2: TII's PAG Unit 7.0 – Impact Scoring System

In relation to the assessment and scoring methodology of the Sub-Criteria, a further level of criteria (i.e. sub-sub-criteria or *Sub-Criterion Elements*) were identified and selected to appropriately inform the impact level and associated seven-point scoring scale of the sub-criteria. For example, Travel Times and Proximity to an Urban Centre are Sub-Criterion Elements of the Sub-Criteria Traffic Assessment. As is the case for the scoring of Sub-Criteria, a seven-point scoring scale was adopted in assessing the impact of these Sub-Criterion Elements. The number of specific Sub-Criterion Elements used for each specific defined Sub-Criteria is outlined in the sections below of this Report.

The methodology and performance scoring results for each Sub-Criterion of Engineering, Environment and Economy for each option are provided in Sections 5.3, 5.4, and 5.5 respectively. The overall Stage 1 Assessment scoring and ranking of each option is provided in Section 5.6.

5.3 Engineering Assessment

The methodology and results for each of the 12 No. Sub-Criteria of Engineering for each option is outlined in Sections 5.3.1 to 5.3.12. A summary of the results of the 12 No. Sub-Criteria is provided in Section 5.3.13.

For the Stage 1 Engineering Assessment, all options, with the exception of the Sub-Criteria of Traffic Assessment and Geology, were comparatively assessed against each other in terms of determining their impact and performance scores. In relation to the Sub-Criterion of Traffic Assessment, all options (i.e. a Do-Something Alternative) were comparatively assessed against the Do-Minimum Option (See Section 3.3 of this Report). As per TII's PAG Unit 4.0, the Do-Minimum Option will be the Base Case (as per the CAF) for the future Stage 2 Assessment. The other Stage 1 Sub-Criteria cannot be reasonably compared to the Do-Minimum Option due to the particular nature/aspect of these Sub-Criteria and/or due to the level of scheme development at this initial stage (i.e. a 400m wide corridor). Taking the example of Sub-Criterion of Earthworks, in terms of its nature, the estimated cut and fill volumes from the proposed options cannot be reasonably compared against a Do-Minimum Option. They can only be comparatively assessed against each other.

Regarding the Engineering Sub-Criteria of Geology, similar to the assessment methodology of the Environmental Sub-Criteria (See Section 5.4), it was considered that all options would have a neutral to highly negative impact in terms of Geology when compared to the Do-Minimum Option.

5.3.1 Sub-Criterion 1 – Traffic Assessment

5.3.1.1 Sub-Criterion Elements & Methodology

2 No. Sub-Criterion Elements were selected for Traffic Assessment; Journey Times and Proximity to an Urban Centre. The methodology for these elements is outlined below.

For the purposes of this Stage 1 assessment, it was considered that the sub-criterion element of Journey Times carries greater importance over the sub-criterion of Proximity to an Urban Centre in the context of Traffic Assessment for this particular scheme. Although, Proximity to an Urban Centre has been identified as a pertinent parameter for the comparative assessment, as described further below, the improvement of Journey Times is specifically identified as a Scheme Objective (See Section 1.4.5 – Accessibility & Social Inclusion), and a National Policy Objective (See Section 1.5.2 – NPF's 2040 Inter-Urban Roads – Average inter-urban speed of 90 km/hr). In addition, it is directly linked to improvements in strategic connectivity, which are also Scheme and National Policy Objectives. Consequently, the following weighting factors were applied to the two sub-criterion elements to accommodate for the significance of Journey Times in the Stage 1 Assessment:

- Journey Times Sub-Criterion Element – Weighting Factor = 2.0
- Proximity to an Urban Centre – Weighting Factor = 1.0

1) Traffic Assessment Sub-Criterion Element 1: Journey Times

As outlined in the introduction to Section 5.3, all options (i.e. a Do-Something Option) were comparatively assessed against the Do-Minimum Option (See Section 3.3 of this Report). As per TII's PAG Unit 4.0, the Do-Minimum Option will be the Base Case (as per the CAF) for the future Stage 2 Assessment and is particularly relevant from a traffic modelling perspective.

As the scheme specific traffic model will not be fully completed and calibrated until Stage 2 of the Options Selection Process, approximate high-level assessments were undertaken to derive the journey times for the Do-Minimum and the route corridor options. Although, more detailed analysis and estimates will be derived during the Stage 2 process, the approximate times derived are directly linked to the lengths of the proposed options, which is the primary parameter of a journey time, and this approach is considered appropriate for comparative purposes.

In estimating the journey times of the options, the length of each option was calculated, with all options having the same start and end points (as outlined in Section 1.3). In order to derive a Journey Time, an average speed of 90 km/hr was applied to all options. This average travel speed aligns with NPF 2040 Inter-Urban speed of 90 Km/hr and a Level of Service (LoS) D (See Section 3.2.2 for further background on LoS).

In relation to approximate times for the Do-Minimum Options, and with reference to Sections 3.2 (Do-Nothing Option) and 3.3 (Do-Minimum Option), it is noted that Do-Nothing and Do-Minimum Options are broadly the same in the context of travel times, as there is a limited number of '*committed*' schemes which will affect journey time. Therefore, for the basis of the Stage 1 Assessment, the Do-Nothing and Do-Minimum Options were considered the same.

The Do-Nothing/Do-Minimum times were calculated using real-time travel data on the existing N2 section over a 30 day period (9th May to 10th June 2019) from Google Application Programming Interfaces (API) Data. The same start and end points as the route corridor options were applied. From this data, an existing average journey time for the scheme was derived from the average of AM peak, Interpeak and PM peak existing times in both directions. A journey time of 23.22 Minutes (23 minutes 13 seconds) was calculated for the N2 Ardee to Castleblayney Road Scheme which approximately equates to average travel speed of 80.5 Kph between the start and end points of the scheme.

Following the estimation of the existing journey times, the Journey Time Savings were identified for each route, by calculating difference between the journey times of the options and the existing journey times. Thereafter, the Journey Time Savings were used as the basis to determine TII's PAG Unit 4.0 seven-point score for each option. The option with the highest journey time savings (i.e. greatest benefit) was awarded a score of 7, the route with the lowest journey time savings was awarded a score of 1, and options with journey time savings in between were proportionally scored based on the difference between the highest and lowest journey time savings. With reference to the introduction above regarding weightings, a Weighting Factor of 2.0 was applied to this score to provide a Weighted Total for each option. Reference is to be made to Table 5-1 below and further details on the scoring methodology is provided in Appendix B.

2) Traffic Assessment Sub-Criterion Element 2: Proximity to an Urban Centre

Proximity to an Urban Centre is directly linked to the Scheme Objectives in terms of enhanced integration, connectivity and access to existing services (See Section 1.4 – Accessibility & Social Inclusion and Integration).

Route options are ranked based on their proximity to large population centres within the Study Area, which is generally interrelated with the level of integration of these options with these centres and their attractiveness to entice traffic onto these options.

Options which are comparatively closer to the identified centres of population, are considered more favourable from a traffic integration and enticement perspective, whilst options that are comparatively further away from the identified centres of population are considered less favourable from a traffic integration and enticement perspective.

In the case of the N2 Ardee to Castleblayney Road Scheme, Carrickmacross which is in the centre of the Study Area and is the only MCC Tier 1/ 2 settlement within the Study Area, and is deemed the most appropriate and sole Urban Centre for this assessment.

Distances from the urban centre were measured from the same point for all options. In the case of the N2 Ardee to Castleblayney Scheme, the common point was the junction of Main Street/O'Neill Street (off) in the centre of Carrickmacross.

As was the case for the sub-criterion of Journey Times, the do-minimum and do-nothing have been considered to be the same for the purposes of this assessment. In the cases of options, which contain existing sections of the N2, these were considered equivalent / neutral in terms of TII's PAG Unit 4.0 seven-point scoring scale and were awarded a score of 4. Options which have distances greater than do-minimum/do-nothing were proportionally awarded a score lower than 4 (i.e. between 1 and 3). A Weighting Factor of 1.0 was applied to this score to provide a Weighted Total for each option. Reference is to be made to Table 5-1 below and further details on the scoring methodology is provided in Appendix B.

Following derivation of a Weighted Totals for both the Journey Times and Proximity to an Urban Centre Sub-Criterion elements, both of these criteria were added together to provide a combined score ('Weighted Total Element 1 & 2 Total'). Then, using this combined score, a final overall 1 – 7 was allocated to each option, where the option with the highest overall weighted total was awarded a score of 7, the option with the lowest overall weighted total was awarded a score of 1, and options with overall weighted totals in between were proportionally scored based on the difference between the highest and lowest overall weighted totals. Further details on the scoring methodology is provided in Appendix B.

5.3.1.2 Results and Conclusion

Table 5-3 below shows the performance matrix for the Traffic Assessment Sub-Criterion. Further details on scoring is provided in Appendix B.

Routes	Sub Criterion Element 1: Journey Times					Sub Criterion Element 2: Proximity to an Urban Centre			Weighted Total – Elements 1 & 2 (Factored Total)	Overall Performance Score	Level of Impact
	Length of Option (km)	Journey Time (mins)	Journey Time Savings Vs. Do-Min.	Performance Score (Un-factored)	Weighted Total	Distance from Centre (m)	Performance Score (Un-factored)	Weighted Total			
Brown	35.380	23.59	-0.37	2	4	3284	2	2	6	**2**	**Moderately Negative**
Cyan	32.660	21.77	1.45	5	10	2865	3	3	13	**5**	**Minor or Slightly Positive**
Yellow	31.160	20.77	2.45	6	12	914	4	4	16	**7**	**Major or Highly Positive**
Green	29.755	19.84	3.38	7	14	4206	2	2	16	**7**	**Major or Highly Positive**
Purple	31.620	21.08	2.14	6	12	914	4	4	16	**7**	**Major or Highly Positive**
Orange	30.290	20.19	3.03	6	12	5553	1	1	13	**5**	**Minor or Slightly Positive**
Yellow + Blue	31.150	20.77	2.45	6	12	914	4	4	16	**7**	**Major or Highly Positive**
Cyan + Yellow + Blue	31.975	21.32	1.90	6	12	914	4	4	16	**7**	**Major or Highly Positive**
Yellow + Purple	30.985	20.66	2.56	6	12	914	4	4	16	**7**	**Major or Highly Positive**
Purple + Yellow + Blue	31.790	21.19	2.03	6	12	914	4	4	16	**7**	**Major or Highly Positive**
Yellow + Cyan + Green	31.020	20.68	2.54	6	12	914	4	4	16	**7**	**Major or Highly Positive**
Yellow+ Purple + Green	31.085	20.72	2.50	6	12	914	4	4	16	**7**	**Major or Highly Positive**
Brown + Purple	35.760	23.84	-0.62	1	2	3224	3	3	5	**1**	**Major or Highly Negative**
Cyan + Yellow + Purple	31.805	21.20	2.02	6	12	914	4	4	16	**7**	**Major or Highly Positive**
Green + Cyan	31.185	20.79	2.43	6	12	2865	3	3	15	**6**	**Moderately Positive**
Orange + Green 1	30.055	20.04	3.18	6	12	4206	2	2	14	**6**	**Moderately Positive**
Orange + Green 2	30.430	20.29	2.93	6	12	5553	1	1	13	**5**	**Minor or Slightly Positive**

Table 5-3: Traffic Assessment Performance Matrix

5.3.2 Sub-Criterion 2 – Technical Standards

The working indicative mainline alignments that have been developed to date within the 400m wide corridor of each Option, and which have all been designed in accordance to TII's Design Standards, are all above or to Desirable Minimum Standards/1 -Step relaxations. No Departures to Standard has been applied at this early stage of the design. Therefore, it is considered at this early stage of the scheme development that there are no discernible differences between the options in terms of Technical Standards, and that a comparative assessment cannot reasonably be undertaken at this stage. Consequently, as outlined in Section 5.1, this Sub-Criterion is identified as non-applicable (N/A) in the performance matrix and is not included in the scoring system.

5.3.3 Sub-Criterion 3 – Junction Strategy

5.3.3.1 Sub-Criterion Elements & Methodology

1 No. Sub-Criterion Element was selected for Junction Strategy; Existing Road Network Interface. The methodology for this element is outlined below.

1) Junction Strategy Sub-Criterion Element 1: Existing Road Network Interface

At Stage 1, the proposed junctions for each individual option has yet to be identified or developed. Therefore, the type of proposed junctions (i.e. roundabouts, grade separated junctions, etc.) cannot be comparatively assessed at this stage. Hence, for the purposes of undertaking a comparative assessment and defining the impact of each individual option at this early stage of the scheme development, the interface of each individual route option corridor with the existing road network was considered as an appropriate criterion for Junction Strategy.

In assessing the interface with the existing road network, the number of crossings of the existing road network intersected by each individual corridor was calculated. This estimation provides an indication of the scale of the engineering complexity and associated impact in terms of interfacing with the existing road network for each option. Options which have a higher number of road crossings, have a higher degree of complexity and impact in terms of interfacing with the existing network, and were scored lower on the defined TII's PAG Unit 4.0 seven-point impact scoring scale (1 – 7). Whilst options which have a lower number of road crossings, were scored higher.

In further defining the impact scoring, it is recognised that roads in Ireland and within the Study Area are classified in terms of strategic importance and significance, as per the following:

- National Primary (Designated with a N followed by a number between 1 and 50 i.e. N2)
- Regional Roads (Designated with a 'R')
- Local Roads (Designated with an 'L')

For the purposes of this assessment, it was considered that roads which a have a higher classification (Designated with a N), in general, have larger traffic flows/larger cross-sections and present a greater degree complexity and impact. While roads with a lower classification, present a lower degree of complexity and impact. Accordingly, it was assessed that the application of weighting factors to these classifications was appropriate. The following weighting factors were applied to each road classification:

- National Primary – Weighting Factor = 3
- Regional Roads – Weighting Factor = 2
- Local Roads – Weight Factor = 1

Following the application of the weighting factor to the number of crossings, a Weighted Total (Road Crossing Counts x Weighting Factor) was calculated for each option. The Weighted Total for each option was then used as the parameter to determine TII's PAG Unit 4.0 seven-point impact score for each option. The option with the highest Weighted Total (i.e. highest weighted total of crossings/greatest impact) was awarded a score of 1, the route with the lowest Weighted Total was awarded a score of 7, and options with Weighted Totals in between were proportionally scored based on the difference between the highest and lowest Weighted Total. Further details on the scoring methodology is provided in Appendix B.

5.3.3.2 Results and Conclusion

Table 5-4 below shows the performance matrix for the Junction Strategy Sub-Criterion. Further details on the scoring is provided in Appendix B.

Routes	Element 1: Existing Road Network Interface						Performance Score	Level of Impact
	Number of Road Crossings					Weighted Total (Factored total)		
	National Primary Roads	National Secondary Roads	Regional Roads	Local Roads	Total (unfactored)			
Brown	0	0	3	35	38	41	**3**	**Minor or Slightly Negative**
Cyan	2	0	2	31	35	41	**3**	**Minor or Slightly Negative**
Yellow	0	0	2	34	36	38	**4**	**Not Significant or Neutral**
Green	1	0	2	27	30	34	**5**	**Minor or Slightly Positive**
Purple	0	0	0	30	30	30	**6**	**Moderately Positive**
Orange	0	0	2	28	30	32	**5**	**Minor or Slightly Positive**
Yellow + Blue	0	0	2	31	33	35	**4**	**Not Significant or Neutral**
Cyan + Yellow + Blue	0	0	2	24	26	28	**6**	**Moderately Positive**
Yellow + Purple	0	0	2	27	29	31	**5**	**Minor or Slightly Positive**
Purple + Yellow + Blue	0	0	2	23	25	27	**7**	**Major or Highly Positive**
Yellow + Cyan + Green	0	0	2	23	25	27	**7**	**Major or Highly Positive**
Yellow+ Purple + Green	0	0	2	28	30	32	**5**	**Minor or Slightly Positive**
Brown + Purple	0	0	3	40	43	46	**1**	**Major or Highly Negative**
Cyan + Yellow + Purple	0	0	2	29	31	33	**5**	**Minor or Slightly Positive**
Green + Cyan	1	0	2	27	30	34	**5**	**Minor or Slightly Positive**
Orange + Green 1	1	0	2	24	27	31	**5**	**Minor or Slightly Positive**
Orange + Green 2	1	0	2	28	31	35	**4**	**Not Significant or Neutral**

Table 5-4: Junction Strategy Performance Matrix

5.3.4 Sub-Criterion 4 – Structures

5.3.4.1 Sub-Criterion Elements & Methodology

1 No. Sub-Criterion Element was selected for Structures; Structures over Watercourse and Road Crossings. The methodology for this element is outlined below.

1) Structures Sub-Criterion Element 1: Structures over Watercourse and Road Crossings

At Stage 1, the exact numbers of proposed structures for each individual option has yet to be fully identified or developed. Notwithstanding, it is recognised that the number of principal structures is a function of the number of existing watercourses and roads which the proposed option interfaces with. Therefore, for the Stage 1 Assessment, the number of existing watercourses and roads intersected by each individual corridor formed the basis of the assessment. This estimation provides an indication of the scale of the engineering complexity and associated impact in terms of interfacing with the watercourses and roads for each option. Options which have a higher number of road crossings, have a higher degree of complexity, a higher likely number of structures and a higher impact, and were scored lower on the defined TII's PAG Unit 4.0 seven-point impact scoring scale (1 – 7). Whilst options which have a lower number of watercourse and road crossings, were scored higher.

Regarding the road crossings, the same methodology and estimation was undertaken for the Junction Strategy Sub-Criterion (See Section 5.3.3 above).

In relation to water crossings, the watercourse data that was assessed was obtained from the EPA Geoportal Website (https://gis.epa.ie/), which was current at the time of the assessment. In terms of categorising the size of watercourses and their location within a tributary network, the EPA use a recognised industry standard method named Strahler Stream Order (SO). As per the associated EPA GIS metadata description, a SO is defined as a:

"Stream order is a method for classifying the relative location of a Reach within the larger river system and is used to define stream size based on a hierarchy of tributaries. It assigns each headwater perennial Stream an order of 1, and then at the confluence of two 1st-order Streams assigns the downstream Reach an order of 2. In this method, the confluence of two 2nd-order Streams results in a downstream Reach of order 3, and so on."

Therefore, a SO of 5 (or SO5) would be the main river of a large river system, whilst a SO of 1, would be a minor stream. For context purposes within the Counties of Monaghan and Louth, the River Glyde is designated as a SO5 and River Blackwater (at Monaghan Town) is designated as a SO4.

In further defining the impact scoring of watercourse crossings, the Strahler Stream Order classification was recognised. It was considered that larger watercourses would present a greater degree of complexity and have a larger impact. Accordingly, it was assessed that the application of weighting factors to the Strahler Stream Order classification was appropriate. Recognising that on-site verification of watercourse sizes was not reasonably practicable at this early stage, and that the classifications are closely related, the 5 No. SO's were combined into two distinct groups and associated weighting factors applied:

- **Group 1: SO 5 to 3** – Larger Watercourses & Canals – Rivers / Larger Streams – Weighting Factor = 3
- **Group 2: SO 1 to 2** – Smaller Watercourses – Streams / Minor Streams – Weighting Factor = 1

Following the application of the weighting factor to the number of watercourse crossings, a Weighted Total (Watercourse Crossing Counts x Weighting Factor) was calculated for each option. The Watercourse Crossing Weighted Total was then combined with the Road Crossing Total (Same total as the Junction Strategy Sub-Criterion. See Section 5.3.3 above). Thereafter, the total of both (The overall Weighted Total) for each option was then used as the parameter to determine TII's PAG Unit 4.0 seven-point impact score for each option.

The option with the highest Overall Weighted Total (i.e. highest weighted total of crossings/greatest impact) was awarded a score of 1, the route with the lowest Overall Weighted Total was awarded a score of 7, and options with Overall Weighted Totals in between were proportionally scored based on the difference between the highest and lowest Weighted Total. Further details on the scoring methodology is provided in Appendix B.

5.3.4.2 Results and Conclusion

Table 5-5 below shows the performance matrix for the Structures Sub-Criterion. Further details on the scoring is provided in Appendix B.

Routes	Element 1: Structures Over Watercourse and Road Crossings										Performance Score	Level of Impact
	Number of Watercourse Crossings							No. of Road Crossings Weighted Total (as per JCT Strategy Total)	Overall Weighted Total Rivers & Roads (Factored Total)			
	Canal	S01*	S02*	S03*	S04*	S05*	Total (Unfactored)	Weighted Total (Factored Total)				
Brown	0	10	2	1	1	0	14	18	41	59	**3**	**Minor or Slightly Negative**
Cyan	0	11	5	0	2	0	18	22	41	63	**2**	**Moderately Negative**
Yellow	0	8	3	1	1	0	13	17	38	55	**4**	**Not Significant or Neutral**
Green	0	11	3	0	0	1	15	17	34	51	**5**	**Minor or Slightly Positive**
Purple	0	8	4	1	1	0	14	18	30	48	**5**	**Minor or Slightly Positive**
Orange	0	13	4	1	0	1	19	23	32	55	**4**	**Not Significant or Neutral**
Yellow + Blue	0	6	3	1	1	0	11	15	35	50	**5**	**Minor or Slightly Positive**
Cyan + Yellow + Blue	0	12	6	1	1	0	20	24	28	52	**4**	**Not Significant or Neutral**
Yellow + Purple	0	6	3	1	1	0	11	15	31	46	**6**	**Moderately Positive**
Purple + Yellow + Blue	0	8	4	1	1	0	14	18	27	45	**6**	**Moderately Positive**
Yellow + Cyan + Green	0	7	3	1	1	0	12	16	27	43	**7**	**Major/ Highly Positive**
Yellow+ Purple + Green	0	7	3	1	1	0	12	16	32	48	**5**	**Minor or Slightly Positive**
Brown + Purple	0	9	4	1	1	0	15	19	46	65	**1**	**Major or Highly Negative**
Cyan + Yellow + Purple	0	12	6	1	1	0	20	24	33	57	**3**	**Minor or Slightly Negative**
Green + Cyan	0	8	3	0	0	1	12	14	34	48	**5**	**Minor or Slightly Positive**

Orange + Green 1	0	15	3	0	0	1	19	21	31	52	**4**	**Not Significant or Neutral**
Orange + Green 2	0	13	2	1	0	1	17	21	35	56	**4**	**Not Significant or Neutral**

Table 5-5: Structures Performance Matrix

5.3.5 Sub-Criterion 5 – Geology

5.3.5.1 Sub-Criterion Elements & Methodology

3 No. Sub-Criterion Elements were selected for Geology; Superficial Geology, Solid Geology & Other Geological Features. The methodology for these elements is outlined below.

All data used for the assessment of the Superficial Geology, Solid Geology & Other Geological Features was obtained from GIS datasets from the Geological Survey of Ireland (GSI), which was current at the time of the assessment. In addition, in relation to 'Other Geological Features', and the sub-set of 'Mines/Quarries', this data was supplemented with a Mines and Quarries Register obtained from Monaghan and Louth County Councils.

1) Geology Sub-Criterion: Superficial Geology

This includes an assessment of the existing Made Ground and Soft Ground. Made Ground has an unknown composition with potential organic material leading to soft deposits, organic decay and eventual differential settlement. Construction issues including dig-out and replace and off-site disposal which can add to the scheme costs and programme duration. It was considered that, as made ground is likely to be at the ground surface, this material will potentially have more of an impact on the scheme in comparison with the solid geology which will be encountered at depth. As such, Made Ground was given a weighting factor of two to recognise this significance.

Soft Ground is a low strength material and can cause excessive or differential settlement and earthworks stability issues. It is considered that as soft ground is likely to be at the ground surface, this material will potentially have more of an impact on the scheme in comparison to the solid geology which will be encountered at depth. As such, soft ground has been given a weighting factor of two to recognise this significance.

Superficial Geology was assessed based on an approximate route coverage range of; >200,000m^2, >50,000m^2 to 200,000m^2, >10,000m^2 to 50,000m^2, and 0 to 10,000m^2. These route coverage ranges were assigned an impact score of 1 to 4 respectively.

Glacial Till was not considered as part of the formal Stage 1 assessment under Superficial Geology as it was determined that the level of detail on glacial till was currently unknown at this stage. As such, Glacial Till was deemed to be non-applicable with no impact score given.

2) Geology Sub-Criterion: Solid Geology

This includes an assessment of the existing Carboniferous Limestone and Potentially Aggressive Ground.

Carboniferous Limestone areas have potential karst features including sink holes, groundwater issues and other solution features that may require special geotechnical measures prior to construction. It was decided to give it a weighting factor of one.

Carboniferous Limestone was assessed based on an approximate route coverage range of; >5,000,000m2, >500,000m2 to 5,000,000m2, > 0 to 500,00m2, and 0m2. These route coverage ranges were assigned an impact score of 1 to 4 respectively.

Potentially Aggressive Ground strata such as pyrite-bearing shale strata or gypsum can be aggressive towards concrete structures. It was decided to give it a weighting factor of one.

Potentially Aggressive Ground was assessed based on an approximate route coverage range of; > 1,000,000m2, > 50,000m2 to 1,000,000m2, and 0 to 50,000m2. These route coverage ranges were assigned an impact score of 2 to 4 respectively.

'Other carboniferous sedimentary strata' and 'Igneous Rocks' were not considered as part of the formal Stage 1 assessment under Solid Geology as it was deemed that they were likely to have little or no impact on the route corridor options. As such, 'Other carboniferous sedimentary strata' and 'Igneous Rocks' were deemed to be non-applicable with no impact score given.

3) Geology Sub-Criterion: Other Geological Features

This includes an assessment of 'Previously Identified Karst Features' and 'Mines/Quarries'. 'Previously Identified Karst Features' were assessed based on an initial desk study which identified several known karst features. It was considered that karst features have a higher potential to significantly impact some of the route corridor options in comparison with other geological features due to the cost of remediating these features should they be encountered. As such, it was considered that a weighting of three should be applied to these features.

'Previously Identified Karst Features' were assessed based on the number of karst features identified within the route corridor options, broken down to; 10+, 5 to 9, 1 to 4, and 0. The range of the numbers of karst features were assigned an impact score of 1 to 4 respectively.

'Mines/Quarries' can cause voids at depth which may have require remedial works to be carried out on potential route corridor options, should they be encountered. 'Mines/Quarries' were assessed based on the number of mines and quarries identified within the route corridor options, broken down to 10+, 5 to 9, 1 to 4, and 0. The range of the numbers of mines and quarries were assigned an impact score of 1 to 4 respectively.

Following the determination of the individual impact scores for each of the three sub-criterion elements, individual weighting factors were applied to these sub-criteria. The following weighting factors were applied:

- Superficial Geology – Weighting Factor = 2
- Solid Geology – Weighting Factor = 1
- Other Geological Features – Weighting Factor = 3

The weighting factors listed above, take account of the degree of impact which one sub-criterion is considered to present over another in terms of engineering complexity.

Following the application of the Weighting Factor to the Impact Score, a Weighted Total was calculated for each option. Thereafter, the Weighted Totals for each option under the three Sub-Criterion Elements i.e. Superficial Geology, Solid Geology, and Other Geological Features were combined to provide an overall Weighted Total to be used as the parameter to determine TII's PAG Unit 4.0 seven-point impact score for each option. The option with the lowest Overall Weighted Total (i.e. greatest impact on geological features) was awarded a score of 1, the route with the highest Overall Weighted Total was awarded a score of 7 (i.e. least impact on geological features), and options with Weighted Totals in between were proportionally scored based on the difference between the highest and lowest Weighted Total. Further details on the scoring methodology is provided in Appendix B.

5.3.5.2 Results and Conclusion

Table 5-6 below shows the performance matrix for the Geology Sub-Criterion. Further details on the scoring is provided in Appendix B.

Routes	Element 1: Superficial Geology			Element 1: Solid Geology			Element 3: Other Geological Features			Overall Score (Un-factored)	Overall Weighted Score	Overall Performance Score	Level of Impact
	Made Ground	Soft Ground	Score (Un-factored)	Limestone	P. Aggress. Ground	Score (Un-factored)	Karst Features	Mines/ Quarries	Score (Un-factored)				
Brown	4	2	6	2	2	4	3	3	6	16	34.00	5	Minor or Slightly Positive
Cyan	2	2	4	1	3	4	2	2	4	12	24.00	2	Moderately Negative
Yellow	2	2	4	2	3	5	1	2	3	12	22.00	2	Moderately Negative
Green	4	2	6	3	2	5	4	3	7	18	38.00	6	Moderately Positive
Purple	2	2	4	2	3	5	2	2	4	13	25.00	2	Moderately Negative
Orange	4	3	7	3	4	7	4	3	7	21	42.00	7	Major or Highly Positive
Yellow + Blue	2	2	4	2	3	5	1	2	3	12	22.00	2	Moderately Negative
Cyan + Yellow + Blue	2	3	5	1	3	4	1	2	3	12	23.00	2	Moderately Negative
Yellow + Purple	2	3	5	2	3	5	2	2	4	14	27.00	3	Minor or Slightly Negative
Purple + Yellow + Blue	2	2	4	2	3	5	1	3	4	13	25.00	2	Moderately Negative
Yellow + Cyan + Green	2	2	4	2	3	5	1	3	4	13	25.00	2	Moderately Negative
Yellow+ Purple + Green	2	3	5	2	3	5	2	2	4	14	27.00	3	Minor or Slightly Negative
Brown + Purple	4	3	7	2	2	4	1	1	2	13	24.00	2	Moderately Negative
Cyan + Yellow + Purple	2	2	4	1	3	4	1	2	3	11	21.00	1	Major or Highly Negative
Green + Cyan	3	2	5	2	3	5	2	2	4	14	27.00	3	Minor or Slightly Negative
Orange + Green 1	4	2	6	3	3	6	4	3	7	19	39.00	6	Moderately Positive
Orange + Green 2	4	3	7	3	3	6	4	3	7	20	41.00	6	Moderately Positive

Table 5-6: Geology Performance Matrix

5.3.6 Sub-Criterion 6 – Groundwater

Following a review of TII's PMM suggested aspects to be considered under this sub-criterion, it was assessed that the same or very similar aspects of Groundwater (aquifers, springs, wells, etc.) are required to be considered and assessed under the Environment Sub-Criterion of Hydrogeology. Therefore, it is considered that there is no merit/benefit in assessing Groundwater under the Engineering sub-criterion at this stage of assessment.

5.3.7 Sub-Criterion 7 – Earthworks

5.3.7.1 Sub-Criterion Elements & Methodology

One Sub-Criterion Element was selected for Earthworks; Comparative Earthworks Balance. The methodology for this element is outlined below. The assessment of significant cuts/fills were not considered appropriate at this stage. Elements such as cut and fill slopes have been taken as 1:3 for each Route Option Corridor at this early stage of the design. For cuttings and fills, the exact slope gradients will ultimately be dictated by the geotechnical slope stability, which will be subject to further investigation and design. Consideration of the forgiving roadsides requirements of TII Standard *DN-REQ-03034 The Design of Road Restraint Systems (Vehicle and Pedestrian) for Roads and Bridges* will also influence the selection of appropriate the slope gradient. This design and further investigation will be undertaken in the subsequent stages/phases of the Scheme.

1) Earthworks Sub-Criterion Element: Comparative Earthworks Balance

For the purposes of this assessment, bulk cut and fill earthworks volume quantities were based on an indicative working alignment within the 400m wide corridor of each option.

In assessing the Comparative Earthworks Balance, the volumetric difference between the cut and fill volumes were estimated for each Route Corridor Option. For the bulk cut volumes, it has been assumed that 65% of the excavated cut material will be acceptable for re-use for the construction of the scheme, with the remaining 35% being identified as unacceptable and removed off-site. This is a high-level approximate assumption which is based on previous projects of similar scale/type. In order to determine a more detailed estimation, on-site ground investigations along with more detailed studies/reviews are required. As per TII's PMM, these investigations and studies will be undertaken in the subsequent later stages of the scheme development.

Following the estimation of the acceptable cut material (i.e. acceptable material available) volume, the difference between this and the bulk fill volume was calculated for each route option. In the case of the N2 Ardee to Castleblayney Road Scheme, the acceptable cut material volume was larger than the bulk fill material (i.e. material required) for each route option. Therefore, excess acceptable cut material is available on each option. No deficit is present on any of the options.

In order to comparatively assess the excess acceptable cut material (i.e. excess acceptable material available) for each option, the efficiency of each option to reuse this excess in terms of the acceptable material generated was used as the basis. The efficiency in use of available acceptable material is expressed as a percentage, where the excess acceptable material available is divided by the acceptable material generated (i.e. acceptable cut material/acceptable material available).

The option with the lowest percentage uses the greatest amount of acceptable material available and generates the least amount for disposal and was awarded a score of 7 (highly positive). The option with the highest percentage uses the least amount of acceptable material available and generates the most amount for disposal and was awarded a score of 1 (highlight negative). Options with percentages in between were proportionally scored based on the difference between the highest and lowest percentages. Further details on the scoring methodology is provided in Appendix B.

5.3.7.2 Results and Conclusion

Table 5-7 below shows the performance matrix for the Earthworks Sub-Criterion. Further details on the scoring is provided in Appendix B.

Routes	Element 1: Comparative Earthworks Balance					Performance Score	Level of Impact
	Bulk Cut (m^3)	Acceptable Cut (m3 [65% of the Bulk Cut - Acceptable Material Available]	Bulk Fill (m3) [Material Required]	Difference between Acceptable Cut/Material Available And Material Required (Bulk Fill) – Excess Acceptable Material Available	Efficiency in Use of Available Acceptable Material (Excess Acceptable Material Available / Acceptable Cut Material) - %		
Brown	5,982,097.87	3,888,363.62	2,854,354.93	1,034,008.69	27%	**5**	**Minor or Slightly Positive**
Cyan	5,357,885.08	3,482,625.30	2,304,075.29	1,178,550.01	34%	**4**	**Not Significant or Neutral**
Yellow	1,655,416.79	1,076,020.91	277,620.62	798,400.29	74%	**2**	**Moderately Negative**
Green	3,460,523.98	2,249,340.59	1,347,940.14	901,400.45	40%	**4**	**Not Significant or Neutral**
Purple	4,047,554.81	2,630,910.63	2,000,068.78	630,841.85	24%	**5**	**Minor or Slightly Positive**
Orange	2,146,940.10	1,395,511.07	1,441,521.54	46,010.47	3%	**7**	**Major or Highly Positive**
Yellow + Blue	2,031,642.89	1,320,567.88	530,644.51	789,923.37	60%	**3**	**Minor or Slightly Negative**
Cyan + Yellow + Blue	2,748,064.62	1,786,242.00	1,260,755.56	525,486.44	29%	**5**	**Minor or Slightly Positive**
Yellow + Purple	3,849,422.40	2,502,124.56	1,713,933.50	788,191.06	32%	**5**	**Minor or Slightly Positive**
Purple + Yellow + Blue	2,341,757.14	1,522,142.14	726,074.11	796,068.03	52%	**3**	**Minor or Slightly Negative**
Yellow + Cyan + Green	3,915,794.44	2,545,266.39	580,290.79	1,964,975.60	77%	**1**	**Major or Highly Negative**
Yellow+ Purple + Green	4,507,034.93	2,929,572.70	1,474,287.53	1,455,285.17	50%	**3**	**Minor or Slightly Negative**
Brown + Purple	5,695,084.15	3,701,804.70	3,929,725.21	227,920.51	6%	**6**	**Moderately Positive**
Cyan + Yellow + Purple	4,643,539.99	3,018,300.99	2,382,980.52	635,320.47	21%	**5**	**Minor or Slightly Positive**
Green + Cyan	4,177,103.82	2,715,117.48	1,577,545.17	1,137,572.31	42%	**4**	**Not Significant or Neutral**
Orange + Green 1	3,482,787.70	2,263,812.01	1,632,084.12	631,727.89	28%	**5**	**Minor or Slightly Positive**
Orange + Green 2	3,610,742.10	2,346,982.37	1,562,292.26	784,690.11	33%	**4**	**Not Significant or Neutral**

Table 5-7: Earthworks Performance Matrix

5.3.8 Sub-Criterion 8 – Road Safety Impact Assessment

5.3.8.1 Sub-Criterion Elements & Methodology

Six Sub-Criterion Elements were used for the Stage 1 Road Safety Impact Assessment (RSIA); Effects on Traffic Flow and Traffic Patterns, Forgiving Roadsides, Tie-in Location, Susceptibility to Climatic Changes at Higher Elevations, Geometric Standards Impacting Driver Comfort – Vertical Alignment and Geometric Standards Impacting Driver Comfort – Horizontal Alignment. The methodology for this element is outlined below.

This Stage 1 comparative assessment has been taken from an extract from the N2 Ardee to Castleblayney Stage 1 RSIA Report, which was undertaken in accordance with Clause 2.1.2.7.1 of TII's PMGs, and TII's Standards; - *Road Safety Impact Assessment Guidelines PE-PMG-02004 (December 2017)* and *Road Safety Impact Assessment PE-PMG-02001 (December 2017).* A copy of the RSIA report is included in Appendix D of this Report.

An RSIA, as defined in the TII Standards is a *'strategic comparative analysis of the impact on the safety performance of the road network of different planning alternatives for a new road or a substantial modification to the existing network.'*

The RSIA Sub-Criterion identified for the Stage 1 Assessment align with the criteria used in the formal RSIA Stage 1 Assessment Report. A number of additional criteria were also identified and considered as part of the assessment but were determined to be neutral or have a negligible difference across all options for this initial stage of the options selection process. As outlined above in Section 5.1 (General Methodology), these criteria were notated as Non-Applicable (N/A) and are not included in the impact scoring system or further discussed below. Details of these criteria are provided in Appendix B.

The 400m wide corridor for each option formed the basis of the RSIA Stage 1 Assessment. Though, for certain criteria, as outlined below, it was necessary for the options to be assessed based on the Stage 1 indicative working alignments.

1) RSIA Sub-Criterion Element 1: Effects on Traffic Flow and Traffic Patterns

At this initial stage of the scheme development, in the absence of a completed scheme specific traffic model, it is recognised that there is insufficient traffic data to determine the influence of each option on traffic travel patterns, and the impact on regional and local roads, used as potential rat runs to access the proposed route. Furthermore, it is recognised the junction strategy is yet to be developed. Therefore, in terms of assessing the impact of options on traffic flow and patterns at this initial stage, consideration of the degree of off-line and on-line construction in terms of safety and its influence on existing travel patterns has been identified as an appropriate Sub-Criterion Element.

An off-line alignment may be considered safer from a road safety perspective; particularly where there is extensive roadside development on the existing road and where there is evidence of collision clusters. The offline options are considered to provide the opportunity to construct a newer safer road layout. The online options would be compromised by the need to cater for existing development and would in all likelihood prove unsatisfactory in the long term with probable future demands for speed limits in certain areas. An online option may also prove more difficult to achieve compliant design in accordance with TII Publications compared to an offline option.

The basis of the performance scoring for this Sub-Criterion is that offline sections of Options being favoured over online sections due to the segregation of local and strategic traffic. The offline sections are also favoured, as it is considered that the online sections will require numerous accesses to be closed and accommodation roads to be built parallel to the mainline on both sides. This would provide an increased number of potential road safety conflict points when compared to offline sections.

As part of the Stage 1 RSIA, the auditor derived the following scoring system for this sub-criterion element:

- <= 10 % Online =7
- 11 to <=20% Online = 6,
- 21 to <=30% Online = 5,
- 31 to <=40% Online = 4,
- 41 to <=50% Online = 3,
- 51 to <=60% Online = 2,
- 61 to <=70% Online = 1

Further details on the basis of the scoring is provided in Appendix B.

2) RSIA Sub-Criterion Element 2: Tie-In Location

This Sub-Criterion relates to the consideration of the tie-in locations of the Corridor/indicative mainline alignment at the start and end points only.

It is recognised that the Junction Strategy is yet to be developed and confirmed. However, for the basis of this assessment, it is assumed that the proposed scheme will tie-in to the existing Castleblayney Roundabout at the northern end and the proposed N52 Bypass at the southern end. Thereby, introducing additional arms to these roundabouts for some of the options. An additional arm introduces another conflict point which increases the risk of collisions. In relation to scoring of this Sub-Criterion, the RSIA Auditor comparatively assessed the options based on the likelihood of additional arms to the identified roundabouts and the general alignments on the approach to these roundabouts. Further details on the basis of the scoring is provided in Appendix B.

3) RSIA Sub-Criterion Element 3: Forgiving Roadsides

It is considered that 'Forgiving Roadside Approach' as defined in the TII Standards will be more difficult to achieve on online route options due to the proximity of housing boundaries, the properties themselves and other existing roadside hazards. This may lead to less desirable mitigation measures from a safety perspective (a higher level of safety barriers, employment of steeper slopes, etc.) within the clearzone of the carriageway. For this assessment, options which had significant lengths of online sections were scored negatively. Further details on the basis of the scoring is provided in Appendix B.

4) RSIA Sub-Criterion Element 4: Susceptibility to Climatic Changes at Higher Elevations

This assessment comprised of the identification of instances where the indicative mainline alignment is greater than an elevation of 180m OD Malin. At heights greater than 180m OD Malin, it is considered that road users would be more susceptible to greater and more extreme climatic changes (snow, frost, etc.), which would adversely affect the safety of road users.

In relation to performance scoring, options which have the highest numbers of instances above 180m OD Malin, were allocated a score 1. Further details on the basis of the scoring is provided in Appendix B.

5) RSIA Sub-Criterion Element 5: Potential Geometric Standards Impacting Driver Comfort - Horizontal

As per Section 5.3.2 (Technical Standards), a working indicative mainline alignment has been developed within the 400m corridor of each Option. All of these indicative alignments have been designed in accordance to TII's Design Standards and are all above or to Desirable Minimum Standards/1-Step relaxations. No Departures to Standard has been applied at this early stage of the design. Although, all of these alignments are subject to change, the RSIA Auditor has determined that the alignments can be considered to be generally representative of the corridors in broad geometric terms, and that their high-level properties (i.e. mainline horizontal and vertical) can be used as a basis for comparative properties for the Stage 1 assessment.

For this Sub-Criterion, the indicative mainline horizontal alignment was reviewed from a RSIA perspective to identify bends, which although acceptable to employ from a TII Standard perspective, may result in a lesser degree of driving comfort for road users. As part of the review, and with reference to TII Design Standard *Rural Road Link Design* - Standard *DN-GEO-03031 (2017),* the following parameters were identified and estimated for each option:

- Application of Horizontal Radii at 720m (Desirable) and <720m (1 Step Relaxation) – Number of Instances & Combined Length

As part of the Stage 1 RSIA, the auditor derived the following scoring system for this sub-criterion element:

- > 4000m Combined Length of Radii at or below 720m Radius = 1
- >3500, <4000 = 2
- >3000, <3500 = 3
- >2500, <3000 = 4
- >2000, <2500 = 5
- >1500, <2000 = 6
- <1500 = 7

Further details on the basis of the scoring is provided in Appendix B.

6) RSIA Sub-Criterion Element 6: Potential Geometric Standards Impacting Driver Comfort - Vertical

Similar to horizontal alignment, for this Sub-Criterion, the indicative mainline vertical alignment was reviewed from a RSIA perspective to identify gradients, which although acceptable to employ from a TII Standard perspective, may result in a lesser degree of driving comfort for road users. As part of the review, and with reference to TII Design Standard *Rural Road Link Design* - Standard *DN-GEO-03031 (2017),* the following parameters were identified and estimated for each option:

- Application of Vertical Gradients at Desirable (4%) and >4% (1 Step Relaxation) – Number of Instances & Combined Length

As part of the Stage 1 RSI, the auditor derived the following scoring system for this sub-criterion element:

- >2500 = 1
- >2000, <2500 = 2
- >1500, <2000 = 3
- >1000, <1500 = 4
- >500, <1000 = 5
- >250, <500 = 6
- <250 = 7

Following the allocation of individual scores to each Sub-Criterion Element, each of these scores were combined to provide an Element Total. The option with the highest Element Total (i.e. Highest positivity/lowest impact) was awarded a final performance score for the sub-criterion of RSIA of 7, the option with the lowest Element Total was awarded a score of 1, and options with Element Totals in between were proportionally scored based on the difference between the highest and lowest Element Totals. Further details on the scoring methodology is provided in Appendix B.

5.3.8.2 Results and Conclusion

Table 5-8 below shows the performance scoring matrix for the RSIA Sub-Criterion. Further details on the scoring is provided in Appendix B.

Routes	Element 1: Effect on Traffic Flow and Traffic Patterns	Element 2: Tie-in Location	Element 3: Forgiving Roadsides	Element 4: Susceptibility to Climatic Changes at Higher Elevations	Element 5: Geometric Standards Impacting Driver Comfort – Horizontal	Element 6: Geometric Standards Impacting Driver Comfort – Vertical	Element 1 – 6 Total	Performance Score	Level of Impact
Brown	7	2	7	1	7	2	26	**4**	**Not Significant or Neutral**
Cyan	7	4	7	4	1	2	25	**4**	**Not Significant or Neutral**
Yellow	1	4	1	4	3	7	20	**2**	**Moderately Negative**
Green	6	4	6	4	6	5	31	**6**	**Moderately Positive**
Purple	4	4	4	4	6	2	24	**3**	**Minor or Slightly Negative**
Orange	7	2	7	4	7	6	33	**7**	**Major or Highly Positive**
Yellow + Blue	1	4	1	4	5	6	21	**2**	**Moderately Negative**
Cyan + Yellow + Blue	2	4	2	4	5	7	24	**3**	**Minor or Slightly Negative**
Yellow + Purple	2	4	2	4	4	3	19	**1**	**Major or Highly Negative**
Purple + Yellow + Blue	2	4	2	4	7	7	26	**4**	**Not Significant or Neutral**
Yellow + Cyan + Green	1	4	1	4	7	5	22	**3**	**Minor or Slightly Negative**
Yellow+ Purple + Green	1	4	1	4	5	4	19	**1**	**Major or Highly Negative**
Brown + Purple	7	4	7	4	2	4	28	**5**	**Minor or Slightly Positive**
Cyan + Yellow + Purple	5	4	5	4	4	3	25	**4**	**Not Significant or Neutral**
Green + Cyan	6	4	6	4	3	3	26	**4**	**Not Significant or Neutral**
Orange + Green 1	7	2	7	4	6	5	31	**6**	**Moderately Positive**
Orange + Green 2	7	2	7	4	6	6	32	**6**	**Moderately Positive**

Table 5-8: RSIA Performance Matrix

5.3.9 Sub-Criterion 9 – Drainage

5.3.9.1 Sub-Criterion Element & Methodology

1 No. Sub-Criterion Element was selected for Drainage; Flood Vulnerability Areas. The methodology for this element is outlined below.

1) Drainage Sub-Criterion: Flood Vulnerability Areas

With reference to TII's PMM outline of aspects/elements to be considered for the Stage 1 Sub-Criterion of Drainage (See Table 5-1 above), it is noted that the following suggested elements are listed: *'carriageway drainage, crossing of watercourses, specific drainage requirements through high vulnerability areas.'* With respect to 'crossings of watercourses', it is highlighted that this element has already been used as a sub-criterion element under Structures (See Section 5.3.4). Therefore, this particular element would not offer any new differential factor to the process. In relation to *'carriageway drainage'*; it noted that the Scheme is at the initial stages of design (i.e. corridor focussed), and the proposed carriageway drainage design has not been developed to a level where a reasonably comparative assessment be undertaken at this stage in terms of this particular drainage element. Therefore, taking account of the PMM's suggested drainage element of '*specific drainage requirements through high vulnerability areas',* and recognising that areas which are vulnerable to a higher risk of flooding will pose a greater degree of complexity, this was selected as the sub-criterion element for Drainage.

For the purposes of the Drainage Stage 1 Assessment, a comparative assessment of the area of the corridor impacted by a 1:100 overland fluvial flood event was undertaken for each option. The specific parameter used for the comparative assessment was the 'Fluvial Flood Extents (Present day) – 1% AEP – 1 in 100 year probability' obtained from the OPW Preliminary Flood Risk Assessment (PFRA) Maps (2011/12). It is noted that the OPW subsequently developed more recent maps in 2017/18, namely the OPW Catchment Flood Risk Assessment and Management (CFRAM) Flood Maps, which are available on the OPW website (www.floodmaps.ie). Though, these CFRAMS maps are more detailed than the PFRA Maps at certain locations/river networks, the development of these maps was limited to modelling of the main river networks which pass through urban areas, and do not cover river networks in low density rural areas. Therefore, as there are substantial areas of rural low densities areas within the route corridor options, and in order to undertake a more balanced comparative assessment, the PFRA Maps were considered the most appropriate OPW flood mapping for the Stage 1 Assessment.

Following the calculation of the area of the corridor impacted by a 1:100 event, the option with the highest Overall area and greatest susceptibility to flooding was awarded a performance score of 1, the option with the lowest area was awarded a score of 7, and options with areas in between were proportionally scored based on the difference between the highest and lowest areas. Further details on the scoring methodology is provided in Appendix B.

5.3.9.2 Results and Conclusion

Table 5-9 below shows the performance matrix for the Drainage Sub-Criterion. Further details on the scoring is provided in Appendix B.

Routes	Element 1: Flood Vulnerability Areas		
	Area of Corridor in 1: 100 Fluvial Flood (PFRA) (M^2)	Performance Score	Level of Impact
Brown	186,825.51	7	Major or Highly Positive
Cyan	496,874.96	4	Not Significant or Neutral
Yellow	293,489.32	6	Moderately Positive
Green	591,780.31	3	Minor or Slightly Negative
Purple	551,854.55	4	Not Significant or Neutral
Orange	427,056.80	5	Minor or Slightly Positive
Yellow + Blue	290,138.12	6	Moderately Positive
Cyan + Yellow + Blue	510,065.29	4	Not Significant or Neutral
Yellow + Purple	275,576.63	6	Moderately Positive
Purple + Yellow + Blue	565,725.61	3	Minor or Slightly Negative
Yellow + Cyan + Green	301,769.77	6	Moderately Positive
Yellow+ Purple + Green	282,725.07	6	Moderately Positive
Brown + Purple	226,051.44	6	Moderately Positive
Cyan + Yellow + Purple	496,168.24	4	Not Significant or Neutral
Green + Cyan	804,807.24	1	Major or Highly Negative
Orange + Green 1	651,892.51	3	Minor or Slightly Negative
Orange + Green 2	335,196.93	5	Minor or Slightly Positive

Table 5-9: Drainage Performance Matrix

5.3.10 Sub-Criterion 10 - Construction

5.3.10.1 Sub-Criterion Elements & Methodology

One sub-criterion element was selected for Construction, Online/Offline Construction. The methodology for this element is outlined below.

1) Construction Sub-Criterion: Online/Offline Construction

It is considered that road schemes which comprise of greater lengths of construction on existing mainline carriageways ('Online') will present a greater degree of complexity in terms of construction. This is due to the fact that the online construction presents a greater level of interface with existing live traffic, which in general requires more significant temporary road diversions, and necessitates undertaking works in more constrained working areas. Greenfield construction ('offline') is considered less complex, as in general the opposite applies.

For the Stage 1 Assessment, using the indicative working alignment within the 400m wide corridor as a basis, the total combined length of offline sections for each option was estimated. Thereafter, the length of the offline sections was divided by the total length of corridor for each option, where an Offline % was calculated.

The option with the lowest Offline % and which presents the greatest level of complexity in terms of construction, was awarded a performance score of 1, the option with the highest Offline % was awarded a score of 7, and options with areas in between were proportionally scored based on the difference between the highest and lowest offline percentages. Further details on the scoring methodology is provided in Appendix B.

5.3.10.2 Results and Conclusion

Table 5-10 below shows the performance matrix for the Construction Sub-Criterion. Further details on the scoring is provided in Appendix B.

Routes	Element 1: Online/Offline Construction			Performance Score	Level of Impact
	Length of Option (km)	Length of Scheme Offline (km)	Offline %		
Brown	35.38	33.611	95	**7**	**Major or Highly Positive**
Cyan	32.66	29.394	90	**6**	**Moderately Positive**
Yellow	31.16	0.935	3	**1**	**Major or Highly Negative**
Green	29.755	25.29175	85	**6**	**Moderately Positive**
Purple	31.62	20.553	65	**5**	**Minor or Slightly Positive**
Orange	30.29	28.7755	95	**7**	**Major or Highly Positive**
Yellow + Blue	31.15	4.6725	15	**2**	**Moderately Negative**
Cyan + Yellow + Blue	31.975	14.38875	45	**4**	**Not Significant or Neutral**
Yellow + Purple	30.985	12.394	40	**4**	**Not Significant or Neutral**
Purple + Yellow + Blue	31.79	14.3055	45	**4**	**Not Significant or Neutral**
Yellow + Cyan + Green	31.02	7.755	25	**3**	**Minor or Slightly Negative**
Yellow+ Purple + Green	31.085	10.87975	35	**3**	**Minor or Slightly Negative**
Brown + Purple	35.76	32.184	90	**6**	**Moderately Positive**
Cyan + Yellow + Purple	31.805	23.85375	75	**5**	**Minor or Slightly Positive**
Green + Cyan	31.185	26.50725	85	**6**	**Moderately Positive**
Orange + Green 1	30.055	28.55225	95	**7**	**Major or Highly Positive**
Orange + Green 2	30.43	28.9085	95	**7**	**Major or Highly Positive**

Table 5-10: Construction Performance Matrix

5.3.11 Sub-Criterion 11 – Service Conflicts

5.3.11.1 Sub-Criterion Element & Methodology

One. sub-criterion was selected for Service Conflicts: Electricity – High Voltage. The methodology for this element is outlined below.

1) Service Conflicts Sub-Criterion Element: Electricity – High Voltage

For the Stage 1 Assessment, significant strategic services which cross the proposed route corridor options were considered only, as they would pose the greatest engineering complexity and associated costs in terms of interface, maintaining or diverting these services. Services, which are of a lesser strategic importance, and are generally more dispersed throughout the study area (i.e. lower voltage electricity services), are considered more routine to divert or maintain. These services were not considered appropriate for the Stage 1 assessment and will be further assessed in the later stages of the scheme development.

In terms of significant strategic services, the following services were selected for consideration:

1) High-Pressure Gas Mains

2) Fibre Optic Cables

3) Electricity – High Voltage – 220Kv & 110Kv Overhead Powerlines and 38Kv Underground Cables

In relation to gas mains, it is noted that existing gas mains within the Study Area are limited to medium and low-pressure mains, and there are no existing high-pressure gas mains within the Study Area. Therefore, gas mains were discounted as a Sub-Criterion. Regarding fibre optic cables, it is noted that readily available records show the presence of these services within the Study Area. Though, without a more detailed assessment of these services, which would comprise of on-site verification and provision of more detailed information by service providers, it was considered that it was not appropriate to use these particular services as Sub-Criterion for the Stage 1 Assessment. Fibre Optic cables will be further assessed in the subsequent later stages of the scheme development.

Therefore, Electricity – High Voltage is the only service which is used as a Sub-Criterion for the Service Conflict. High Voltage electrical services within the N2 Ardee to Castleblayney Scheme Study Area consists of 220Kv & 110Kv Overhead Powerlines and 38Kv Underground Cables.

For this assessment a weighting factor was given to each of the High Voltage categories. For the 220Kv, 110Kv and 38Kv lines a weighting factor of 6, 3 & 1 was assigned respectively. This was based on the descending scale of the voltage through these lines and the complexity of any potential impact each Route Option Corridor may have on them.

Following the application of the weighting factor to the impact score of the three High Voltage sub-criteria, a Weighted Total was calculated for each option.

The Weighted Totals for each option were used as the parameter to determine TII's PAG Unit 4.0 seven-point impact score for each option. The option with the lowest Overall Weighted Total (i.e. lowest number of High Voltage crossings) was awarded a score of 1, the route with the highest Overall Weighted Total was awarded a score of 7, and options with Weighted Totals in between were proportionally scored based on the difference between the highest and lowest Weighted Total. Further details on the scoring methodology is provided in Appendix B.

5.3.11.2 Results and Conclusion

Table 5-11 below shows the performance matrix for the Service Conflicts Sub-Criterion. Further details on the scoring is provided in Appendix B.

Routes	Element 1: High Voltage					Performance Score	Level of Impact
	No. of 220kV Overhead Crossings	No. of 110kV Overhead Crossings	No. of 38kV Overhead Crossings	Total (Unfactored)	Weighted Total		
Brown	2	3	2	7	23	**6**	**Moderately Positive**
Cyan	2	3	1	6	22	**7**	**Major or Highly Positive**
Yellow	2	3	1	6	22	**7**	**Major or Highly Positive**
Green	2	7	1	10	34	**1**	**Major or Highly Negative**
Purple	2	3	1	6	22	**7**	**Major or Highly Positive**
Orange	2	3	3	8	24	**6**	**Moderately Positive**
Yellow + Blue	2	3	1	6	22	**7**	**Major or Highly Positive**
Cyan + Yellow + Blue	2	3	1	6	22	**7**	**Major or Highly Positive**
Yellow + Purple	2	3	1	6	22	**7**	**Major or Highly Positive**
Purple + Yellow + Blue	2	3	1	6	22	**7**	**Major or Highly Positive**
Yellow + Cyan + Green	2	3	1	6	22	**7**	**Major or Highly Positive**
Yellow+ Purple + Green	2	3	1	6	22	**7**	**Major or Highly Positive**
Brown + Purple	2	3	2	7	23	**6**	**Moderately Positive**
Cyan + Yellow + Purple	2	3	1	6	22	**7**	**Major or Highly Positive**
Green + Cyan	2	3	1	6	22	**7**	**Major or Highly Positive**
Orange + Green 1	2	7	1	10	34	**1**	**Major or Highly Negative**
Orange + Green 2	2	7	1	10	34	**1**	**Major or Highly Negative**

Table 5-11: Services Conflicts Performance Matrix

5.3.12 Sub-Criterion 12 – Land and Property

Two sub-criterion elements were selected for Land and Property; Land Acquisition and Residential Property Acquisition. The methodology for these elements is outlined below.

5.3.12.1 Sub-Criteria & Methodology

1) Land and Property Sub-Criterion: Land Acquisition

At this early stage of the scheme development, potential severance impacts/extents and accommodations works have not been identified or defined. Therefore, it is not feasible to use these elements for the Land and Property sub-criterion.

In terms of land acquisition, although the exact extents cannot be determined at this stage, a representative approximate land take area can be estimated based on the footprint of an indicative working alignment within 400mm corridor of each option. It is considered that this approach provides an appropriate and representative parameter for the purposes of comparing the options at this early stage of the scheme development.

In estimating the indicative land acquisition areas, the footprint area extends to the edge of the associated indicative earthworks of the alignment, plus an additional allowance for a 5m maintenance strip either side.

Following the calculation of the indicative land acquisition, the option with the highest estimated area and considered to have the greatest impact was awarded a performance score of 1, the option with the lowest area was awarded a score of 7, and options with areas in between were proportionally scored based on the difference between the highest and lowest areas. Further details on the scoring methodology is provided in Appendix B.

It is highlighted that the areas provided in Table 5-10 below are not expected to be the actual landtake required to deliver the project. The estimated areas shown have been solely derived for the comparative purposes described above.

2) Land and Property Sub-Criterion: Residential Property Acquisition

For the Stage 1 Engineering Assessment, it is noted that TII's PMM advises assessment of residential property acquisitions only in terms of property acquisitions. Therefore, other properties types, such as commercial and agricultural, do not form part of this particular assessment.

As part of this assessment, all residential properties within the 400m wide corridor of each option were counted.

The data source for the identification and estimation of the number of residential properties was the GeoDirectory database. The GeoDirectory database, which has been established by An Post and Ordnance Survey Ireland, contains a comprehensive list of property addressees and is regularly updated. The most up-to-date and available database at the time of the assessment was used (i.e. Quarter 2 2019). When considering the relatively large size of the Study area, and the early stage of the scheme development, this data source is considered appropriate for Stage 1 comparative assessment purposes. A more detailed assessment/estimate, including on-site verification of properties, will be undertaken in the subsequent later stages of the scheme development. The GeoDirectory database identifies residential properties under the following categories: Occupied, Derelict, Residential and Under-Construction. Each of these residential property types were identified and counted as part of this assessment.

In relation to planning applications, and specifically planning applications pertaining to residential developments which have been approved within the planning consent period (5 years) but are yet to be built, this was considered as part of the assessment. Though, it was determined that the number of these applications within the 400m wide corridors make-up a relatively small number when compared to the existing properties, and that their inclusion would not have a discernible influence on the comparative assessment. Therefore, planning applications have not been included in the residential property count.

In terms of the performance scoring, options which have a greater number of residential properties within the 400m wide corridor are considered to have a higher negative impact, and are allocated a comparatively lower score on TII's PAG Unit 4.0 seven-point impact scoring scale (1 – 7). Equally, the opposite applies to options which have a lower number of residential properties, where they are allocated a comparatively higher score.

In further defining the impact scoring, it is assessed that properties closer to the centreline of the corridor would have a comparatively higher probability of being potentially impacted by the Scheme when compared to properties at the outside edge of the route corridor. Therefore, for the purposes of this Stage 1 assessment, two. separate bands with associated weighting factors were applied:

- 0 – 50m from the centreline – Weighting Factor = 3.0
- 50-100m from the centreline – Weighting Factor = 2.0
- 100-200m from the centreline – Weighting Factor = 1.0

In relation to property types (Occupied, Derelict, Vacant, and Under construction) which were identified by GeoDirectory, it was considered that it was not appropriate to allocate additional separate weighting factors to these as the exact status would need to be confirmed through on-site verification and significant landowner liaison, which is not reasonably feasible at this stage of the scheme development.

Following the application of the weighting factor to the number of properties within the two bands, a Weighted Total (Number of Properties x Weighting Factor) was calculated for the two bands for each option. Thereafter, the weighted total of each was combined to provide an Overall Weighted Total. The Overall Weighted Total for each option was then used as the parameter to determine TII's PAG Unit 4.0 seven-point impact score for each option. The option with the highest Overall Weighted Total (i.e. highest weighted number of properties/greatest impact) was awarded a score of 1, the route with the lowest Overall Weighted Total was awarded a score of 7, and options with Weighted Totals in between were proportionally scored based on the difference between the highest and lowest Weighted Total. Further details on the scoring methodology is provided in Appendix B.

Following derivation of a 1-7 Score for both the Land Acquisition and Residential Building Acquisition sub-criterion, both criteria were added together to provide a combined score ('Element 1 & 2 Total'). Then, using the combined score, a final overall 1 – 7 was allocated to each option using the same max. and min. approach as described above (i.e. max combined score was awarded a score of 1, min. combined score was awarded a score of 1). Further details on the scoring methodology is provided in Appendix B.

5.3.12.2 Results and Conclusion

Table 5-12 below shows the performance matrix for the Land and Property Sub-Criterion. Further details on the scoring is provided in Appendix B.

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Routes	Element 1: Land Take		Element 2: Residential Property																		Element 1 & 2 Total (Scores)	Performance Score	Level of Impact
			Within 0 – 50m of the Centreline of the Corridor						Within 50 – 100m of the Centreline of the Corridor						Within 100 – 200m of the Centreline of the Corridor						Overall Weighted Total	Property Score			
	Area (Ha)	Land Score	Occupied	Derelict	Vacant	Under Construction	Total Count (Unfactored)	Weighted Total	Occupied	Derelict	Vacant	Under Construction	Total Count (Unfactored)	Weighted Total	Occupied	Derelict	Vacant	Under Construction	Total Count (Unfactored)	Weighted Total					
Brown	225.69	2	12	0	1	0	13	**39**	38	0	3	0	41	**82**	77	0	5	2	84	84	**205**	6	8	**3**	**Minor or Slightly Negative**
Cyan	201.97	3	10	0	0	0	10	**30**	36	0	2	0	38	**76**	74	0	1	3	78	78	**184**	6	9	**4**	**Not Significant or Neutral**
Yellow	111.72	7	55	0	2	0	57	**171**	114	0	5	4	123	**246**	162	0	12	0	174	174	**591**	1	8	**3**	**Minor or Slightly Negative**
Green	159.23	5	14	0	0	0	14	**42**	45	0	3	0	48	**96**	86	0	3	1	90	90	**228**	6	11	**6**	**Moderately Positive**
Purple	178.63	4	22	0	1	0	23	**69**	82	0	4	0	86	**172**	149	0	13	2	164	164	**405**	4	8	**3**	**Minor or Slightly Negative**
Orange	158.97	5	1	0	0	0	1	**3**	29	0	2	0	31	**62**	76	0	4	0	80	80	**145**	7	12	**7**	**Major or Highly Positive**
Yellow + Blue	123.48	6	44	0	3	0	47	**141**	115	0	4	3	122	**244**	155	0	12	1	168	168	**553**	2	8	**3**	**Minor or Slightly Negative**
Cyan + Yellow + Blue	154.66	5	33	0	1	0	34	**102**	90	0	2	2	94	**188**	142	0	12	3	157	157	**447**	3	8	**3**	**Minor or Slightly Negative**
Yellow + Purple	157.62	5	28	0	3	0	31	**93**	92	0	5	2	99	**198**	150	0	13	2	165	165	**456**	3	8	**3**	**Minor or Slightly Negative**
Purple + Yellow + Blue	147.60	5	38	0	1	0	39	**117**	103	0	3	3	109	**218**	154	0	12	1	167	167	**502**	2	7	**2**	**Moderately Negative**
Yellow + Cyan + Green	141.33	5	33	0	2	0	35	**105**	104	0	4	3	111	**222**	156	0	12	0	168	168	**495**	3	8	**3**	**Minor or Slightly Negative**
Yellow+ Purple + Green	155.94	5	25	0	3	0	28	**84**	90	0	4	2	96	**192**	154	0	13	2	169	169	**445**	3	8	**3**	**Minor or Slightly Negative**
Brown + Purple	234.00	1	12	0	1	0	13	**39**	50	0	1	0	51	**102**	98	0	2	3	103	103	**244**	5	6	**1**	**Major or Highly Negative**
Cyan + Yellow + Purple	192.11	3	17	0	1	0	18	**54**	67	0	3	1	71	**142**	137	0	13	4	154	154	**350**	4	7	**2**	**Moderately Negative**
Green + Cyan	172.29	4	17	0	0	0	17	**51**	37	0	4	0	41	**82**	78	0	3	2	83	83	**216**	6	10	**5**	**Minor or Slightly Positive**
Orange + Green 1	169.83	4	2	0	0	0	2	**6**	27	0	3	0	30	**60**	77	0	4	1	82	82	**148**	6	10	**5**	**Minor or Slightly Positive**
Orange + Green 2	171.55	4	1	0	0	0	1	**3**	30	0	3	0	33	**66**	79	0	2	0	81	81	**150**	6	10	**5**	**Minor or Slightly Positive**

Figure 5-12: Land & Property Performance Matrix

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5.3.13 Summary of Engineering Assessment

Main Criterion	Ref. No.	Engineering Sub-Criteria	Quantitative Assessment	Quantitative Assessment	Brown	Cyan	Yellow	Green	Purple	Orange	Yellow + Blue	Cyan+ Yellow + Blue	Yellow +Purple	Purple + Yellow + Blue	Yellow + Cyan + Green	Yellow + Purple + Green	Brown + Purple	Cyan + Yellow+ Purple	Green + Cyan	Orange + Green 1	Orange + Green 2
Engineering	1	**Traffic Assessment**	✖	✓ - See Section 5.3.1	2	5	7	7	7	5	7	7	7	7	7	7	1	7	6	6	5
	2	Technical Standards	Non-Applicable (N/A)	✓ - See Section 5.3.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	3	**Junction Strategy**	✖	✓ - See Section 5.3.3	3	3	4	5	6	5	4	6	5	7	7	5	1	5	5	5	4
	4	**Structures**	✖	✓ - See Section 5.3.4	3	2	4	5	5	4	5	4	6	6	7	5	1	3	5	4	4
	5	**Geology**	✖	✓ - See Section 5.3.5	5	2	2	6	2	7	2	2	3	2	2	3	2	1	3	6	6
	6	Groundwater	Non-Applicable (N/A)	N/A – See Section 5.3.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	7	**Earthworks**	✖	✓ - See Section 5.3.7	5	4	2	4	5	7	3	5	5	3	1	3	6	5	4	5	4
	8	**Road Safety Impact Assessment (RSIA)**	✖	✓ - See Section 5.3.8	4	4	2	6	3	7	2	3	1	4	3	1	5	4	4	6	6
	9	**Drainage**	✖	✓ - See Section 5.3.9	7	4	6	3	4	5	6	4	6	3	6	6	6	4	1	3	5
	10	**Construction**	✖	✓ - See Section 5.3.10	7	6	1	6	5	7	2	4	4	4	3	3	6	5	6	7	7
	11	**Service Conflicts**	✖	✓ - See Section 5.3.11	6	7	7	1	7	6	7	7	7	7	7	7	6	7	7	1	1
	12	**Land & Property**	✖	✓ - See Section 5.3.12	3	4	3	6	3	7	3	3	3	2	3	3	1	2	5	5	5
			Engineering Assessment Sub-Total Score (Raw)		**45**	**41**	**38**	**49**	**47**	**60**	**41**	**45**	**47**	**45**	**46**	**43**	**35**	**43**	**46**	**48**	**47**

Table 5-13: Stage 1 Engineering Assessment Performance Matrix Results

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5.4 Environment Assessment

The items to be considered in the Stage 1 (Preliminary Options Assessment) Environmental Appraisal are outlined in Appendix A2.4 of TII's PMM. These headings do not exactly match EIAR assessment topics and so for ease for reading TII's PMM Headings are compared with EIAR Heading in Table 5.14.

TII's PMM Headings	Associated EIAR Headings
Ecology	Biodiversity (Flora and Fauna)
Soils and Geology	Soils, Geology and Hydrogeology
Hydrogeology	Soils, Geology and Hydrogeology
Hydrology	Hydrology
Landscape and Visual	Landscape and Visual
Archaeological, Architectural and Cultural Heritage	Cultural Heritage
Material Assets – agricultural	Agriculture
Material Assets – non-agricultural	Non-Agricultural Properties Human Beings
Waste	Waste and Sustainability
Air Quality and Climate	Air Quality Climate
Noise and Vibration	Noise
Human Beings	Non-Agricultural Properties Human Beings
Inter-relationships	Interactions and Cumulative Effects

Table 5-14: TII's PMM Environment Sub-Criteria and EIAR Assessment Topics

After reviewing the TII's PMM and the approach to this particular scheme, it has been determined that the environmental assessment for the schemes will not include the PAG headings Waste and Human Beings. While these are important topics, it is considered that the relevant information is contained in other assessed headings and their inclusion would lead to "double counting" within the Environment Assessment. For example, the previous guidance on waste states that: "*All contaminated land including Landfills, Infilled quarries, Former industrial sites are considered under the heading of Waste*". These matters are fully addressed under the PMG (2019) heading of Soils and Geology. Similarly, information relating to Human Beings is addressed under the other assessed headings including Material Assets (Agricultural), Material Assets (Non-Agricultural), Noise, Landscape & Visual and Air Quality & Climate.

There can also be some apparent "double counting" of topics which are included in the Engineering and Environmental Assessment, such as Geology, and watercourse crossings, however the assessments consider different aspects of these topics. The Engineering Assessment primarily focuses on the logistical and engineering challenges to the presence of these features, where as they Environmental Assessment primarily focuses on the direct or indirect impacts associated with the disturbance or loss of this feature as an environmental resource.

A number of receptors have been identified under each subject heading for the purposes of this assessment; some of these are area features and others point features.

- *For area features - The percentage area of the feature covered by the route option (the 400m corridor).*
- *For point features – The number of features within the footprint of the route option (the 400m corridor) or if no features are within the footprint, the distance from the nearest feature will be considered where relevant.*

Each receptor will be discussed in more detail in the relevant section below.

It should be noted at this stage that only negative impacts are expected to be identified. Any interaction with the receptors identified will be expected to cause some level of disturbance to the receptor in the absence of mitigation.

All measurements where stated are taken from the centreline of the 400m corridor, unless otherwise stated.

In terms of the environmental comparative assessment of the Route Corridor Options, it is noted that all options were comparatively assessed against the Do-Nothing Option i.e. using the existing environment as the baseline.

5.4.1 Sub-Criterion 1 – Ecology

5.4.1.1 Sub-Criterion Element & Methodology

7 No. sub-criterion were selected for Ecology. The methodology for these elements is outlined below.

1) Ecology Sub-Criterion Element 1: European Designated Sites

The proximity to and/or degree of overlap between the proposed route and European sites (i.e. Special Areas of Conservation and Special Protection Areas) has been considered. It is important to also consider European sites that are in relatively close proximity and those with mobile species, i.e. not just those that overlap with the route. Distance from a designated site will not always rule out impact to the site and its designated features. Distance is an indicator only and the presence of mobile species (e.g. hen harriers with a range of 20 km) is also taken into consideration.

Due to effective routing, no route options overlap with European Designated Sites, therefore distance of the nearest site from the centreline is considered. The closer the sites are, the greater the negative impact, the lower the score.

2) Ecology Sub-Criterion Element 2: Nationally Designated Sites

Proximity to and/or degree of overlap between the proposed route and nationally designated sites (i.e. Natural Heritage Areas and proposed Natural Heritage Areas).

Due to effective routing, no route options overlap with Nationally Designated Sites, therefore distance of the nearest site from the centreline is considered. The closer the sites are, the greater the negative impact, the lower the score.

3) Ecology Sub-Criterion Element 2: Habitats of County Importance

Degree of overlap between the proposed route and habitats likely to be valued as being of at least county importance or higher (i.e. habitat information provided in NPWS data sets relevant to location, such as native/ancient and long-established woodlands and semi-natural grasslands).

4) Ecology Sub-Criterion Element 3: Habitats of Biodiversity Value

Degree of overlap between the proposed route and habitats likely to be of biodiversity value (i.e. woodlands, wetlands, heathland etc.). In absence of detailed habitat surveys at this route selection stage, a desktop review of aerial photography has been undertaken to determine potentially sensitive ecological habitat. This would generally be sites that is not improved agricultural fields or built ground.

5) Ecology Sub-Criterion Element 3: Number of Watercourse Crossings

Total number of watercourses to be crossed by a route. This has been based on the same dataset as the Structures heading assessment in the Engineering section of the report. The watercourses counted are based on those identified by the Environmental Protection Agency's Water Framework Directive assessments the Neagh-Bann, North-Western, Eastern River Basin Districts. In this way, field drainage ditches or sheughs are not counted and these would have significant biodiversity value. These smaller watercourses will be fully considered at a later stage of assessment.

6) Ecology Sub-Criterion Element 4: Proximity to Waterbodies

Number of waterbodies (lough, lakes, etc) proximity. Waterbodies were identified from the Environmental Protection Agency's Water Framework Directive assessments and aerial photography and mapping. These sites are measured in band from the centreline of the route corridor: <200 m, 200 – 500 m, 501 – 1000m.

7) Ecology Sub-Criterion Element 5: Proximity to Species of Conservation Concern

Proximity to any desktop records of species of conservation concern. This was be based again on NPWS datasets, such as those for freshwater pearl mussel, otter and other species as recorded by NPWS for the area of each route corridor.

5.4.1.2 Results

Table 5-15 below shows the performance matrix for the Ecology Sub-Criterion elements. Further details on the scoring is provided in Appendix B.

Options	Performance Score	Level of Impact
Brown	1	Major or Highly Negative
Cyan	2	Moderately Negative
Yellow	2	Moderately Negative
Green	2	Moderately Negative
Purple	2	Moderately Negative
Orange	2	Moderately Negative
Yellow + Blue	2	Moderately Negative
Cyan + Yellow + Blue	2	Moderately Negative
Yellow + Purple	2	Moderately Negative
Purple + Yellow + Blue	2	Moderately Negative
Yellow + Cyan + Green	2	Moderately Negative
Yellow+ Purple + Green	2	Moderately Negative
Brown + Purple	2	Moderately Negative

Options	Performance Score	Level of Impact
Cyan + Yellow + Purple	2	Moderately Negative
Green + Cyan	2	Moderately Negative
Orange + Green 1	2	Moderately Negative
Orange + Green 2	2	Moderately Negative

Table 5-15: Ecology Performance Matrix

For ecology, based on level of desktop information available at this stage, it is difficult to separate route options from each other. Each have a different set of potential risks and some are only hypothetical; further investigation may reveal these constraints to be benign. For example, the northern section of the blue route traverses a freshwater pearl mussel catchment, however there are no known records of the species from this catchment since 1970s and further analysis/surveys might reveal there are none at risk from the blue option. However, in the absence of knowing, we have conservatively assessed the blue option as Major Negative. Similarly, many options traverse karst aquifer, however this would only become a differentiating factor for ecology if there are ground water dependent terrestrial ecosystems within the zone of influence of route option, which at this point in time is unknown.

Many of the criteria examined under the heading of ecology are equally an issue across all routes and don't easily differentiate routes from each other e.g. proximity to Ramsar/SPAs/SACs (none of these sites are in particularly close proximity to any route options), number of watercourse crossings (similar issues for all routes) and number and proximity of lakes (similar issues for all routes). Bat issues are assumed to be equal across all options despite online options possibly affecting more structures but there is not enough information at this stage to differentiate route options.

All routes have been assessed as being Moderate Negative, aside from the Brown route option which is assessed as Major Negative due to the northern portion of this route option falling within Erne-Annalee Freshwater Pearl Mussel catchment. However as noted above there are no known records of the species from this catchment since 1970s and further analysis/surveys might reveal there are none at risk from the brown option, in which case this route might be assessed as Moderate Negative. This assessment rating of the route may change following further development of the scheme and more detailed assessment at the future Phases of this scheme.

The main defining criteria for ecology at this stage of the process are use of existing infrastructure (which is likely to have lower impacts than options through greenfield), proximity to the cluster of pNHAs around Carrickmacross, traversing the Erne-Annalee Freshwater Pearl Mussel catchment, and traversing karst aquifer. Some of these key defining criteria as relevant to the main route options include:

- **Cyan** – weaves through the cluster of pNHAs near Carrickmacross
- **Brown** – northern portion of this falls within Erne-Annalee Freshwater Pearl Mussel catchment. Note that the Brown + Purple option avoids this issue.
- **Green** – one of the few routes which does not traverse Karst aquifer
- **Purple** – although this comes in close proximity to the cluster of pNHAs near Carrickmacross, as this section is online the impacts may be lesser than the cyan option which goes through greenfield in this area.
- **Yellow** – an online route which might have significantly less impacts than a greenfield route, although may affect more structures which might have more impacts on bat roosts.
- **Orange** – one of the few routes which does not traverse Karst aquifer
- **Yellow + Blue** – a largely online route which might have significantly less impacts than a greenfield route, although may affect more structures which might have more impacts on bat roosts.

- **Cyan+ Yellow + Blue** – similar to Yellow and Yellow + Blue, it has substantial online sections which might have significantly less impacts than a greenfield route, although may affect more structures which might have more impacts on bat roosts. As it only uses the southern portion of cyan, it does not have the problem that full cyan route has of weaving through the cluster of pNHAs near Carrickmacross.
- **Yellow + Purple** - approximately half of this route is online which might have significantly less impacts than a greenfield route, although may affect more structures which might have more impacts on bat roosts. Although this comes in close proximity to the cluster of pNHAs near Carrickmacross, as this section is online the impacts may be lesser than the cyan option which goes through greenfield in this area.
- **Purple + Yellow + Blue** – this route has substantial online sections which might have significantly less impacts than a greenfield route, although may affect more structures which might have more impacts on bat roosts. Although this comes in close proximity to the cluster of pNHAs near Carrickmacross, as this section is online the impacts may be lesser than the cyan option which goes through greenfield in this area.
- **Yellow + Cyan + Green** - this route has substantial online sections which might have significantly less impacts than a greenfield route, although may affect more structures which might have more impacts on bat roosts. Although this comes in close proximity to the cluster of pNHAs near Carrickmacross, as this section is online the impacts may be lesser than the cyan option which goes through greenfield in this area.
- **Yellow + Purple +Green** - this route has substantial online sections which might have significantly less impacts than a greenfield route, although may affect more structures which might have more impacts on bat roosts. Although this comes in close proximity to the cluster of pNHAs near Carrickmacross, as this section is online the impacts may be lesser than the cyan option which goes through greenfield in this area.
- **Brown + Purple** - this avoids the Erne-Annalee Freshwater Pearl Mussel catchment and therefore avoids the potential impact which Blue has.
- **Cyan + Yellow + Purple** – this route does not have the benefits that yellow has as its online sections are relatively short, however it has the benefit of being online where it is in close proximity to the cluster of pNHAs near Carrickmacross and therefore the impacts may be lesser than the cyan option which goes through greenfield in this area.
- **Green + Cyan**– comes in proximity to the cluster of pNHAs near Carrickmacross but is preferable to cyan in that respect as it is further away from the pNHAs than cyan, unlike green does not avoid karst aquifer due to the switch onto cyan for its northern portion.
- **Orange + Green 1** – similar to orange and green, one of the few routes which does not traverse Karst aquifer.
- **Orange + Green 2** - similar to orange and green, one of the few routes which does not traverse Karst aquifer

5.4.2 Sub-Criterion 2 – Soils and Geology

5.4.2.1 Sub-Criterion Elements & Methodology

6 No. sub-criterion elements were selected under Soils and Geology. The methodology for these elements is outlined below.

The data for soils and geology is based on desktop information, which is an appropriate source of information for this level of assessment. The data has been gathered from information downloaded from the CORINE Land Cover mapping, GSI website, the Monaghan and Louth County Development Plans, EPA datasets and aerial photography. These sites were accessed in May 2019.

The TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes aim to provide guidance on the assessment of geological, hydrological and hydrogeological impacts during the planning and design of National Road schemes in Ireland. It expands on references to soil and water contained in the NRPMG's and specifically outlines the approach to be adopted in the consideration and treatment of geology, hydrology and hydrogeology at the Constraints Study, Route Corridor Selection and Preliminary Design/Environmental Impact Assessment phases. All construction projects, including national road schemes, are constructed in, or on, the geological environment. Road schemes have the potential to impact geological resources, geological heritage sites and areas dependent on geology for their functions. The impact assessment criteria in the MCA are the same as stated in the aforementioned Guidelines.

1) Soils and Geology Sub-Criterion Element 1: Peat

The percentage of 400m corridor that passes through Peat (Blanket Peat, Fen Peat, Cutover Peat) has been calculated. The CORINE Land Cover GIS layer has been used to determine this. The greater the percentage of the route with peat, the greater the negative impact, and so the lower the score.

2) Soils and Geology Sub-Criterion 2: Mines & Quarries

The number of mines and Quarries within 400m corridor. This has been done using aerial photography mapping and historical records from GSI. The possible future gold extraction sites at Tullybuck, Clontibret have been considered. The greater the interaction of the route with mines and quarries, the greater the negative impact, the lower the score.

3) Soils and Geology Sub-Criterion 3: Economic Deposits

The percentage of 400m corridor that passes through Economic Deposits (crushed rock, sand and gravel) has been calculated. This has been determined using GSI Aggregate Potential Mapping. The greater the interaction of the route with economic deposits, the greater the negative impact, the lower the score.

4) Soils and Geology Sub-Criterion 4: Contaminated Land

This includes a count of the number of contaminated land sites within the 400m route corridor. Contaminated land sites include landfills, infilled quarries and former industrial sites (as far as can be determined). This has been based on data from EPA Licensed Facilities dataset and data from Monaghan and Louth County Councils. The greater the interaction of the route with contaminated land, the greater the negative impact, the lower the score.

5) Soils and Geology Sub-Criterion 5: Karst Landforms

The percentage of 400m corridor that passes through karst landforms was calculated. This was based on GSO datasets. The greater the interaction of the route with karst landforms, the greater the negative impact, the lower the score.

6) Soils and Geology Sub-Criterion 6: Geological Heritage Sites

The percentage of 400m corridor that passes through Geological Heritage Sites was calculated. These sites were available from GIS datasets. The greater the interaction of the route with Geological Heritage Sites, the greater the negative impact, the lower the score.

5.4.2.2 Results

Table 5-16 below shows the performance matrix for the Soils and Geology Sub-Criterion. Further details on the scoring is provided in Appendix B.

Options	Performance Score	Level of Impact
Brown	2	Moderately Negative
Cyan	2	Moderately Negative
Yellow	2	Moderately Negative
Green	2	Moderately Negative
Purple	2	Moderately Negative
Orange	2	Moderately Negative
Yellow + Blue	2	Moderately Negative
Cyan + Yellow + Blue	2	Moderately Negative
Yellow + Purple	2	Moderately Negative
Purple + Yellow + Blue	2	Moderately Negative
Yellow + Cyan + Green	1	Major or Highly Negative
Yellow+ Purple + Green	2	Moderately Negative
Brown + Purple	1	Major or Highly Negative
Cyan + Yellow + Purple	2	Moderately Negative
Green + Cyan	2	Moderately Negative
Orange + Green 1	2	Moderately Negative
Orange + Green 2	2	Moderately Negative

Table 5-16: Soils and Geology Performance Matrix

The importance and sensitivity of each feature type was considered for Geology & Soils. For example, sand and gravel deposits are widely distributed in the surrounding area and likely to be available from other sources, so that loss of access locally is not considered to be of high importance. However, geological heritage sites and karst landforms are rarer and considered to be of higher individual importance, therefore loss of small numbers or area of features is considered to a negative impact.

There is limited differentiation between route options. All options generate Moderately Negative impacts, except for the Yellow+Cyan+Green and Blue + Purple options which are both rated as Major Negative. The Major Negative rating relates to the loss of karst landforms. All options generate Moderately Negative impacts related to loss of economic deposits (High/Very High crushed rock potential), with Moderately Negative impacts also related to impact on mines for some route options.

Overall Geology and Soils aspects do not suggest strong reasons to differentiate between proposed route options. There is a slight preference against the Yellow+Cyan+Green and Blue+Purple options as these could result in the loss of individual valued features (karst landforms). However, this may not be definitive as it could in practice be possible to preserve (or possibly provide enhanced access to) some of these features.

5.4.3 Sub-Criterion 3 – Hydrogeology

5.4.3.1 Sub-Criteria & Methodology

5 No. sub-criterion elements were selected under Hydrogeology. The methodology for these elements is outlined below.

The data for hydrogeology is based on desktop information, which is an appropriate source of information for this level of assessment. The data has been gathered from information downloaded from GSI website, the Monaghan and Louth County Development Plans, EPA datasets and aerial photography. These sites were accessed in May 2019.

The TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes gives references to soil and water contained in the NRPMG and specifically outlines the approach to be adopted in the consideration and treatment of geology, hydrology and hydrogeology at the Constraints Study, Route Corridor Selection and Preliminary Design / Environmental Impact Assessment phases. Road schemes have the potential to impact groundwater bodies and aquifers. The impact assessment criteria in the MCA are the same as stated in the TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

Assessment on the impact of each route option on groundwater aquifer vulnerability and Group Water Supply Zones e.g. length of the route option (the 400m corridor) within vulnerable aquifers or Group Water Supply Zones.

The overall score for Hydrogeology has been determined by considering the sub-criteria information. Collaboration has been undertaken between the Engineering assessment of this report and this hydrogeology section to ensure consistency without "double counting".

1) Hydrogeology Sub-Criterion Element 1: Vulnerable & Regionally Important Aquifers

The percentage of the 400m corridor that passes through regionally important aquifers has been calculated. Karstified bedrock (Rk), Fissured bedrock (Rf) and Extensive sand & gravel (Rg) have been considered using GSI groundwater mapping. Vulnerable and regionally important aquifers is identifying important aquifer bodies as a whole, including those that may be generally more susceptible to external impacts.

2) Hydrogeology Sub-Criterion Element 2: Sand & Gravel Aquifers

The percentage of the 400m corridor that passes through Sand & Gravel Aquifer has been calculated using GSI groundwater mapping.

3) Hydrogeology Sub-Criterion Element 3: Groundwater Vulnerability

Groundwater vulnerability is the susceptibility of the aquifer to pollution (from the surface); this may vary spatially across the aquifer depending on local conditions (mainly type and thickness of superficial deposits). This includes area identified as Extreme, High, Rock near surface or Karst. The percentage of the 400m corridor that passes through these areas has been calculated using GSI groundwater mapping.

4) Hydrogeology Sub-Criterion: Public Water Supply Protection Area (Inner & Outer)

This involves determining the percentage of the 400m corridor within the Inner and Outer Protection Areas using datasets based on information from GSI and the local councils.

5.4.3.2 Results

Table 5-17 below shows the performance matrix for the Hydrogeology Sub-Criterion. Further details on the scoring is provided in Appendix B.

Options	Performance Score	Level of Impact
Brown	1	Major or Highly Negative
Cyan	2	Moderately Negative
Yellow	2	Moderately Negative
Green	1	Major or Highly Negative
Purple	2	Moderately Negative
Orange	1	Major or Highly Negative
Yellow + Blue	2	Moderately Negative
Cyan + Yellow + Blue	2	Moderately Negative
Yellow + Purple	2	Moderately Negative
Purple + Yellow + Blue	1	Major or Highly Negative
Yellow + Cyan + Green	2	Moderately Negative
Yellow+ Purple + Green	2	Moderately Negative
Brown + Purple	2	Moderately Negative
Cyan + Yellow + Purple	2	Moderately Negative
Green + Cyan	1	Major or Highly Negative
Orange + Green 1	2	Moderately Negative
Orange + Green 2	2	Moderately Negative

Table 5-17: Hydrogeology Performance Matrix

The majority of routes have received a Moderate Negative score with five routes recording Major Negative impacts on the sub criterion listed above. The interactions with Sand and Gravel Aquifer, Groundwater Vulnerability and Group Water Schemes or Public & Group Supply Source Protection Areas between routes did not vary considerably, therefore predicted negative impacts relate to widely distributed groundwater / aquifer features which may not be practicable to avoid.

The Brown, Green, Orange, Purple+Yellow+Blue and Green+Cyan options are rated as Major Negative. All other options generate Moderately Negative impacts. The Major Negative impacts are all generated by the degree of incursion of the route options onto areas of groundwater vulnerability (Extreme, High, Rock near surface or Karst). Across all route options, Moderately Negative impacts are generated by incursion of the routes onto areas of groundwater vulnerability and incursion onto vulnerable and regionally important aquifer types.

5.4.4 Sub-Criterion 4 – Hydrology

5.4.4.1 Sub-Criterion Elements & Methodology

1 No. sub-criterion element was selected under Hydrology. The methodology for this element is outlined below.

The TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes is also the basis for measuring hydrology impact in the MCA. Road schemes have the potential to significantly affect surface water bodies such as rivers, lakes/ponds, estuaries and reservoirs. In particular construction of a road scheme may affect the flood response of a catchment or alter the established drainage pattern.

The impact assessment criteria in the MCA are informed by the Hydrology sections within the TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. The Guidelines refer to specific criteria for the Phase 2 – 4 assessments, therefore a high-level approach to Phase 2 requirements has been adopted which includes; Surface Water Features, Flooding, and Public Water Supplies. Flooding and Public Water Supplies have been assessed previously in the Engineering Assessment, therefore, to avoid double counting the Hydrology appraisal involves an assessment on the impact of each route option (the 400m corridor) on surface water bodies only.

1) Hydrology Sub-Criterion Element 1: Water Quality – Waterbody Crossings

It can be assumed that standard mitigation can avoid impacts such as construction run-off on waterbodies in close proximity to works, therefore only direct water body crossings are being considered. Due to the range in sensitivities of water bodies, this category has been banded to add weighting to more sensitive waterbodies. The banding is as follows:

- Good and High status WFD Water bodies;
- Moderate / Poor / Bad status WFD Water bodies;
- Other water bodies, field ditches and drains.

A much lower number of crossings of Good or High status WFD waterbodies is required to result in Major Negative impact scoring as they are considered to be more sensitive to change than Medium, Poor and Bad WFD waterbodies, and non-WFD water bodies, field ditches or drains.

The EPA river network GIS dataset has been used to identify water bodies.

5.4.4.2 Results

Table 5-18 below shows the performance matrix for the Hydrology Sub-Criterion. Further details on the scoring is provided in Appendix B.

Options	Performance Score	Level of Impact
Brown	3	Minor or Slightly Negative
Cyan	2	Moderately Negative
Yellow	3	Minor or Slightly Negative
Green	3	Minor or Slightly Negative
Purple	3	Minor or Slightly Negative
Orange	3	Minor or Slightly Negative
Yellow + Blue	3	Minor or Slightly Negative
Cyan + Yellow + Blue	2	Moderately Negative
Yellow + Purple	3	Minor or Slightly Negative
Purple + Yellow + Blue	3	Minor or Slightly Negative
Yellow + Cyan + Green	3	Minor or Slightly Negative
Yellow+ Purple + Green	3	Minor or Slightly Negative
Brown + Purple	2	Moderately Negative
Cyan + Yellow + Purple	2	Moderately Negative
Green + Cyan	3	Minor or Slightly Negative
Orange + Green 1	3	Minor or Slightly Negative

Options	Performance Score	Level of Impact
Orange + Green 2	3	Minor or Slightly Negative

Table 5-18: Hydrology Performance Matrix

In relation to Hydrology, the importance and sensitivity of each feature type was considered. For example, field ditches and drains are widely distributed in the surrounding area and the sensitivity of these receptors is considered to be relatively low, so crossings of these types of water bodies are not considered to be of high importance. However, WFD water bodies are considered to be of much higher individual importance, particularly Good or High Status WFD water bodies. Therefore, impacts of small numbers of Good or High Status water bodies is considered to a negative impact compared to Medium, Poor or Bad status waterbodies and undesignated waterbodies.

The majority of route corridors are considered to have Minor Negative impacts on Hydrology aspects as illustrated in Table 5-16. Those 4 routes which have received Moderate Negative score have received these scores due to crossing what is considered to be a number of WFD water bodies or a high number of undesignated water bodies / field ditches and drains; routes with over 7 crossings of Good or High Status water bodies, and or 10 or more crossings of Medium, Poor or Bad Status water bodies were given a Moderate Negative impact.

5.4.5 Sub-Criterion 5 – Landscape and Visual

5.4.5.1 Sub-Criterion Elements & Methodology

5 No. sub-criterion elements were selected under Landscape and Visual. The methodology for these elements is outlined below.

The data for landscape and visual is based on desktop information, which is an appropriate source of information for this level of assessment. The data has been gathered from information downloaded from CORINE land cover mapping, NPWS and the Department of Culture, Heritage and the Gaeltacht websites, the national Landscape Character Assessment, the Monaghan and Louth County Development Plans, and aerial photography. These sites were accessed in May 2019.

Assessment on the potential impacts the route options may have on the physical landscape/townscape and visual environments. The analysis identifies and examines important / sensitive landscape which are vulnerable to changes to the landscape character as well as the locations of sensitive visual receptors relative to the proposed development which may have the potential to be negatively affected by visual changes.

1) Landscape & Visual Sub-Criterion Element 1: Areas of 'Very High Landscape'

Areas of 'Very High Landscape' are determined with reference to Guidelines for Landscape and Visual Impact Assessments (GLVIA) and TII guidelines - *Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis* (PE-PAG-02031-01 October 2016.) Table 7.1.1 in this document states:

"A landscape or townscape protected by an international or national designation (Special Area Amenity Order (SAAO), candidate Special Area of Conservation (cSAC), proposed Natural Heritage Area (pNHA), etc.). A landscape widely acknowledged for its distinctive features and the quality and value of its elements and edge condition. A landscape with distinctive character and low capacity to accommodate change. Absence of negative elements, e.g. traffic, noise, dereliction, unmanaged areas, etc. Landscape types to include but not limited to: - Historical townscapes and urban set pieces; - Nationally important open spaces and parkland."

The number of such landscape were calculated within the following bands: <200 m, 200 m – 1.2 km and 1.2 km – 2.2 km. The distance larger than the 400 m route corridor was to allow the consideration of views.

2) Landscape & Visual Sub-Criterion Element 2: Historic Designated Landscapes

Demesne landscapes, stately properties with designed landscapes / gardens or other locations of social / cultural heritage value. The numbers of these sites were measured in bands from the centreline. <200 m, 200 – 700 m, 700 m – 1.2 km.

3) Landscape & Visual Sub-Criterion Element 3: Designated Scenic Routes / Views (County Development Plans)

Designated scenic routes / views sourced from County Development Plans. These are likely to be elevated and / or offer long distance, open or panoramic views hence the buffer for these extends to 2200m from the centreline of the route corridors. The numbers of these sites were measured in bands from the centreline. <700 m, 700 m – 1.2 km, 1.2 km – 2.2 km.

4) Landscape & Visual Sub-Criterion Element 4: Amenity / Recreational and Heritage Views

This is where receptors (people) are involved in outdoor or touristic activities and are likely to be highly attuned to their surroundings including National Waymarked Ways (walking routes), other walking trails, cycle routes, golf courses, parks, recreational woodlands etc. There is a high possibility that these locations will be elevated and / or offer long distance, open or panoramic views, hence the buffer for these extends to 2200m. The numbers of these sites were measured in bands from the centreline. <700 m, 700 m – 1.2 km, 1.2 km – 2.2 km.

5) Landscape & Visual Sub-Criterion: Towns and Villages

This includes centres of population where there is a high proportion of receptors. Settlements are less likely to be situated in visually exposed locations such as mountain tops, cliff edges or headlands, etc. so the buffer is smaller than that which will be used for other visual receptors. (Analysis of individual dwellings and corresponding buffers will be examined at a later point once the route corridors have been refined.) The numbers of these sites were measured in bands from the centreline. <700 m, 700 m – 1.2 km, 1.2 km – 1.7 km.

5.4.5.2 Results

The importance sensitivity of each landscape feature type was considered in this assessment. For example, impacts on scenic views and amenity and heritage views are widely distributed in the surrounding area so that loss locally is not considered to be of high importance. However, Historic Designated Landscapes and Highly Sensitive Landscapes such as specific Landscape Character Areas, Areas of Primary Amenity Value and European Designated sites such SAC and SPA are rarer and considered to be of higher individual importance, therefore loss of small area of such features is considered to a negative impact. Not only were landscape feature types weighted but the proximity of receptors to the route corridors were banded and distance bands closer to the route corridor were given higher weighting.

The desktop study indicates that none of the route options pass within a Highly Sensitive Landscape so no 'Major Negative' results in that regard. There are several designated scenic routes and views that occur within the route corridor of a number of route options however, it is assumed that these would be avoided in so far as possible during the design stages so it is likely that 'Major Negative' impacts could be avoided (roads tend to result in visual intrusion rather than visual obstruction). Table 5-19 below shows the performance matrix for the Landscape and Visual Sub-Criterion. Further details on the scoring is provided in Appendix B.

Options	Performance Score	Level of Impact
Brown	3	Minor or Slightly Negative
Cyan	2	Moderately Negative
Yellow	3	Minor or Slightly Negative
Green	3	Minor or Slightly Negative
Purple	2	Moderately Negative
Orange	3	Minor or Slightly Negative
Yellow + Blue	3	Minor or Slightly Negative
Cyan + Yellow + Blue	2	Moderately Negative
Yellow + Purple	2	Moderately Negative
Purple + Yellow + Blue	2	Moderately Negative
Yellow + Cyan + Green	3	Minor or Slightly Negative
Yellow+ Purple + Green	3	Minor or Slightly Negative
Brown + Purple	3	Minor or Slightly Negative
Cyan + Yellow + Purple	2	Moderately Negative
Green + Cyan	3	Minor or Slightly Negative
Orange + Green 1	3	Minor or Slightly Negative
Orange + Green 2	3	Minor or Slightly Negative

Table 5-19: Landscape and Visual Performance Matrix

For Landscape & Visual aspects the results ranged from Moderate Adverse to Neutral. The differentiation between route options is based on a high-level assessment of proximity to sensitive landscape and visual receptors to each route option and hence the probability of adverse impacts. Routes with higher probability for potential adverse impacts were rated as Moderate and those with lower potential were rated as either Minor Adverse or Neutral. Neutral represents the least risk of adverse impacts from the range of route options.

The following route option were categorised as Moderate Adverse as they all showed higher risk of generating impacts on both sensitive landscapes and on sensitive visual receptors:

- Cyan
- Purple
- Cyan+Yellow+Blue
- Yellow+Purple
- Purple+Yellow+Blue
- Cyan+Yellow+Purple

5.4.6 Sub-Criterion 6 – Archaeological, Architectural, and Cultural Heritage

5.4.6.1 Sub-Criterion Elements & Methodology

TII have produced a set of guidelines called the TII Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes and the Guidelines for the Assessment of Archaeological Impacts of National Road Schemes. The aim of this document is to provide guidance on the assessment of architectural heritage impacts and archaeological impacts during the planning and design of National Road schemes in Ireland. It specifically outlines the approach to be adopted in the assessment of architectural heritage at the Constraints Study, Route Corridor Selection and Preliminary Design / Environmental Impact Assessment phases. The impact assessment criteria in the MCA are the same as stated in the Guidelines as adapted from the EPA Guidelines on Information to be contained in Environmental Impact Statements (March 2002) and updated versions.

The datasets have come from the Monaghan and Louth County Development Plans, the Department of Culture, Heritage and the Gaeltacht website and aerial photography. These sites were accessed in May 2019.

2 No. sub-criterion elements were selected under Archaeological, Architectural, and Cultural Heritage.

1) Archaeological, Architectural, and Cultural Heritage Sub-Criterion Element: RMP / SMR / National Monuments

A receptor which is closer to the route corridor is more likely to be impacted by the proposed project, and the magnitude of the impact is also likely to be greater. Therefore, this category has been banded to add weighting to closer receptors. The banding is as follows:

- No. of RMP / SMR / National Monuments within <25m
- No. of RMP / SMR / National Monuments within 25 – 200m
- No. of RMP / SMR / within 200 – 500m

A much lower number of interactions with these receptors within 25m of the corridor is required to result in Major Negative impact scoring as they are considered to be more sensitive to change than those 25 – 200 and 200 - 500. The band 25 – 200m represents receptors which are within the corridor and may require some re-routing or mitigation to reduce impacts. The band 200 – 500m represent receptors which are within close proximity to the route and impacts to setting could arise.

2) Archaeological, Architectural, and Cultural Heritage Sub-Criterion Element: RPS / NIAH/ Demesne

Similarly, a receptor which is closer to the route corridor is more likely to be impacted by the proposed project, and the magnitude of the impact is also likely to be greater. Therefore, this category has been banded to add weighting to closer receptors. The banding is as follows:

- No. of Record of Protected Structures (RPS) / National Inventory of Architectural Heritage (NIAH) / Demesne within <25m
- No. of RPS / NIAH / Demesne within 25 – 200m
- No. of RPS / NIAH / Demesne 200m – 500m

A much lower number of interactions with these receptors within 25m of the corridor is required to result in Major Negative impact scoring as they are considered to be more sensitive to change than those 25 – 200 and 200 - 500.

5.4.6.2 Results

Table 5-20 below shows the performance matrix for the Archaeological, Architectural, and Cultural Heritage Sub-Criterion. Further details on the scoring is provided in Appendix B.

Options	Performance Score	Level of Impact
Brown	1	Major or Highly Negative
Cyan	1	Major or Highly Negative
Yellow	3	Minor or Slightly Negative
Green	1	Major or Highly Negative
Purple	1	Major or Highly Negative
Orange	1	Major or Highly Negative
Yellow + Blue	2	Moderately Negative
Cyan + Yellow + Blue	1	Major or Highly Negative
Yellow + Purple	2	Moderately Negative
Purple + Yellow + Blue	1	Major or Highly Negative
Yellow + Cyan + Green	2	Moderately Negative
Yellow+ Purple + Green	1	Major or Highly Negative
Brown + Purple	1	Major or Highly Negative
Cyan + Yellow + Purple	1	Major or Highly Negative
Green + Cyan	1	Major or Highly Negative
Orange + Green 1	1	Major or Highly Negative
Orange + Green 2	1	Major or Highly Negative

Table 5-20: Archaeological, Architectural, and Cultural Heritage Performance Matrix

For cultural heritage, Major Negative impacts can be predicted for the Cyan, Brown, Green, Purple, Orange, Cyan+Yellow+Blue, Purple+Yellow+Blue, Yellow+Purple+Green, Brown+Purple, Cyan+Yellow+Purple, Green+Cyan, Orange+Green1 and Orange+Green2 routes. The Major Negative rating relates to the potential direct and/or indirect impacts on Recorded Monuments, Protected Structures and their curtilages, and incursion onto historic demesnes. These routes all potentially impact two or more Recorded Monuments or Protected Structures. However, this may not be definitive as it could be possible in practice to avoid or reduce some of these impacts during the design, though this could be more difficult where constraints occur in clusters and/or cover large areas.

The Yellow+Blue, Yellow+Purple and Yellow+Cyan+Green options are likely to generate Moderately Negative impacts. These routes have comparatively fewer potential direct and/or indirect impacts on Recorded Monuments, Protected Structures and their curtilages, and on historic demesnes. However, impacts on unrecorded archaeological sites and other currently unknown cultural heritage assets cannot be accurately quantified at this stage. There is the potential to impact previously unrecorded archaeology, particularly in undeveloped greenfield areas and areas of high archaeological potential, which means that the actual impact on cultural heritage could be much higher than currently predicted.

The Yellow route is predicted to generate Minor Negative impacts on known cultural heritage sites. No Recorded Monuments or Protected Structures would be directly impacted by this route, and because the option is mostly on the line of the existing road there is less risk of encountering unrecorded archaeology.

5.4.7 Sub-Criterion 7 – Material Assets – Agricultural

5.4.7.1 Sub-Criterion Elements & Methodology

3 No. sub-criterion elements were selected under Archaeological, Architectural, and Cultural Heritage. The methodology for these elements is outlined below.

The impact on agriculture is one of the most significant impacts of road schemes due to the largely rural nature of green field schemes. The degree to which a new road affects an agricultural property depends on a number of issues such as:

- The type of farm enterprises carried out;
- Farm size;
- Land take;
- The degree of severance with mitigation;
- Viability; and
- Removal of buildings and / or facilities.

1) Material-Assets – Agricultural Sub-Criterion: Agricultural Land

The percentage of agricultural land within each option route (400m corridor) was calculated. This was be based on the length of the corridor passing through agricultural land as identified on the CORINE landcover report 2012.

All of the route options will have a negative impact on agriculture because of land take, severance, and disturbance. The majority of the land for all route options is classified as agricultural land.

The proposed route options all pass through productive agricultural land with impacts on farm holdings or individual land parcels. The land quality appears to be good quality land with some areas of poor quality land but in the main the land quality is considered good. Most of the land is in grassland however there are some intensive tillage operations within the scheme study area. All of the main farming enterprises beef, sheep, tillage, and dairy are found throughout the study area.

2) Material-Assets – Agricultural Sub-Criterion Element 1: Existing Farm Facilities

A high level desktop review of the route options using the ortho-photography mapping. This involved a count of the number of farm buildings / yards/ farm roadways/ animal handling facilities within the footprint of each route.

3) Material-Assets – Agricultural Sub-Criterion Element 2: Existing Sensitive Farms

A high level desktop review of the route options using the ortho-photography mapping. This involved a count of the number of sensitive farm enterprises such as dairy farms, equine farms and horticultural operations (Mushroom facilities) and pig/poultry operations and assessing the impact on farm facilities and farm buildings.

Dairy farms are considered sensitive because of the impact land take may have on the viability of the operation, e.g. reduction in the grazing area leading to a reduction in cow numbers and disturbance to access etc dairy herds require twice daily access to the milking parlour during the grazing season, impact on existing farm infrastructure paddocks, roadways, water systems etc.

Equine farms are considered sensitive because horses are sensitive to noise and some equine enterprises may contain high value stock and have extensive facilities e.g. stables, gallops that cannot be easily re-organised.

Pig/Poultry/ Horticultural Operations are considered sensitive because they have extensive buildings which would not be easily reorganised and are usually operated very intensively. Biosecurity would be a big concern for these enterprises.

5.4.7.2 Results

Table 5-21 below shows the performance matrix for the Material Assets - Agricultural Sub-Criterion. Further details on the scoring is provided in Appendix B.

Options	Performance Score	Level of Impact
Brown	1	Major or Highly Negative
Cyan	1	Major or Highly Negative
Yellow	2	Moderately Negative
Green	2	Moderately Negative
Purple	2	Moderately Negative
Orange	2	Moderately Negative
Yellow + Blue	2	Moderately Negative
Cyan + Yellow + Blue	1	Major or Highly Negative
Yellow + Purple	2	Moderately Negative
Purple + Yellow + Blue	1	Major or Highly Negative
Yellow + Cyan + Green	2	Moderately Negative
Yellow+ Purple + Green	1	Major or Highly Negative
Brown + Purple	1	Major or Highly Negative
Cyan + Yellow + Purple	1	Major or Highly Negative
Green + Cyan	2	Moderately Negative
Orange + Green 1	2	Moderately Negative
Orange + Green 2	2	Moderately Negative

Table 5-21: Material Assets – Agricultural Performance Matrix

The majority of the land in both study areas is classified as agricultural land. The proposed route options all pass through productive agricultural land with impacts on farm holdings or individual land parcels. The land quality appears to be good quality land with some areas of poor quality land but in the main the land quality is considered good. Most of the land is in grassland however there are some intensive tillage operations located in the Ardee to Castleblayney scheme. All of the main farming enterprises beef, sheep, tillage, and dairy are found throughout the study area.

The majority of the routes impact on farm buildings however many of these range from derelict sheds, storage sheds to hay barns to silage slabs. However, the Major Negative classification has been allocated to routes where sensitive farm operations have been identified and are impacted. Sensitive farm operations include:

- Equine farms because horses are sensitive to noise and some equine enterprises may contain high value stock and have extensive facilities e.g. stables, gallops that cannot be easily reorganised; and
- Pig/Poultry/ Horticultural Operations because they have extensive buildings which would not be easily reorganised and are usually operated very intensively. Biosecurity would be a big concern for these enterprises.

The majority of sensitive farm operations encountered are intensive dairy farms. There are very few equine farms located within the study area (approx. 10) and there are a number of intensive poultry/pig/ horticultural operations along with large intensive dairy operations.

5.4.8 Sub-Criterion 8 – Material Assets – Non-Agricultural

5.4.8.1 Sub-Criterion Elements & Methodology

2 No. sub-criteria were selected under Material Assets – Non-Agricultural. The methodology for these elements is outlined below.

All affected properties and types of land classed as commercial, recreational, open space, minerals and public facilities (hospitals, schools, and religious institutions) which are not of an agricultural nature are considered under the heading of Non-Agricultural Properties. The impact assessment criteria adopted in the MCA are adapted from the EPA Guidelines on Information to be contained within Environmental Impact Statements (March 2002) and updated versions.

1) Material-Assets – Non-Agricultural Sub-Criterion Element 1: Community Assets - Existing Properties

Community Asset includes schools, churches, sports clubs, community halls/centres, hospitals/nursing homes/GP surgery, tourism/accommodation, entertainment (e.g. cinema) and shopping areas)

Community Assets within 200m of the centreline of the route option were calculated. However, Community Assets within 500m of the route boundary could also be impacted and therefore were included.

Community Assets have been identified using ortho-photographic mapping and driving surveys.

2) Material-Assets – Non-Agricultural Sub-Criterion Element 2: Community Assets – Existing Greenways, Cycle Routes and Walkways

Intersections with (within 400m corridor) Greenways, Cycle Routes and Walking Routes.

5.4.8.2 Results

Table 5-22 below shows the performance matrix for the Material Assets- Non-Agricultural Sub-Criterion. Further details on the scoring is provided in Appendix B.

Options	Performance Score	Level of Impact
Brown	3	Minor or Slightly Negative
Cyan	3	Minor or Slightly Negative
Yellow	3	Minor or Slightly Negative
Green	4	Not Significant or Neutral
Purple	3	Minor or Slightly Negative
Orange	3	Minor or Slightly Negative

Options	Performance Score	Level of Impact
Yellow + Blue	2	Moderately Negative
Cyan + Yellow + Blue	2	Moderately Negative
Yellow + Purple	3	Minor or Slightly Negative
Purple + Yellow + Blue	2	Moderately Negative
Yellow + Cyan + Green	3	Minor or Slightly Negative
Yellow+ Purple + Green	3	Minor or Slightly Negative
Brown + Purple	3	Minor or Slightly Negative
Cyan + Yellow + Purple	3	Minor or Slightly Negative
Green + Cyan	3	Minor or Slightly Negative
Orange + Green 1	4	Not Significant or Neutral
Orange + Green 2	4	Not Significant or Neutral

Table 5-22: Material Assets – Non-Agricultural Performance Matrix

The majority of routes were considered to have Minor Negative impacts on Material Assets (Non-Agricultural) with the remainder receiving Neutral or Moderate Negative scores. No routes intersect with major community infrastructure such as cycle routes, walking routes or greenways therefore those routes therefore the differentiator has been the number community assets intersected or within 500m of the centreline of the route corridor. Those routes that have received a neutral score encounter very few or zero community assets within these ranges.

Those routes that have scored Moderate Negative involved some part of route Yellow +Blue which involves partial realignment of the existing N2 around St Patrick's Nursery School and St Patrick's Church in Broomfield. This has the potential for negative impacts as these properties will be located between the existing N2 and the new route alignment and St Patrick's Nursery School is particularly close to the new alignment.

5.4.9 Criterion 9 – Air Quality and Climate

5.4.9.1 Sub-Criterion Elements & Methodology

2 No. sub-criterion elements were selected under Air Quality and Climate. The methodology for these elements is outlined below.

The TII Guidelines on the Treatment of Air Quality during the Planning and Construction of National Road Schemes (May 2011) should be referred to in completing the air quality and climate assessment.

Stage 1: Preliminary Options Assessment: For Stage 1 the existing local air quality conditions in relation to nitrogen dioxide and Particulate Matter 10µm (PM_{10}) should be described including any non-road sources that may significantly affect air quality. Previous air quality studies and granted planning permissions within the study area should also be considered. This will be a qualitative statement. Sensitive receptors within 50m of the carriageway of each option should be identified and recorded. This will be a quantitative statement.

The number of receptors sensitive to air quality within 50m of each of the proposed route corridors has been determined based on the GeoDirectory dataset. Receptors for the purpose of this preliminary assessment are regarded as any buildings with the exception of non-residential farm buildings and buildings known to be solely for commercial use. At this stage of the assessment no further distinction is made between different types of property. For the purpose of this assessment, granted planning permissions have been included in the assessment through their inclusion in the GeoDirectory data.

The potential impact of the proposed route corridors on ambient NOx concentrations at sensitive ecosystems (European designated sites) within 200m of the route centrelines has also been considered when comparing the routes from an air quality perspective.

For the purpose of the preliminary assessment of route corridors, comparison of the proposed routes with the existing N2 alignment has not been considered. Each proposed route corridor is considered as a proposed new road which will have a potentially negative impact on air quality at receptors within 50m of its proposed alignment and at designated sites within 200m of the alignment. In reality, all proposed route corridors will impact a lower number of sensitive receptors when compared to the existing N2 and therefore, all route options are preferable from an air quality perspective.

1) Air Quality and Climate Sub-Criterion Element 1: Sensitive Receptors

The location of dwellings was determined based on the GeoDirectory dataset. The number of dwellings were counted within 0 - 50 m of the centreline of each route corridor.

2) Air Quality and Climate Sub-Criterion Element 2: Nitrogen sensitive habitats

These were counted with 200 m of the centreline of each route corridor based on each NPWS datasets.

5.4.9.2 Results

Table 5-23 below shows the performance matrix for the Air Quality and Climate Sub-Criterion. Further details on the scoring is provided in Appendix B.

Options	Performance Score	Level of Impact
Brown	3	Minor or Slightly Negative
Cyan	2	Moderately Negative
Yellow	2	Moderately Negative
Green	3	Minor or Slightly Negative
Purple	3	Minor or Slightly Negative
Orange	3	Minor or Slightly Negative
Yellow + Blue	2	Moderately Negative
Cyan + Yellow + Blue	2	Moderately Negative
Yellow + Purple	2	Moderately Negative
Purple + Yellow + Blue	2	Moderately Negative
Yellow + Cyan + Green	2	Moderately Negative
Yellow+ Purple + Green	2	Moderately Negative
Brown + Purple	3	Minor or Slightly Negative
Cyan + Yellow + Purple	2	Moderately Negative
Green + Cyan	3	Minor or Slightly Negative
Orange + Green 1	3	Minor or Slightly Negative

Options	Performance Score	Level of Impact
Orange + Green 2	3	Minor or Slightly Negative

Table 5-23: Air Quality & Climate Performance Matrix

The is a limited differentiation between route options from an air quality and climate perspective. All options are anticipated to generate Minor Negative or Moderate Negative impacts on air quality and climate. For routes rated as Moderate Negative, these routes are within 200m of an ecologically sensitive ecosystem[13]. There was no significant differentiation amongst the route options with regard to the impact on air sensitive receptors within 50m of each route. All route options are predicted to impact a relatively low number of air sensitive receptors.

Overall, air quality and climate aspects do not provide strong justification to differentiate between the proposed route options. There is a slight preference for the route options rated as Minor Negative in terms of potential impacts rather than those marked as Moderate Negative as the former routes do not have the potential to impact air quality at ecologically sensitive ecosystems.

5.4.10 Sub-Criterion 10 – Noise and Vibration

5.4.10.1 Sub-Criterion Elements & Methodology

1 No. sub-criterion element was selected under Noise and Vibration.

The TII Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 25th October 2004 and the Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes March 2014 should be referred to in completing the noise assessment.

Stage 1 Preliminary Options Assessment: For Stage 1 any receptors deemed to be particularly sensitive to noise and/or vibration should be identified along with characteristics of the prevailing noise climate and opportunities for noise mitigation e.g. as a result of favourable topography. This will be a qualitative statement based on the GeoDirectory dataset.

1) Noise and Vibration Sub-Criterion Element: Sensitive receptors

The location of dwellings was determined based on the GeoDirectory dataset. The number of dwellings were counted within 0 - 50 m, 50 – 100 m and 100 – 200 m of the centreline of each route corridor.

5.4.10.2 Results

Table 5-24 below shows the performance matrix for the Noise and Vibration Sub-Criterion. Further details on the scoring is provided in Appendix B.

Options	Performance Score	Level of Impact
Brown	2	Moderately Negative
Cyan	2	Moderately Negative
Yellow	1	Major or Highly Negative

[13] Including some Nitrogen Sensitive Ecosystems as defined in the TII Air Quality Guidelines: Sites which will be considered include, Natural Heritage Areas (NHA), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar Sites and where the information is available Wildfowl Sanctuaries, National Parks, Nature Reserves.

Options	Performance Score	Level of Impact
Green	2	Moderately Negative
Purple	1	Major or Highly Negative
Orange	2	Moderately Negative
Yellow + Blue	1	Major or Highly Negative
Cyan + Yellow + Blue	1	Major or Highly Negative
Yellow + Purple	2	Moderately Negative
Purple + Yellow + Blue	1	Major or Highly Negative
Yellow + Cyan + Green	1	Major or Highly Negative
Yellow+ Purple + Green	1	Major or Highly Negative
Brown + Purple	1	Major or Highly Negative
Cyan + Yellow + Purple	2	Moderately Negative
Green + Cyan	2	Moderately Negative
Orange + Green 1	2	Moderately Negative
Orange + Green 2	2	Moderately Negative

Table 5-24: Noise and Vibration Performance Matrix

There is a limited differentiation between route options from a noise perspective. All options are anticipated to generate Moderate Negative or Major Negative noise impacts. More detailed noise assessment will be required at later phases of the scheme to determine the precise impacts and the need for mitigation. Those routes with significantly more properties have been assessed to be Major Negative because of the potential for a greater level of impacts.

5.4.11 Sub-Criterion 11 – Human Beings

Further to reviewing the TII's PMM and the approach to this particular project, it has been determined that the environmental assessment for the scheme will not include the PMM heading of Human Beings. While these are important topics, it is considered that the relevant information is contained in other assessed headings and their inclusion would lead to "double counting". Information relating to Human Beings is addressed under the other assessed headings: Landscape and Visual; Material Assets – agricultural; Material Assets – non-agricultural; Air Quality and Climate; and, Noise and Vibration.

Therefore, as outlined in Section 5.1, this Sub-Criterion is notated as non-applicable (N/A) in the performance matrix and is not included in the scoring system in order to avoid "double counting" due to relevant receptors such as properties and community assets being considered as part of Air Quality & Climate, Landscape & Visual, Noise, Material Assets (Agricultural) and Material Assets – Non-Agricultural. Human Beings will be considered in further detail at Stage 2.

5.4.12 Sub-Criterion 12 – Waste

Further to reviewing the TII's PMM and the approach to this particular project, it has been determined that the environmental assessment for the schemes will not include the TII's PMM headings of Waste. While these are important topics, it is considered that the relevant information is contained in other assessed headings and their inclusion would lead to "double counting". For example, the previous guidance on waste states that: "*All contaminated land including Landfills, Infilled quarries, Former industrial sites are considered under the heading of Waste*". These matters are fully addressed under the Sub-Criterion of Soils and Geology.

Therefore, as outlined in Section 5.1, this Sub-Criterion is notated as non-applicable (N/A) in the performance matrix and is not included in the scoring system in order to avoid "double counting" due to relevant receptors such as properties and community assets being considered as part of Air Quality & Climate, Landscape & Visual, Noise, Material Assets (Agricultural) and Material Assets – Non-Agricultural. Human Beings will be considered in further detail at Stage 2.

5.4.13 Sub- Criterion 13 – Interactions and Cumulative Effects (Interrelationships Considerations)

Topics with interactions will be identified with a **x** in the Table 5-25 below. The potential for interacting effects has been considered within each environmental assessment topic. At this stage of assessment, it has been determined that to a scoring table for interactions and cumulative effects could be considered double counting of the above scores and it has not been provided.

Therefore, as outlined in Section 5.1, this Sub-Criterion is notated as non-applicable (N/A) in the performance matrix and is not included in the scoring system.

	Ecology	Soils and Geology	Hydrogeology	Hydrology	Landscape and Visual	Architectural, Archaeological and Cultural Heritage	Material Assets - agricultural	Material Assets – non-agricultural	Air Quality and Climate	Noise and Vibration
Ecology		X	X	X	X			X	X	X
Soils and Geology			X	X	X	X				
Hydrogeology				X	X					
Hydrology					X					
Landscape and Visual						X		X		
Architectural, Archaeological and Cultural Heritage										
Material Assets - agricultural										
Material Assets – non-agricultural									X	X
Air Quality and Climate										
Noise and Vibration										

Table 5-25: Interactions and Cumulative Effects Performance Matrix

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5.4.14 Summary of Environment Assessment

Main Criterion	Ref. No.	Environment Sub-Criteria	Qualitative Assessment	Quantitative Assessment	Brown	Cyan	Yellow	Green	Purple	Orange	Yellow + Blue	Cyan + Yellow + Blue	Yellow + Purple	Purple + Yellow + Blue	Yellow+ Cyan+ Green	Yellow+ Purple + Green	Brown + Purple	Cyan+ Yellow+ Purple	Green + Cyan	Orange + Green 1	Orange + Green 2
Environment	1	Ecology	✘	✓ - See Section 5.4.1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	2	Soils and Geology	✘	✓ - See Section 5.4.2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	2	2	2
	3	Hydrogeology	✘	✓ - See Section 5.4.3	1	2	2	1	2	1	2	2	2	1	2	2	2	2	1	2	2
	4	Hydrology	✘	✓ - See Section 5.4.4	3	2	3	3	3	3	3	2	3	3	3	3	2	2	3	3	3
	5	Landscape and Visual	✘	✓ - See Section 5.4.5	3	2	3	3	2	3	3	2	2	2	3	3	3	2	3	3	3
	6	Archaeological, Architectural, and Cultural Heritage	✘	✓ - See Section 5.4.6	1	1	3	1	1	1	2	1	2	1	2	1	1	1	1	1	1
	7	Material assets – Agricultural	✘	✓ - See Section 5.4.7	1	1	2	2	2	2	2	1	2	1	2	1	1	1	2	2	2
	8	Material assets – Non-Agricultural	✘	✓ - See Section 5.4.8	3	3	3	4	3	3	2	2	3	2	3	3	3	3	3	4	4
	9	Air Quality and Climate	✘	✓ - See Section 5.4.9	3	2	2	3	3	3	2	2	2	2	2	2	3	2	3	3	3
	10	Noise and Vibration	✘	✓ - See Section 5.4.10	2	2	1	2	1	2	1	1	2	1	1	1	1	2	2	2	2
	11	Human Beings	N/A (See Section 5.4.11)																		
	12	Waste	N/A (See Section 5.4.12)																		
	13	Interrelationship Considerations	N/A (See Section 5.4.13)																		
		Environment Assessment Sub-Total Score (Raw)			**20**	**19**	**23**	**23**	**21**	**22**	**21**	**17**	**22**	**17**	**21**	**20**	**19**	**19**	**22**	**24**	**24**

Table 5-26: Stage 1 Environment Assessment Performance Matrix Results

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5.5 Economy Assessment

5.5.1 Introduction

The sub-criterion for the Stage 1 Economy Assessment is a comparative assessment of the Stage 1 Option Comparison Estimate (OCE) for each route corridor option. The OCE for each route corridor option is based on the Level 2 Cost Estimate Template as per the TII Cost Management Manual (2010).

Copies of the OCE, using TII's CMM Level 2 Cost Estimate for each route corridor option, along with an overarching assumptions sheet which is applicable to all options is provided in Appendix C of this Report.

5.5.2 Methodology

As per the TII's CMM Level 2 Cost Estimate, the OCE comprises of a Total (incl. VAT) of the following items:

1) Main Contract Construction
2) Land and Property
3) Planning and Design
4) Archaeology
5) Advance Works and Other Contracts
6) Main Contract Supervision
7) Residual Network
8) Project Specific Risk Contingency

5.5.2.1 Main Contract Construction

The Main Contract Construction (MCC) costs comprise of the main works items including site clearance, fencing, safety barriers, drainage, preliminaries, earthworks, roadworks, main carriageways, interchanges and junctions, side roads, structures, signage, kerbing, road markings and accommodation works as well as the ancillary works such as lighting and landscaping. The works for statutory authorities and utilities are also included.

For each Stage 1 Route Corridor Option a Level 2 cost estimate has been prepared in accordance with the TII Cost Management Manual (2010) and the *PAG Unit 6.2 – Preparation of Scheme Costs (October 2016)*. These cost estimates have been developed based on key component quantities obtained from the working indicative alignments prepared to inform the Route Corridor Option selection process. Key quantities that have been used for the purposes of these cost estimates include detailed cut and fill earthworks and pavement areas obtained from the indicative horizontal and vertical alignments.

Mid-range rates from the *TII Schedule of Rates 2019 (Base Date March 2019)* have been used throughout. These rates have been supplemented by current market rates where no relevant TII rates were available from the TII Schedule of Rates 2019.

For each route option, Preliminaries are estimated at 15% of the MCC Cost. These percentages are considered appropriate based on industry norms and the current stage of the scheme development.

Further details on the assumptions used for estimating the MCC Costs are provided in the Assumptions Sheet in Appendix C.

5.5.2.2 Land and Property

As per TII PAG Unit 6.2, Land and Property Costs shall account for all payments for land and property including acquisitions costs, legal transaction costs, property management costs and resale value of surplus land and property.

Land and property rates for each route option have been derived from previous land acquisition costs in Co. Monaghan. Previous scheme land acquisition costs for the N2 Phase 3 Monaghan to Emyvale and the N54 Tullybryan to Annaghervey road schemes were made available by Monaghan County Council and were in the region of €40,000 to €60,000 per acre.

Cost estimates for Land and Property were calculated based on the total area of the construction footprint. A rate of €50,000 per acre was used.

The number of properties affected within the route option corridor have been calculated using the GeoDirectory Building Points database (Q2 2019). These have been cross referenced against a manual check of the routes using the aerial imagery basemap on the ArcGIS online ProjectMapper.

Prices for residential properties in Co. Monaghan have been derived from the Property Price Register 2018 and 2019, published by the Property Services Regulatory Authority. An average price of €147,000 has been provided from this source. For the purposes of this cost estimate, an average residential property price of €150,000 was used, in addition to a nominal value of €50,000 to cover for legal transaction costs, property management costs, and other miscellaneous compensation costs (i.e. disturbance, etc.). Thereby, providing a total cost per property of €200,000. An assumption of 50% of €200,000 (i.e. €100,000) was used as the basis for a value for derelict properties. It is noted the exact value of individual properties and associated compensation will be assessed by a valuer on a case by case basis if a property is to be acquired.

5.5.2.3 Planning and Design

As defined in TII PAG Unit 6.2, Planning and Design Costs *'include the fees payable to those involved in developing the project up to construction stage. These include costs associated with design, planning, public consultation and oral hearing, in addition to costs of any surveys carried out during the scheme preparation'.*

In the context of the PAG Definition above, it is considered that Planning and Design Costs are defined as previously incurred and estimated future costs required for the delivery of the Scheme from TII's PMG Phase 0 (Scope and Pre-Appraisal) to the end of Phase 4 (Statutory Processes). Both design/procurement/supervision related costs and direct contractor related costs in the delivery of TII PMG Phase 5 (Enabling and Procurement) is covered under Advance Works and Other Contracts (See Section 5.5.2.5 below). Costs from the end of Phase 5 (i.e. including TII's PMG Phases 6 and 7) are covered under Main Contract Supervision (See Section 5.5.2.6).

Planning and Design Costs include costs related to feasibility studies, constraints studies, route selection, preliminary design, land acquisition mapping for CPO and oral hearing. Planning and design costs take account of Local Authority and NRDO costs which are directly related to the project, and consultant fee estimates which are required for the delivery of TII's PMG Phases 0 to 4.

The cost estimate for Planning and Design has been calculated based on a lump sum cost for each route option. This lump sum of €4,433,555 was based on current industry consultancy costs for Phases 1 to 4 and includes a lump sum cost to include for Local Authority and NRDO costs.

5.5.2.4 Archaeology

Archaeology costs include any direct payments to archaeological consultants or contractors engaged to carry out archaeological investigations and/or excavations.

Cost estimates for Archaeology have been calculated based on the National Secondary Road Needs Study (NSRNS) rate of €0.13M per Km for a Type 1 single carriageway factored up to approximately €0.15M per Km for a Type 2 dual carriageway. This rate per Km has been adopted for each route corridor option.

5.5.2.5 Advance Works and Other Contracts

TII PAG Unit 6.2 defines Advance Works and Other Contracts Costs as costs associated with *'all works required prior to execution of Main Contract'.*

In the context of the PAG Definition above, it is considered that Advance Works and Other Contracts Costs are the estimated future costs required for the delivery of TII's PMG Phase 5 (Enabling and Procurement) for the Scheme.

As the procurement strategy for the Main Contract Construction is yet to be identified, for the purposes of this Stage 1 OCE, it is assumed that the Main Contract Construction will be delivered through a traditional Design and Build procurement strategy. The Advance Works and Other Contracts Cost for this Stage 1 OCE accounts for this approach.

In relation to advance/enabling works, the costs include for works which are typically undertaken on road schemes during TII PMG Phase 5, as identified in TII's PMM:

- *'Service diversions / fencing / hedge clearing;*
- *Environmental; including the management of noxious weeds and non-native invasive alien plant species;*
- *Topographical proof survey (including accuracy and tolerance requirements, particularly at road tie-ins, structures, and watercourses); and*
- *Additional ground investigations. '*

The Advance Works and Other Contracts Costs take account of direct costs for undertaking these works, as well as Local Authority and NRDO costs which are directly related to the project, and consultant fee estimates which are required for the delivery of TII's PMG Phase 5.

The cost estimate for Advance Works and Other Contracts Cost has been calculated based on a percentage of 2.5% of the Main Contract Construction Cost for each route option. This percentage is considered appropriate based on industry norms and the current stage of the scheme development.

5.5.2.6 Main Contract Supervision

TII PAG Unit 6.2 defines Main Contract Supervision Costs as *'those associated with the costs of site staff acting on behalf of the client, together with the back office support.'*

In the context of the PAG Definition, it is considered that Main Contract Supervision Costs are estimated future costs required for the delivery of TII's PMG Phases 6 (Construction and Implementation) and 7 (Close-Out and Review) excluding the Main Contract Construction Cost.

It is considered that Local Authority and WNRO costs, which are directly related to the project, as well as consultant fees, would apply.

The cost estimate for Main Contract Supervision Cost has been calculated based on a percentage of 3.5%of the Main Contract Construction Cost for each route option. This percentage was based on a high-level approximate estimate for the execution of Phases 6 and 7 on this Scheme. This percentage is considered appropriate based on industry norms and the current stage of the scheme development.

5.5.2.7 Residual Network

Residual Network costs include those associated with upgrading of/or remedial works to the local roads network and any other minor works that may be necessary as a result of the main contract.

The cost estimate for Residual Network has been calculated based on a percentage of 1% of the Main Contract Construction Cost for Options which are generally nearer to large urban settlements, which have a relatively higher quality of existing local road network in their surrounding environs. A higher percentage of 2% was adopted to options, which are further away from large urban settlements and have a relatively lower quality of existing local road network in their surrounding environs.

These percentages are based on industry norms and considered appropriate for the current stage of the scheme development.

5.5.2.8 Project Specific Risk Contingency

The Level 2 Cost Estimates at this stage are a combination of elemental and unit cost estimating based on the level of detail available from the Stage 1 route options. As such, a degree of project specific risk contingency has been provided as part of the Level 2 cost estimates. For each route option this percentage of risk contingency has been set at 15%. This percentage is considered appropriate based on industry norms and the current stage of the scheme development.

5.5.2.9 Cost Exclusions

In accordance with the TII's CMM (2010) and the TII PAG Unit 6.2, the Stage 1 OCEs have been prepared using the Level 2 Estimate Summary and the Back-Up template (Appendix C of the CMM).

These Level 2 costs estimates have estimated the core cost elements (inclusive of VAT) and appropriate project specific risk contingency in respect of these elements. However, as per the TII's CMM, the Stage 1 OCEs are exclusive of allowance for future inflation to the completion of the project. The Stage 1 OCEs, as per TII's CMM, are also exclusive of any programme level contingency or programme risk which cover any exceptional items occurring. Both inflation and programme risk will be included at Phase 2.

As per Cl. 2.1.2.7.3 of TII's PMM, it is not typically required, nor is it feasible for this scheme, to undertake a Cost Benefit Analysis (CBA) for Stage 1. As per Section 2.1 of this report, and PAG Units 4.0 and 7.0, a CBA will be undertaken on the Stage 2 Corridor Options and will inform the Stage 2 appraisal process and the Phase 2 Preliminary Business Case. The Stage 1 OCEs are limited to construction and delivery costs only.

5.5.2.10 Performance Scoring

The option with the highest OCE was awarded a score of 1, the route with the lowest OCE was awarded a score of 7, and options with OCEs in between were proportionally scored based on the difference between the highest and lowest OCE. Further details on the scoring methodology is provided in Appendix B.

5.5.3 Results

Table 5-27 below shows the performance matrix for the Economic Assessment Criterion. Further details on scoring is provided in Appendix B.

Option	Option Comparison Cost	Performance Score	Level of Impact
Brown	€ 284,810,426.79	2	Moderately Negative
Cyan	€ 263,458,367.77	3	Minor or Slightly Negative
Yellow	€ 213,153,952.94	6	Moderately Positive
Green	€ 221,213,317.70	5	Minor or Slightly Positive
Purple	€ 251,815,982.84	4	Not Significant or Neutral
Orange	€ 200,216,678.42	7	Major or Highly Positive
Yellow + Blue	€ 217,234,723.26	6	Moderately Positive
Cyan + Yellow + Blue	€ 229,363,405.85	5	Minor or Slightly Positive
Yellow + Purple	€ 245,753,584.91	4	Not Significant or Neutral
Purple + Yellow + Blue	€ 222,718,379.77	5	Minor or Slightly Positive
Yellow + Cyan + Green	€ 252,382,171.92	4	Not Significant or Neutral
Yellow+ Purple + Green	€ 257,234,705.18	3	Minor or Slightly Negative
Brown + Purple	€ 294,159,171.67	1	Major or Highly Negative
Cyan + Yellow + Purple	€ 254,206,477.30	4	Not Significant or Neutral
Green + Cyan	€ 241,170,677.45	4	Not Significant or Neutral
Orange + Green 1	€ 216,683,656.54	6	Moderately Positive
Orange + Green 2	€ 218,710,449.60	6	Moderately Positive

Table 5-27: Stage 1 Economy Assessment Performance Matrix

5.6 Summary of Combined Stage 1 Assessment

5.6.1 Introduction

The methodology and assessment for each of the 12 No. Sub-Criteria of Engineering for each option is outlined in Sections 5.3.1 to 5.3.12. Further to the assessment, it was identified that 2 of 12 No. Sub-Criteria were non-applicable at this stage of the option selection process and did not contribute the overall performance score. A summary of the results of the 10 No. Sub-Criteria is provided in Section 5.3.13.

The methodology and results for each of the 13 No. Sub-Criteria of Environment for each option is outlined in Sections 5.4.1 to 5.4.13. Further to the assessment, it was identified that 3 of 13 No. Sub-Criteria were non-applicable at this stage of the route selection process and did not contribute to the overall performance score. A summary of the results of the 10 No. Sub-criteria is provided in Section 5.4.14.

The sub-criterion for the Stage 1 Economy Assessment is a comparative assessment of the Stage 1 Option Cost Estimate (OCE) for each route corridor option. The OCE for each route corridor option is based on the Level 2 Cost Estimate Template as per the TII Cost Management Manual (2010). The methodology and results for the Economy Assessment is outlined in Sections 5.5.1 to 5.5.3 and Appendix C.

5.6.2 Combined Stage 1 Results

As per Section 5.1 of this report, Stage 1 Feasible Route Corridor Options, as outlined in the previous section of this Report, were assessed in accordance with TII's PAG Unit 7.0 – Multi Criteria Analysis PE-PAG-02031 (October 2016) and TII's PMM.

As part of the Multi Criteria Analysis, a performance matrix is used as a tool to determine and show how each option performs against the set of Main Criteria and Sub-Criteria. As part of the performance matrix, a scoring system is established to assign an impact level ('*Highly Positive*' to *'Highly Negative'*) to a particular option against the defined Main Criteria and Sub-Criteria, following the completion of a quantitative or qualitative assessment of these criteria. As per TII PAG Unit 7.0, each impact level is then assigned a performance score based on a seven-point scale (i.e. *'7 – Highly Positive, '1 – Highly Negative'*).

Each sub-criterion has been assessed to provide a score of 1 to 7 for each Route Corridor Option, with the Criteria of Engineering providing scores against a total of 10 Sub-Criteria, Environment providing scores against a total of 10 sub-criteria, and Economy providing as a score against 1 No. Sub-Criteria.

Table 5-27 below shows the Stage 1 Overall Assessment Performance Matrix Results for the Engineering, Environment and Economy criteria. This table shows the Total Scores achieved by each of the Route Corridor Options against these three criteria. The 'raw score' is the total score achieved through adding the individual 1 to 7 scores of each of the sub-criteria, as presented in the summary tables at the end of each of the three assessments. These scores were then expressed as a mark out of 100 under each of the Main Criteria of Engineering, Environment and Economy to ensure an overall balanced scoring approach.

In the case of Environment, although the full PAG Unit 7.0 seven-point scale was available for the purposes of this assessment, it was determined that all impacts associated with the environmental Sub-Criteria lay within the Neutral (Performance Score of 4) to Highly Negative (Performance Score of 1) band, when compared with the existing (Do-Nothing/Baseline) situation. Hence, the total performance scores for Environment are lower when compared with the total performances scores for Engineering (Section 8.4 above) and Economy (Section 8.5 below). However, it is highlighted that differentiation was determined between the options as part of the environmental assessment, which is reflected in the varying performance scores across the options, and hence this aligns with the overarching purpose/principle of the comparative assessment.

Tables 5-28, 5-29 and 5-30 below have been prepared following the Stage 1 Assessment.

Ref. No.	Route Corridor Option	Engineering		Environment		Economy		Total Score (out of 300)	Maximum Score Available
		Raw Score	Marks (out of 100)	Raw Score	Marks (out of 100)	Raw Score	Marks (out of 100)		
1	Brown	45	64	20	29	2	29	122	300
2	Cyan	41	59	19	27	3	43	129	300
3	Yellow	38	54	23	33	6	86	173	300
4	Green	49	70	23	33	5	71	174	300
5	Purple	47	67	21	30	4	57	154	300
6	Orange	60	86	22	31	7	100	217	300
7	Yellow + Blue	41	59	21	30	6	86	175	300
8	Cyan + Yellow + Blue	45	64	17	24	5	71	159	300
9	Yellow + Purple	47	67	22	31	4	57	155	300
10	Purple + Yellow + Blue	45	64	17	24	5	71	159	300
11	Yellow + Cyan + Green	46	66	21	30	4	57	153	300
12	Yellow+ Purple + Green	43	61	20	29	3	43	133	300
13	Brown + Purple	35	50	19	27	1	14	91	300
14	Cyan + Yellow + Purple	43	61	19	27	4	57	145	300
15	Green + Cyan	46	66	22	31	4	57	154	300
16	Orange + Green 1	48	69	24	34	6	86	189	300
17	Orange + Green 2	47	67	24	34	6	86	187	300
	Max Available Marks		**100**		**100**		**100**	**300**	

Table 5-28: Stage 1 Overall Assessment Performance Matrix Results (Engineering, Environment, & Economy) of Route Corridor Options

Route Corridor Option	Overall Performance Score (Expressed as Marks out of 300)	Ranking Order
Orange	217	**1**
Orange + Green 1	189	**2**
Orange + Green 2	187	**3**
Yellow + Blue	175	**4**
Green	174	**5**
Yellow	173	**6**
Cyan + Yellow + Blue	159	**7**
Purple + Yellow + Blue	159	**7**
Yellow + Purple	155	**9**
Green + Cyan	154	**10**
Purple	154	**10**
Yellow + Cyan + Green	153	**12**
Cyan + Yellow + Purple	145	**13**
Yellow + Purple + Green	133	**14**
Cyan	129	**15**
Brown	122	**16**
Brown + Purple	91	**17**

Table 5-29: Stage 1 Assessment Performance Matrix – Ranking of Options

Rank	Engineering	Environment	Economy	Overall
1	Orange	Orange + Green 1	Orange	Orange
2	Green	Orange + Green 2	Yellow	Orange + Green 1
3	Orange + Green 1	Yellow	Orange + Green 1	Orange + Green 2
4	Purple	Green	Orange + Green 2	Yellow + Blue
5	Yellow + Purple	Yellow + Purple	Yellow + Blue	Green
5	Orange + Green 2	Orange	Green	Yellow
7	Yellow + Cyan +Green	Green + Cyan	Purple + Yellow + Blue	Cyan + Yellow + Blue
8	Green + Cyan	Yellow + Blue	Cyan + Yellow + Blue	Purple + Yellow + Blue
9	Purple + Yellow + Blue	Yellow + Cyan + Green	Green + Cyan	Yellow + Purple
10	Cyan + Yellow + Blue	Purple	Purple	Green + Cyan
11	Brown	Yellow + Purple + Green	Yellow + Purple	Purple
12	Cyan + Yellow + Purple	Brown	Cyan + Yellow + Purple	Yellow + Cyan + Green
13	Yellow + Purple + Green	Brown + Purple	Yellow + Cyan + Green	Cyan + Yellow + Purple
14	Yellow + Blue	Cyan	Cyan	Yellow + Purple + Green
15	Cyan	Cyan +Yellow+ Purple	Yellow + Purple + Green	Cyan
16	Yellow	Cyan + Yellow + Blue	Brown	Brown
17	Brown + Purple	Purple + Yellow + Blue	Brown + Purple	Brown + Purple

Table 5-30: Stage 1 Assessment Performance Matrix – Trends

6. Conclusion & Recommendation

As outlined in Section 2 of this report and in TII's PMM 'all reasonable / feasible options (Including Do-Nothing, 'Do-Minimum and Traffic Management Alternatives)' are to be considered, developed and assessed for the Stage 1 Assessment (Preliminary Options Assessment). The conclusion of the Stage 1 Assessment is to result in a reduced number of options ('*Do-Nothing or Do-Minimum, and a least three Do-Something Options') being taken forward to Stage 2 Assessment (Project Appraisal Matrix*).

As per Section 3 of this report, the Do-Nothing, Do-Minimum, Do-Something Alternative – Public Transport and the Traffic Management Option have been defined and assessed as part of the Stage 1 assessment. At this current stage, all of these Options/Alternatives, as solutions, have been discounted. Notwithstanding this Stage 1 determination, these Options/Alternatives will be further considered and assessed as part of Stage 2.

A total of 17 No. Stage 1 Feasible Route Corridors Options were developed for the N2 Ardee to Castleblayney Road Scheme. As outlined in Section 5 of this report, each Route Corridor Option was assessed under the defined Main Criteria of Engineering, Environment and Economy as well as a list of defined Sub-Criteria as identified in advance of undertaking the Stage 1 Performance Matrix. Upon completion of the performance matrix, the Route Corridor Options with the highest performance scores, and hence lowest impact, were ranked accordingly (See Table 5-29 of this Report).

As per the above, TII's PAG Unit 4.0 advises that a *minimum* of three route corridor options are to be taken forward to Stage 2. It does not prescribe a maximum number. Though, it is noted that TII's 2010 PMG provides guidance in this regard: '*..carry out a Preliminary Options Assessment using a Framework Matrix (comprising the assessment criteria of Engineering, Environment and Economy). This will result in the number of route options being refined to a maximum of 3 – 5'.*

Considering the PAG Guidance of a minimum of three options, in the case of the N2 Ardee to Castleblayney Road Scheme, two of the three top-ranked options (i.e. Orange + Green 1 and Orange and Green 2), were both combinations of the Green and Orange Options. Therefore, in order to broaden the assessment for Stage 2, it was considered prudent to expand past the minimum threshold of three options.

Furthermore, in the case of the N2 Ardee to Castleblayney Road Scheme, as there was a relatively significant separation distance in terms of overall performance scores between 6th ranked option (Yellow) and 7th ranked option (Cyan+Yellow+Blue), it is was recommended to progress the top 6 ranked options, as opposed to 5, to the Stage 2 Assessment (Project Appraisal Matrix).

The Stage 1 Route Corridor Options selected for progression to Stage 2 are listed below and shown on Drawing Ref. No. N2-JAC-HWG-A2C-DR-OS-0005 in Appendix A.

1) **Orange (Ranked 1st)**
2) **Orange + Green 1 (Ranked 2nd)**
3) **Orange + Green 2 (Ranked 3rd)**
4) **Yellow + Blue (Ranked 4th)**
5) **Green (Ranked 5th)**
6) **Yellow (Ranked 6th)**

Appendix A. Feasible Route Option Corridors Drawings (Refer to Volume 2 – Drawings; Part A- Route Corridor Drawings)

Ref. No.	Drawing Ref. No.	Drawing Title	Revision No.
1	N2-JAC-HWG-A2C-DR-OS-0001	Study Area – Main Layout Plan	R0
2	N2-JAC-HWG-A2C-DR-OS-0002	Stage 1 Route Corridor Options – Main Layout Plan	R0
3	N2-JAC-HWG-A2C-DR-OS-0003	Stage 1 Amalgamated Route Corridor Options (Sheet 1 of 2)	R0
4	N2-JAC-HWG-A2C-DR-OS-0004	Stage 1 Amalgamated Route Corridor Options (Sheet 2 of 2)	R0
5	N2-JAC-HWG-A2C-DR-OS-0005	Stage 2 Route Corridor Options - Main Layout Plan (Note: Stage 1 Route Corridor Options Progressing to Stage 2)	R0

Note: All drawings can be found in Volume 2 (Drawings)

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Appendix B. Overall Stage 1 Performance Matrix

Ref. No.	Title	Revision No.
1	Overall Summary	R0
2	Environment Summary	R0
3	Economics Summary	R0
4	Engineering Summary	R0
5	Supporting Information on Engineering & Environment Sub-Criteria	R0

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Overall Summary

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Stage 1 Assessment Summary

Route	Scheme Length (km)	% Offline	Engineering Marks	Economics Marks	Environmental Marks	Total	Overall Rank
Brown	35.38	95	64	29	29	122	16
Cyan	32.66	90	59	43	27	129	15
Yellow	31.16	3	54	86	33	173	6
Green	29.755	85	70	71	33	174	5
Purple	31.62	65	67	57	30	154	10
Orange	30.29	95	86	100	31	217	1
Yellow + Blue	31.15	15	59	86	30	175	4
Cyan + Yellow + Blue	31.975	45	64	71	24	159	7
Yellow + Purple	30.985	40	67	57	31	155	9
Purple + Yellow + Blue	31.79	45	64	71	24	159	7
Yellow + Cyan +Green	31.02	25	66	57	30	153	12
Yellow + Purple + Green	31.085	35	61	43	29	133	14
Brown + Purple	35.76	90	50	14	27	91	17
Cyan + Yellow + Purple	31.805	75	61	57	27	145	13
Green + Cyan	31.185	85	66	57	31	154	10
Orange + Green 1	30.055	95	69	86	34	189	2
Orange + Green 2	30.43	95	67	86	34	187	3

Stage 1 Assessment Summary

Rank	Engineering	Economics	Environmental	Overall
1	Orange	Orange	Orange + Green 1	Orange
2	Green	Yellow	Orange + Green 2	Orange + Green 1
3	Orange + Green 1	Orange + Green 1	Yellow	Orange + Green 2
4	Purple	Orange + Green 2	Green	Yellow + Blue
5	Yellow + Purple	Yellow + Blue	Yellow + Purple	Green
6	Orange + Green 2	Green	Orange	Yellow
7	Yellow, Cyan, Green	Purple + Yellow + Blue	Green + Cyan	Cyan + Yellow + Blue
8	Green + Cyan	Cyan & Yellow + Blue	Yellow + Blue	Purple + Yellow + Blue
9	Purple + Yellow + Blue	Green + Cyan	Yellow + Cyan +Green	Yellow + Purple
10	Cyan + Yellow + Blue	Purple	Purple	Green + Cyan
11	Brown	Yellow + Purple	Yellow + Purple + Green	Purple
12	Cyan, Yellow, Purple	Cyan, Yellow, Purple	Brown	Yellow + Cyan +Green
13	Yellow, Purple, Green	Yellow, Cyan, Green	Brown + Purple	Cyan + Yellow + Purple
14	Yellow + Blue	Cyan	Cyan	Yellow + Purple + Green
15	Cyan	Yellow, Purple, Green	Cyan + Yellow + Purple	Cyan
16	Yellow	Brown	Cyan + Yellow + Blue	Brown
17	Brown + Purple	Brown & Purple	Purple + Yellow + Blue	Brown + Purple

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Environment Results				
Route	**Length**	**% Offline**	**Marks**	**Rank**
Orange + Green 1	30.055	95	34	1
Orange + Green 2	30.43	95	34	1
Yellow	31.16	3	33	3
Green	29.755	85	33	3
Yellow + Purple	30.985	40	31	5
Orange	30.29	95	31	5
Green + Cyan	31.185	85	31	5
Yellow + Blue	31.15	15	30	8
Yellow + Cyan +Green	31.02	25	30	8
Purple	31.62	65	30	8
Yellow + Purple + Green	31.085	35	29	11
Brown	35.38	95	29	11
Brown + Purple	35.76	90	27	13
Cyan	32.66	90	27	13
Cyan + Yellow + Purple	31.805	75	27	13
Cyan + Yellow + Blue	31.975	45	24	16
Purple + Yellow + Blue	31.79	45	24	16

Enconomics Results				
Route	**Length**	**% Offline**	**Marks**	**Rank**
Orange	30.29	95	100	1
Yellow	31.16	3	86	2
Orange + Green 1	30.055	95	86	2
Orange + Green 2	30.43	95	86	2
Yellow + Blue	31.15	15	86	2
Green	29.755	85	71	6
Purple + Yellow + Blue	31.79	45	71	6
Cyan & Yellow + Blue	31.975	45	71	6
Green + Cyan	31.185	85	57	9
Purple	31.62	65	57	9
Yellow + Purple	30.985	40	57	9
Cyan, Yellow, Purple	31.805	75	57	9
Yellow, Cyan, Green	31.02	25	57	9
Cyan	32.66	90	43	14
Yellow, Purple, Green	31.085	35	43	14
Brown	35.38	95	29	16
Brown & Purple	35.76	90	14	17

Engineering Results				
Route	**Length**	**% Offline**	**Marks**	**Rank**
Orange	30.29	95	86	1
Green	29.755	85	70	2
Orange + Green 1	30.055	95	69	3
Purple	31.62	65	67	4
Yellow + Purple	30.985	40	67	4
Orange + Green 2	30.43	95	67	4
Yellow, Cyan, Green	31.02	25	66	7
Green + Cyan	31.185	85	66	7
Purple + Yellow + Blue	31.79	45	64	9
Cyan + Yellow + Blue	31.975	45	64	9
Brown	35.38	95	64	9
Cyan, Yellow, Purple	31.805	75	61	12
Yellow, Purple, Green	31.085	35	61	12
Yellow + Blue	31.15	15	59	14
Cyan	32.66	90	59	14
Yellow	31.16	3	54	16
Brown + Purple	35.76	90	50	17

Overall Results				
Route	**Scheme Length (km**	**% Offline**	**Total**	**Rank**
Orange	30.29	95	217	1
Orange + Green 1	30.055	95	189	2
Orange + Green 2	30.43	95	187	3
Yellow + Blue	31.15	15	175	4
Green	29.755	85	174	5
Yellow	31.16	3	173	6
Cyan + Yellow + Blue	31.975	45	159	7
Purple + Yellow + Blue	31.79	45	159	7
Yellow + Purple	30.985	40	155	9
Green + Cyan	31.185	85	154	10
Purple	31.62	65	154	10
Yellow + Cyan +Green	31.02	25	153	12
Cyan + Yellow + Purple	31.805	75	145	13
Yellow + Purple + Green	31.085	35	133	14
Cyan	32.66	90	129	15
Brown	35.38	95	122	16
Brown + Purple	35.76	90	91	17

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Environment Summary

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Route	Air Quality & Climate	Archaeological, Architectural & Cultural Heritage	Ecology	Geology and Soils	Hydrogeology	Hydrology	Landscape and Visual	Agricultural	Material Assests (Non-Agricultural)	Noise & Vibration
Brown	Minor Adverse	Major Adverse	Major Adverse	Moderate Adverse	Major Adverse	Minor Adverse	Minor Adverse	Major Adverse	Minor Adverse	Moderate Adverse
Cyan	Moderate Adverse	Major Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Major Adverse	Minor Adverse	Moderate Adverse
Yellow	Moderate Adverse	Minor Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Minor Adverse	Minor Adverse	Moderate Adverse	Minor Adverse	Major Adverse
Green	Minor Adverse	Major Adverse	Moderate Adverse	Moderate Adverse	Major Adverse	Minor Adverse	Minor Adverse	Moderate Adverse	Neutral	Moderate Adverse
Purple	Minor Adverse	Major Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Minor Adverse	Moderate Adverse	Moderate Adverse	Minor Adverse	Major Adverse
Orange	Minor Adverse	Major Adverse	Moderate Adverse	Moderate Adverse	Major Adverse	Minor Adverse	Minor Adverse	Moderate Adverse	Minor Adverse	Moderate Adverse
Yellow + Blue	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Minor Adverse	Minor Adverse	Moderate Adverse	Moderate Adverse	Major Adverse
Cyan + Yellow + Blue	Moderate Adverse	Major Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Major Adverse	Moderate Adverse	Major Adverse
Yellow + Purple	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Minor Adverse	Moderate Adverse	Moderate Adverse	Minor Adverse	Moderate Adverse
Purple + Yellow + Blue	Moderate Adverse	Major Adverse	Moderate Adverse	Moderate Adverse	Major Adverse	Minor Adverse	Moderate Adverse	Major Adverse	Moderate Adverse	Major Adverse
Yellow + Cyan +Green	Moderate Adverse	Moderate Adverse	Moderate Adverse	Major Adverse	Moderate Adverse	Minor Adverse	Minor Adverse	Moderate Adverse	Minor Adverse	Major Adverse
Yellow + Purple + Green	Moderate Adverse	Major Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Minor Adverse	Minor Adverse	Major Adverse	Minor Adverse	Major Adverse
Brown + Purple	Minor Adverse	Major Adverse	Moderate Adverse	Major Adverse	Moderate Adverse	Moderate Adverse	Minor Adverse	Major Adverse	Minor Adverse	Major Adverse
Cyan + Yellow + Purple	Moderate Adverse	Major Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Major Adverse	Minor Adverse	Moderate Adverse
Green + Cyan	Minor Adverse	Major Adverse	Moderate Adverse	Moderate Adverse	Major Adverse	Minor Adverse	Minor Adverse	Moderate Adverse	Minor Adverse	Moderate Adverse
Orange + Green 1	Minor Adverse	Major Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Minor Adverse	Minor Adverse	Moderate Adverse	Neutral	Moderate Adverse
Orange + Green 2	Minor Adverse	Major Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Minor Adverse	Minor Adverse	Moderate Adverse	Neutral	Moderate Adverse

Major Adverse	1
Moderate Adverse	2
Minor Adverse	3
Neutral	4
Minor Positive	5
Moderate Positive	6
Major Positive	7

Environment												
	Air Quality & Climate	Archaeological, Architectural & Cultural Heritage	Ecology	Geology and Soils	Hydrogeology	Hydrology	Landscape and Visual	Agricultural	Material Assests (Non-Agricultural)	Noise & Vibration	Total	Marks
Brown	3	1	1	2	1	3	3	1	3	2	20	29
Cyan	2	1	2	2	2	2	2	1	3	2	19	27
Yellow	2	3	2	2	2	3	3	2	3	1	23	33
Green	3	1	2	2	1	3	3	2	4	2	23	33
Purple	3	1	2	2	2	3	2	2	3	1	21	30
Orange	3	1	2	2	1	3	3	2	3	2	22	31
Yellow + Blue	2	2	2	2	2	3	3	2	2	1	21	30
Cyan + Yellow + Blue	2	1	2	2	2	2	2	1	2	1	17	24
Yellow + Purple	2	2	2	2	2	3	2	2	3	2	22	31
Purple + Yellow + Blue	2	1	2	2	1	3	2	1	2	1	17	24
Yellow + Cyan +Green	2	2	2	1	2	3	3	2	3	1	21	30
Yellow + Purple + Green	2	1	2	2	2	3	3	1	3	1	20	29
Brown + Purple	3	1	2	1	2	2	3	1	3	1	19	27
Cyan + Yellow + Purple	2	1	2	2	2	2	2	1	3	2	19	27
Green + Cyan	3	1	2	2	1	3	3	2	3	2	22	31
Orange + Green 1	3	1	2	2	2	3	3	2	4	2	24	34
Orange + Green 2	3	1	2	2	2	3	3	2	4	2	24	34

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Economics Summary

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Economics Summary			
Route	**Total Cost**	**Score (1-7)**	**Marks**
Brown	€ 284,810,426.79	2	29
Cyan	€ 263,458,367.77	3	43
Yellow	€ 213,153,952.94	6	86
Green	€ 221,213,317.70	5	71
Purple	€ 251,815,982.84	4	57
Orange	€ 200,216,678.42	7	100
Yellow + Blue	€ 217,234,723.26	6	86
Cyan + Yellow + Blue	€ 229,363,405.85	5	71
Yellow + Purple	€ 245,753,584.91	4	57
Purple + Yellow + Blue	€ 222,718,379.77	5	71
Yellow + Cyan +Green	€ 252,382,171.92	4	57
Yellow + Purple + Green	€ 257,234,705.18	3	43
Brown + Purple	€ 294,159,171.67	1	14
Cyan + Yellow + Purple	€ 254,206,477.30	4	57
Green + Cyan	€ 241,170,677.45	4	57
Orange + Green 1	€ 216,683,656.54	6	86
Orange + Green 2	€ 218,710,449.60	6	86

	Min	**€**	**200,216,678.42**	
	Max	**€**	**294,159,171.67**	
	Difference	**€**	**93,942,493.26**	
	Scoring 1 to 7			**Range**
Highly Positive	Scoring 7 Min	€	200,216,678.42	Min = €200,216,678.42 Scoring 7
	Scoring 6	€	219,005,177.07	Between €200,216,678.42 and €219,005,177.07 Scoring 6
	Scoring 5	€	237,793,675.72	Between €219,005,177.07 and €237,793,675.72 Scoring 5
	Scroing 4	€	256,582,174.37	Between €237,793,675.72 and €256,582,174.37 Scoring 4
	Scoring 3	€	275,370,673.02	Between €256,582,174.37 and €275,370,673.02 Scoring 3
	Scoring 2	€	294,159,171.67	Between €275,370,673.02 and €294,159,171.67 Scoring 2
Highly Negative	Scoring 1 Max	€	294,159,171.67	Max = €294,159,171.67 Scoring 1

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Engineering Summary

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Engineering Assessment Summary																
			Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5	Criteria 6	Criteria 7	Criteria 8	Criteria 9	Criteria 10	Criteria 11	Criteria 12		
Route	Length	% Offline	Traffic Assessment	Technical Standards	Junction Strategy - Road Crossings	Structures	Geology	Groundwater	Earthworks	RSIA	Drainage	Construction	Service Conflicts	Land & Property	Total out of 70	Marks out of 100
Brown	35.38	95	2	N/A	3	3	5	N/A	5	4	7	7	6	3	45	64
Cyan	32.66	90	5	N/A	3	2	2	N/A	4	4	4	6	7	4	41	59
Yellow	31.16	3	7	N/A	4	4	2	N/A	2	2	6	1	7	3	38	54
Green	29.76	85	7	N/A	5	5	6	N/A	4	6	3	6	1	6	49	70
Purple	31.62	65	7	N/A	6	5	2	N/A	5	3	4	5	7	3	47	67
Orange	30.29	95	5	N/A	5	4	7	N/A	7	7	5	7	6	7	60	86
Yellow + Blue	31.15	15	7	N/A	4	5	2	N/A	3	2	6	2	7	3	41	59
Cyan + Yellow + Blue	31.98	45	7	N/A	6	4	2	N/A	5	3	4	4	7	3	45	64
Yellow + Purple	30.99	40	7	N/A	5	6	3	N/A	5	1	6	4	7	3	47	67
Purple + Yellow + Blue	31.79	45	7	N/A	7	6	2	N/A	3	4	3	4	7	2	45	64
Yellow + Cyan +Green	31.02	25	7	N/A	7	7	2	N/A	1	3	6	3	7	3	46	66
Yellow + Purple + Green	31.09	35	7	N/A	5	5	3	N/A	3	1	6	3	7	3	43	61
Brown + Purple	35.76	90	1	N/A	1	1	2	N/A	6	5	6	6	6	1	35	50
Cyan + Yellow + Purple	31.81	75	7	N/A	5	3	1	N/A	5	4	4	5	7	2	43	61
Green + Cyan	31.19	85	6	N/A	5	5	3	N/A	4	4	1	6	7	5	46	66
Orange + Green 1	30.06	95	6	N/A	5	4	6	N/A	5	6	3	7	1	5	48	69
Orange + Green 2	30.43	95	5	N/A	4	4	6	N/A	4	6	5	7	1	5	47	67

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Supporting Information on Engineering & Environment Sub-Criteria

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Criteria 1- Traffic Assessment

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Criteria 1 -Traffic Assessment

(a) Journey Savings

Route	Distance (m)	Journey Time (mins)	Journey Time Savings against existing road	Score (1-7)
Brown	35,380	23.59	-0.37	2
Cyan	32,660	21.77	1.45	5
Yellow	31,160	20.77	2.45	6
Green	29,755	19.84	3.38	7
Purple	31,620	21.08	2.14	6
Orange	30,290	20.19	3.03	6
Yellow + Blue	31,150	20.77	2.45	6
Cyan + Yellow + Blue	31,975	21.32	1.90	6
Yellow + Purple	30,985	20.66	2.56	6
Purple + Yellow + Blue	31,790	21.19	2.03	6
Yellow + Cyan +Green	31,020	20.68	2.54	6
Yellow + Purple + Green	31,085	20.72	2.50	6
Brown + Purple	35,760	23.84	-0.62	1
Cyan + Yellow + Purple	31,805	21.20	2.02	6
Green + Cyan	31,185	20.79	2.43	6
Orange + Green 1	30,055	20.04	3.18	6
Orange + Green 2	30,430	20.29	2.93	6

	Min	**-0.62**	
	Max	**3.38**	
	Difference	**4.00**	
	Scoring 1 to 7		**Range**
Highly Positive	Scoring 7 Max	3.38	Max = 3.38 mins savings Scoring 7
	Scoring 6	1.69	Between 1.69 and 3.38 mins savings Scoring 6
	Scoring 5	0.00	Between 0 and 1.69 mins savings Scoring 5
	Scroing 4	0.00	0 mins savings Scoring 4
	Scoring 3	-0.31	Between 0 and -0.31 mins savings Scoring 3
	Scoring 2	-0.62	Between -0.31 and -0.62 mins savings Scoring 2
Highly Negative	Scoring 1 Min	-0.62	Min = -0.62 mins savings Scoring 1

Distance (m)	Time (mins)
31162	23.22

Time taken from Google API Data

Criteria 1 -Traffic Assessment

(b) Proximity to Urban Centre

Route	Distance to Carrickmacross Town (m)	Score (1-7)
Brown	3284	2
Cyan	2865	3
Yellow	914	4
Green	4206	2
Purple	914	4
Orange	5553	1
Yellow + Blue	914	4
Cyan + Yellow + Blue	914	4
Yellow + Purple	914	4
Purple + Yellow + Blue	914	4
Yellow + Cyan +Green	914	4
Yellow + Purple + Green	914	4
Brown + Purple	3224	3
Cyan + Yellow + Purple	914	4
Green + Cyan	2865	3
Orange + Green 1	4206	2
Orange + Green 2	5553	1

	Min	**914.00**	
	Max	**5553.00**	
	Difference	**4639.00**	
	Scoring 1 to 7		**Range**
Neutral	Scoring 4	914.00	Min = 914m Scoring 4
	Scoring 3	3233.50	Between 914m and 3,233.5m Scoring 3
	Scoring 2	5553.00	Between 3,233.5m and 5,553m Scoring 2
Highly Negative	Scoring 1	5553.00	Max 5,553m Scoring 1

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Criteria 1 -Traffic Assessment Summary					
Sub Criteria	**Journey Time Savings Score**	**Proximity to Current N2 Score**			
Weighting	**2**	**1**	**Total**	**Weighted Total**	**Score (1-7)**
Brown	2	2	4	6	2
Cyan	5	3	8	13	5
Yellow	6	4	10	16	7
Green	7	2	9	16	7
Purple	6	4	10	16	7
Orange	6	1	7	13	5
Yellow + Blue	6	4	10	16	7
Cyan + Yellow + Blue	6	4	10	16	7
Yellow + Purple	6	4	10	16	7
Purple + Yellow + Blue	6	4	10	16	7
Yellow + Cyan +Green	6	4	10	16	7
Yellow + Purple + Green	6	4	10	16	7
Brown + Purple	1	3	4	5	1
Cyan + Yellow + Purple	6	4	10	16	7
Green + Cyan	6	3	9	15	6
Orange + Green 1	6	2	8	14	6
Orange + Green 2	6	1	7	13	5

	Min	**5.00**	
	Max	**16.00**	
	Difference	**11.00**	
	Scoring 1 to 7		**Range**
Highly Positive	Scoring 7 Max	16.00	Max = 16 Scoring 7
	Scoring 6	13.80	Between 13.8 and 16 Scoring 6
	Scoring 5	11.60	Between 11.6 and 13.8 Scoring 5
	Scroing 4	9.40	Between 9.4 and 11.6 Scoring 4
	Scoring 3	7.20	Between 7.2 and 9.4 Scoring 3
	Scoring 2	5.00	Between 5 and 7.2 Scoring 2
Highly Negative	Scoring 1 Min	5.00	Max = 5 Scoring 1

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Criteria 2- Technical Standards

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Criteria 2: Technical Standards

N/A

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Criteria 3- Junction Strategy: Road Crossings

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Criteria 2 - Junction Strategy -Road Crossings Summary							
Sub Criteria	**National Primary**	**National Secondary**	**Regional Roads**	**Local**		**Weighted**	
Weighting	3	3	2	1	**Unweighted Total**	**Total**	**Score (1-7)**
Brown	0	0	3	35	38	41	3
Cyan	2	0	2	31	35	41	3
Yellow	0	0	2	34	36	38	4
Green	1	0	2	27	30	34	5
Purple	0	0	0	30	30	30	6
Orange	0	0	2	28	30	32	5
Yellow + Blue	0	0	2	31	33	35	4
Cyan + Yellow + Blue	0	0	2	24	26	28	6
Yellow + Purple	0	0	2	27	29	31	5
Purple + Yellow + Blue	0	0	2	23	25	27	7
Yellow + Cyan +Green	0	0	2	23	25	27	7
Yellow + Purple + Green	0	0	2	28	30	32	5
Brown + Purple	0	0	3	40	43	46	1
Cyan + Yellow + Purple	0	0	2	29	31	33	5
Green + Cyan	1	0	2	27	30	34	5
Orange + Green 1	1	0	2	24	27	31	5
Orange + Green 2	1	0	2	28	31	35	4
					Min	**27.00**	
					Max	**46.00**	
					Difference	**19.00**	
					Scoring 1 to 7		**Range**
				Highly Positive	Scoring 7 Min	27.00	Min = 27 Scoring 7
					Scoring 6	30.80	Between 27 and 30.8 Scoring 6
					Scoring 5	34.60	Between 30.8 and 34.6 Scoring 5
					Scroing 4	38.40	Between 34.6 and 38.4 Scoring 4
					Scoring 3	42.20	Between 38.4 and 42.2 Scoring 3
					Scoring 2	46.00	Between 42.2 and 46 Scoring 2
				Highly Negative	Scoring 1 Max	46.00	Max = 46 Scoring 1

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Criteria 4- Structures

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Criteria 4 - Structures Summary											
Sub Criteria	Canals	Streams Order 1	Streams Order 2	Streams Order 3	Streams Order 4	Streams Order 5	Total (unfactored)	Weighted Total	Road Crossings	Overall Weighted Total	**Score (1-7)**
Weighting	3	1	1	3	3	3			1		
Brown	0	10	2	1	1	0	14	18	41	59	3
Cyan	0	11	5	0	2	0	18	22	41	63	2
Yellow	0	8	3	1	1	0	13	17	38	55	4
Green	0	11	3	0	0	1	15	17	34	51	5
Purple	0	8	4	1	1	0	14	18	30	48	5
Orange	0	13	4	1	0	1	19	23	32	55	4
Yellow + Blue	0	6	3	1	1	0	11	15	35	50	5
Cyan + Yellow + Blue	0	12	6	1	1	0	20	24	28	52	4
Yellow + Purple	0	6	3	1	1	0	11	15	31	46	6
Purple + Yellow + Blue	0	8	4	1	1	0	14	18	27	45	6
Yellow + Cyan +Green	0	7	3	1	1	0	12	16	27	43	7
Yellow + Purple + Green	0	7	3	1	1	0	12	16	32	48	5
Brown + Purple	0	9	4	1	1	0	15	19	46	65	1
Cyan + Yellow + Purple	0	12	6	1	1	0	20	24	33	57	3
Green + Cyan	0	8	3	0	0	1	12	14	34	48	5
Orange + Green 1	0	15	3	0	0	1	19	21	31	52	4
Orange + Green 2	0	13	2	1	0	1	17	21	35	56	4

			Min	**43.00**
			Max	**65.00**
			Difference	**22.00**
			Scoring 1 to 7	
Highly Positive			Scoring 7 Min	43.00
			Scoring 6	47.40
			Scoring 5	51.80
			Scroing 4	56.20
			Scoring 3	60.60
			Scoring 2	65.00
Highly Negative			Scoring 1 Max	65.00

Range
Min = 43 Scoring 7
Between 43 and 47.4 Scoring 6
Between 47.4 and 51.8 Scoring 5
Between 51.8 and 56.2 Scoring 4
Between 56.2 and 60.6 Scoring 3
Between 60.6 and 65 Scoring 2
Max = 65 Scoring 1

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Criteria 5- Geology

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Criteria 6 - Geology Summary					
	Superficial Geology				
	Made Ground m2	Alluvium m2	Cutover Peat m2	Lake Sediments m2	Karstified Limestone m2
Brown	0	332771.699	1261999.728	9527.856776	114376.1527
Cyan	16876.91108	821021.604	1037945.74	17144.14677	145732.4479
Yellow	174051.3472	345424.978	1161591.574	43422.25681	249482.5586
Green	0	484319.587	1229909.855	39957.7094	13156.72108
Purple	148433.1199	327444.442	1554019.094	39989.10808	344013.0048
Orange	0	459391.389	953155.5173	36476.83952	0
Yellow + Blue	174054.5858	334148.223	1158232.656	43423.06476	249487.2007
Cyan + Yellow + Blue	148468.7409	485779.153	973158.7361	9584.120686	275264.5898
Yellow + Purple	176056.4902	320248.606	1115878.136	43424.22083	345466.0548
Purple + Yellow + Blue	148453.6993	340847.712	1596277.029	39994.65501	247916.155
Yellow + Cyan +Green	174068.6023	389165.083	1072174.27	43426.56159	282465.5111
Yellow + Purple + Green	174052.4162	334964.878	1084436.948	43422.52351	345501.9019
Brown + Purple	0	385882.458	1022086.029	9528.57974	162149.3487
Cyan + Yellow + Purple	148456.5011	472535.714	931215.9428	9583.330568	371401.0077
Green + Cyan	12631.93865	599352.653	1307534.745	47760.38402	117927.0799
Orange + Green 1	0	697599.999	1129520.241	33040.02238	13159.00077
Orange + Green 2	0	473394.754	851258.1204	34060.04228	0

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Criteria 6 - Geology Summary												
Solid Geology												
Ballysteen Formation CDBALL m2	Benbulben Shale Formation CDBENS m2	Ballyshannon Limestone CDBSNN m2	Bundoran Shale Formation CDBUNS m2	Dartry Limestone Formation CDDART m2	Maydown Limestone Formation CDMYDO m2	Cruicetown Group (undifferentiated) CDCRUT m2	Milverton Group (undifferentiated) CDMLV m2	Navan Beds CDNAV m2	Cabra Formation CNCABR m2		Carratober Bridge Formation CNCATO m2	Carrickleck Formation CNCKLK m2
n/a	n/a	n/a	n/a	n/a	n/a	194934.4597	1999872.898	154774.6217	518328.3216		333611.4644	305762.4512
n/a	n/a	n/a	n/a	n/a	n/a	0	5414089.613	15246.07992	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	0	4358137.935	376474.6214	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	0	409273.7169	15263.24382	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	0	3564520.197	15272.20704	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	0	0	16640.59904	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	0	4358193.011	376481.5166	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	0	5896094.587	15244.7847	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	0	3585240.267	376491.5465	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	0	4338447.932	15274.33204	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	0	4488170.391	376511.9503	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	0	3584979.708	376476.9007	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	194949.216	3030179.1	154786.3018	515911.8086		322684.079	268492.3738
n/a	n/a	n/a	n/a	n/a	n/a	0	5122103.652	15243.62762	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	0	3250636.458	15238.8621	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	0	409343.6901	15062.9649	0		0	0
n/a	n/a	n/a	n/a	n/a	n/a	0	153571.8113	15058.95496	0		0	0

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Criteria 6 - Geology Summary					Criteria 6 - Geology Summary	
Solid Geology					Other Geological Features	
Clontrain Formation CNCLTR m2	Westphalian (undifferentiated) CWWES m2	Laragh Formation OCLARA m2	Tullyraghan Shale Formation OSTULL m2	Kingscourt Gypsum Formation PKGCT m2	No. Karst Features	No. of Mines/ Quarries
152963.7318	544329.9327	198289.7574	48958.844	736745.1949	2	3
0	0	83699.0884	0	0	8	9
0	0	96766.50752	0	0	10	5
0	0	90790.36032	0	0	0	3
0	0	127003.5007	0	0	8	8
0	0	0	0	0	0	3
0	0	107357.852	0	0	10	5
0	0	107502.6359	0	0	10	6
0	0	126992.2704	0	0	8	9
0	0	107444.0963	0	0	10	4
0	0	97033.16568	0	0	11	4
0	0	127703.77	0	0	8	5
120612.4723	544371.1901	127162.703	0	736801.1856	12	10
0	0	127023.954	0	0	8	10
0	0	83659.62528	0	0	8	7
0	0	90806.13326	0	0	0	3
0	0	90716.94224	0	0	0	3

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Criteria 6 - Geology Summary																		
	Superficial Geology					Solid Geology						Other Geological features						
Weighting	Made Ground	Soft Ground	Glacial Till	Total (unfactored)	Weighted total 2	Carboniferous Limestone	Potentially Aggressive Ground	Other carboniferous sedimentary strata	Igneous rocks	Total (unfactored)	Weighted total 1	Previously identified karst features	Mines / Quarries	Total (unfactored)	Weighted total 3	Total (Unfactored)	**Total**	**Score (1-7)**
Brown	4	2	N/A	6	12	2	2	N/A	N/A	4	4	3	3	6	18	16	34.00	5
Cyan	2	2	N/A	4	8	1	3	N/A	N/A	4	4	2	2	4	12	12	24.00	2
Yellow	2	2	N/A	4	8	2	3	N/A	N/A	5	5	1	2	3	9	12	22.00	2
Green	4	2	N/A	6	12	3	2	N/A	N/A	5	5	4	3	7	21	18	38.00	6
Purple	2	2	N/A	4	8	2	3	N/A	N/A	5	5	2	2	4	12	13	25.00	2
Orange	4	3	N/A	7	14	3	4	N/A	N/A	7	7	4	3	7	21	21	42.00	7
Yellow + Blue	2	2	N/A	4	8	2	3	N/A	N/A	5	5	1	2	3	9	12	22.00	2
Cyan + Yellow + Blue	2	3	N/A	5	10	1	3	N/A	N/A	4	4	1	2	3	9	12	23.00	2
Yellow + Purple	2	3	N/A	5	10	2	3	N/A	N/A	5	5	2	2	4	12	14	27.00	3
Purple + Yellow + Blue	2	2	N/A	4	8	2	3	N/A	N/A	5	5	1	3	4	12	13	25.00	2
Yellow + Cyan +Green	2	2	N/A	4	8	2	3	N/A	N/A	5	5	1	3	4	12	13	25.00	2
Yellow + Purple + Green	2	3	N/A	5	10	2	3	N/A	N/A	5	5	2	2	4	12	14	27.00	3
Brown + Purple	4	3	N/A	7	14	2	2	N/A	N/A	4	4	1	1	2	6	13	24.00	2
Cyan + Yellow + Purple	2	2	N/A	4	8	1	3	N/A	N/A	4	4	1	2	3	9	11	21.00	1
Green + Cyan	3	2	N/A	5	10	2	3	N/A	N/A	5	5	2	2	4	12	14	27.00	3
Orange + Green 1	4	2	N/A	6	12	3	3	N/A	N/A	6	6	4	3	7	21	19	39.00	6
Orange + Green 2	4	3	N/A	7	14	3	3	N/A	N/A	6	6	4	3	7	21	20	41.00	6

	Min	**21.00**	
	Max	**42.00**	
	Difference	**21.00**	
	Scoring 1 to 7		**Range**
Highly Negative	Scoring 1 Min	21.00	Min = 21 Scoring 1
	Scoring 2	25.20	Between 21 and 25.2 Scoring 2
	Scoring 3	29.40	Between 25.2 and 29.4 Scoring 3
	Scroing 4	33.60	Between 29.4 and 33.6 Scoring 4
	Scoring 5	37.80	Between 33.6 and 37.8 Scoring 5
	Scoring 6	42.00	Between 37.8 and 42 Scoring 6
Highly Positive	Scoring 7 Max	42.00	Max = 42 Scoring 7

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Criteria 6- Groundwater

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Criteria 6: Groundwater

N/A

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Criteria 7- Earthworks

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Criteria 7 - Earthworks Summary							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Route	**Cut (m^3)**	**Disposal =(2)-(4)**	**Usable Cut =(2) X 65%**	**Fill (m^3)**	**Difference =(4)-(5)**	**Percentage of Usable Fill Disposed or Imported =(6)/(4)**	**Score (1-7)**
Brown	5,982,097.87	2,093,734.25	3,888,363.62	2,854,354.93	1,034,008.69	27%	5
Cyan	5,357,885.08	1,875,259.78	3,482,625.30	2,304,075.29	1,178,550.01	34%	4
Yellow	1,655,416.79	579,395.88	1,076,020.91	277,620.62	798,400.29	74%	2
Green	3,460,523.98	1,211,183.39	2,249,340.59	1,347,940.14	901,400.45	40%	4
Purple	4,047,554.81	1,416,644.18	2,630,910.63	2,000,068.78	630,841.85	24%	5
Orange	2,146,940.10	751,429.04	1,395,511.07	1,441,521.54	46,010.47	3%	7
Yellow + Blue	2,031,642.89	711,075.01	1,320,567.88	530,644.51	789,923.37	60%	3
Cyan + Yellow + Blue	2,748,064.62	961,822.62	1,786,242.00	1,260,755.56	525,486.44	29%	5
Yellow + Purple	3,849,422.40	1,347,297.84	2,502,124.56	1,713,933.50	788,191.06	32%	5
Purple + Yellow + Blue	2,341,757.14	819,615.00	1,522,142.14	726,074.11	796,068.03	52%	3
Yellow + Cyan +Green	3,915,794.44	1,370,528.05	2,545,266.39	580,290.79	1,964,975.60	77%	1
Yellow + Purple + Green	4,507,034.93	1,577,462.23	2,929,572.70	1,474,287.53	1,455,285.17	50%	3
Brown + Purple	5,695,084.15	1,993,279.45	3,701,804.70	3,929,725.21	227,920.51	6%	6
Cyan + Yellow + Purple	4,643,539.99	1,625,239.00	3,018,300.99	2,382,980.52	635,320.47	21%	5
Green + Cyan	4,177,103.82	1,461,986.34	2,715,117.48	1,577,545.17	1,137,572.31	42%	4
Orange + Green 1	3,482,787.70	1,218,975.70	2,263,812.01	1,632,084.12	631,727.89	28%	5
Orange + Green 2	3,610,742.10	1,263,759.74	2,346,982.37	1,562,292.26	784,690.11	33%	4
					Min	**0.03**	
					Max	**0.77**	
					Difference	**0.74**	
					Scoring 1 to 7		**Range**
			Highly Positive		Scoring 7 Min	0.03	Min = 000.03 Scoring 7
					Scoring 6	0.18	Between 0.03 and 0.18 Scoring 6
					Scoring 5	0.33	Between 0.18 and 0.33 Scoring 5
					Scroing 4	0.48	Between 0.33 and 0.48 Scoring 4
					Scoring 3	0.62	Between 0.48 and 0.62 Scoring 3
					Scoring 2	0.77	Between 0.62 and 0.77 Scoring 2
			Highly Negative		Scoring 1 Max	0.77	Max= 0.77 Scoring 1

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Criteria 8- Road Safety Impact Assessment

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Criteria 8 - RSIA Summary												
Route	Effect on Traffic Flow and Traffic Patterns (1-7)	Impact on Non Motorised User Travel (1-7)	Tie In Location (1-7)	Seasonal Conditions (1-7)	Possibility of Seismic Activity (1-7)	Safe Parking Areas (1-7)	Forgiving road sides (1-7)	Susceptibility to Higher Climatic Impacts (snow) (1-7)	Less than Desirable Standards Impacting Driver Comfort (1-7)	Vertical - Length of use of 4% Gradient or Greater (1-7)	Total	Score 1-7
Brown	7	N/A	2	N/A	N/A	N/A	7	1	7	2	26	4
Cyan	7	N/A	4	N/A	N/A	N/A	7	4	1	2	25	4
Yellow	1	N/A	4	N/A	N/A	N/A	1	4	3	7	20	2
Green	6	N/A	4	N/A	N/A	N/A	6	4	6	5	31	6
Purple	4	N/A	4	N/A	N/A	N/A	4	4	6	2	24	3
Orange	7	N/A	2	N/A	N/A	N/A	7	4	7	6	33	7
Yellow + Blue	1	N/A	4	N/A	N/A	N/A	1	4	5	6	21	2
Cyan + Yellow + Blue	2	N/A	4	N/A	N/A	N/A	2	4	5	7	24	3
Yellow + Purple	2	N/A	4	N/A	N/A	N/A	2	4	4	3	19	1
Purple + Yellow + Blue	2	N/A	4	N/A	N/A	N/A	2	4	7	7	26	4
Yellow + Cyan +Green	1	N/A	4	N/A	N/A	N/A	1	4	7	5	22	3
Yellow + Purple + Green	1	N/A	4	N/A	N/A	N/A	1	4	5	4	19	1
Brown + Purple	7	N/A	4	N/A	N/A	N/A	7	4	2	4	28	5
Cyan + Yellow + Purple	5	N/A	4	N/A	N/A	N/A	5	4	4	3	25	4
Green + Cyan	6	N/A	4	N/A	N/A	N/A	6	4	3	3	26	4
Orange + Green 1	7	N/A	2	N/A	N/A	N/A	7	4	6	5	31	6
Orange + Green 2	7	N/A	2	N/A	N/A	N/A	7	4	6	6	32	6

	Min	19.00	
	Max	33.00	
	Difference	14.00	
	Scoring 1 to 7		Range
Highly Positive	Scoring 7 Max	33.00	Max = 33 Scoring 7
	Scoring 6	30.20	Between 30 and 33 Scoring 6
	Scoring 5	27.40	Between 27 and 30 Scoring 5
	Scroing 4	24.60	Between 25 and 27 Scoring 4
	Scoring 3	21.80	Between 22 and 25 Scoring 3
	Scoring 2	19.00	Between 19 and 22 Scoring 2
Highly Negative	Scoring 1 Min	19.00	Min= 19 Scoring 1

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N2 Ardee to Castleblayney Scheme
Summary Table - RSIA Criteria

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Primary Routes						Combinations										
	Brown Route	Cyan Route	Purple Route	Green Route	Orange Route	Yellow Route	Yellow + Blue	Cyan + Yellow + Blue	Yellow + Purple	Purple + Yellow + Blue	Yellow + Cyan + Green	Yellow+Purple+Green	Brown + Purple Route	Cyan+Yellow+Purple	Green + Cyan	Orange + Green 1	Orange + Green 2
Effect on Traffic Flow and Traffic Patterns	The route includes the provision of a new Type 2 Dual Carriageway Road between the two tie in points at Ardee and Castleblayney. The route option would replace the existing N2 as the national route and the new route would be constructed offline. The current N2 would remain as a functioning link, in the form of a down graded regional road. Maintaining the N2 will help segreate local traffic from strategic traffic and reduced congestion and lower strategic traffic volumes create a better environment for vulnerable road users.		The proposed route follows a 35% portion of the existing N2 alignment which will require numerous accesses to be closed and accommodation roads to be built parallel to the mainline on both sides. This will provide an increased number of potential conflict points between (i) the accesses and the accommodation road , and (ii) the accommodation road and the nearest adjacent Local Rd/ Regional Rd.	The route includes the provision of a new Type 2 Dual Carriageway Road between the two tie in points at Ardee and Castleblayney. The route option would replace the existing N2 as the national route and the new route would be constructed offline. The current N2 would remain as a functioning link, in the form of a down graded regional road. Maintaining the N2 will help segreate local traffic from strategic traffic and reduced congestion and lower strategic traffic volumes create a better environment for vulnerable road users.		The proposed route follows the majority of the existing N2 alignment which will require numerous accesses to be closed and accommodation roads to be built parallel to the mainline on both sides. This will provide an increased number of potential conflict points between (i) the accesses and the accommodation road , and (ii) the accommodation road and the nearest adjacent Local Rd/ Regional Rd.	The proposed route follows a portion of the existing N2 alignment which will require numerous accesses to be closed and accommodation roads to be built parallel to the mainline on both sides. This will provide an increased number of potential conflict points between (i) the accesses and the accommodation road , and (ii) the accommodation road and the nearest adjacent Local Rd/ Regional Rd.					The proposed route follows a 10% portion of the existing N2 alignment which will require numerous accesses to be closed and accommodation roads to be built parallel to the mainline on both sides. This will provide an increased number of potential conflict points between (i) the accesses and the accommodation road , and (ii) the accommodation road and the nearest adjacent Local Rd/ Regional Rd.	The proposed route follows a 25% portion of the existing N2 alignment which will require numerous accesses to be closed and accommodation roads to be built parallel to the mainline on both sides. This will provide an increased number of potential conflict points between (i) the accesses and the accommodation road , and (ii) the accommodation road and the nearest adjacent Local Rd/ Regional Rd.	The route includes the provision of a new Type 2 Dual Carriageway Road between the two tie in points at Ardee and Castleblayney. The route option would replace the existing N2 as the national route and the new route would be constructed offline. The current N2 would remain as a functioning link, in the form of a down graded regional road. Maintaining the N2 will help segreate local traffic from strategic traffic and reduced congestion and lower strategic traffic volumes create a better environment for vulnerable road users.		
	The towns of Castleblayney and Carrickmacross are already bypassed. Retention of the existing N2 will continue to serve local traffic as it currently does.		Utilises existing Carrickmacross Bypass (Single Carriageway)	The towns of Castleblayney and Carrickmacross are already bypassed. Retention of the existing N2 will continue to serve local traffic as it currently does.		The closure of direct accesses on the N2 will segregate local traffic from strategic traffic										The towns of Castleblayney and Carrickmacross are already bypassed. Retention of the existing N2 will continue to serve local traffic as it currently does.		
	At this stage, it is assumed that a design principal of the scheme will be to retain local and regional roads dissecting the proposed route by means of overbridges/ underbridges. Therefore, no significant effects on traffic patterns are anticipated. Where there is severance of any route, an alternative local road connection will be provided			At this stage, it is assumed that a design principal of the scheme will be to retain local and regional roads dissecting the proposed route by means of overbridges/ underbridges. Therefore, no significant effects on traffic patterns are anticipated. Where there is severance of any route, an alternative local road connection will be provided										At this stage, it is assumed that a design principal of the scheme will be to retain local and regional roads dissecting the proposed route by means of overbridges/ underbridges. Therefore, no significant effects on traffic patterns are anticipated. Where there is severance of any route, an alternative local road connection will be provided		
	The proposed alignment may result in junctions to serve with one or more of the R178, R179 and R180 due to the additional traffic attracted from Carrickmacross, and may alter traffic patterns on the regional and local roads in the area		The closure of direct accesses ono the N2 will segregate local traffic from strategic traffic The closure of direct accesses onto the N2 will displace local traffic from thse accommodation roads and onto the local, regional road network to proposed junctions on the N2	The proposed alignment may result in junctions to serve with one or more of the R178 and R179 due to the additional traffic attracted from Carrickmacross, and may alter traffic patterns on the regional and local roads in the area		The closure of direct accesses onto the N2 will displace local traffic onto the local, regional road network to proposed junctions on the N2 via the accommodation roads					The proposed alignment may result in junctions to serve with one or more of the R178, R179 and R180 due to the additional traffic attracted from Carrickmacross, and may alter traffic patterns on the regional and local roads in the area	The closure of direct accesses onto the N2 will segregate local traffic from strategic traffic The closure of direct accesses onto the N2 will displace local traffic onto the local, regional road network to proposed junctions on the N2 via the accommodation roads	The proposed alignment may result in junctions to serve with one or more of the R178 and R179 due to the additional traffic attracted from Carrickmacross, and may alter traffic patterns on the regional and local roads in the area		
Scoring	7	7	4	6	7	1	1	2	2	2	1	1	7	5	6	7	7
Impact on Non Motorised User Travel	An off road two way cycle lane is included as part of the proposed road cross section																
Scoring	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tie In Location	To the north, the proposed alignment will create a forth arm on the roundabout, and closure of an existing accommodation road to facilitate the new arm. A fifth arm on the roundabout would not be desirable.	To the north and south, the proposed alignment will tie into the roundabout on the same alignment as the existing N2	To the north and south, the proposed alignment will tie into the roundabout on the same alignment as the existing N2	To the north and south, the proposed alignment will tie into the roundabout on the same alignment as the existing N2	To the north, the proposed alignment will tie into the roundabout on the same alignment as the existing N2 To the south, the proposed alignment will create a forth arm on the proposed roundabout which connects to the proposed N52 Ardee Bypass. This roundabout is in close proximity to an existing roundabout junction, which may lead to an increased risk of rear shunt type collisions		To the north and south, the proposed alignment will tie into the roundabout on the same alignment as the existing N2									To the south, the proposed alignment will create a new junction with the N2 in close proximity to an existing roundabout junction, which may lead to an increased risk of rear shunt type collisions To the north, the proposed alignment will tie into the roundabout on the same alignment as the existing N2	To the south, the proposed alignment will create a new junction with the N2 in close proximity to an existing roundabout junction, which may lead to an increased risk of rear shunt type collisions To the north, the proposed alignment will tie into the roundabout on the same alignment as the existing N2
Scoring	2	4	4	4	2	4	4	4	4	4	4	4	4	4	4	2	2
Seasonal Conditions	No impacts on road safety anticipated due to Seasonal Conditions																
Scoring	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Possibility of Seismic Activity	Not deemed to be applicable in Co Monaghan/ Co Louth																
Scoring	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Safe Parking Areas	No safe parking areas indicated. Recommend consideration of provision of such at next design stage																
Scoring	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Forgiving road sides	Embankment/ Cutting slopes of 1V:3H assumed																
Scoring	7	7	4	6	7	1	1	2	2	2	1	1	7	5	6	7	7
Susceptibility to Higher Climatic Impacts (snow)																	
The highest elevation (m) of the alignment	195.08	158.10	160.09	140.02	115.60	121.80	134.39	134.47	160.21	134.41	151.35	160.11	160.13	160.22	158.10	140.02	140.03
Location (Chainage)	27+786.49	29889	27187	25591	26130	26571	24913	25736	26551	25544	26466	26549	31325	27372	28415	25889	26264
Scoring	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Less than Desirable Standards Impacting Driver Comfort																	
1a) Horizontal - Use of Limiting Horizontal Radii																	
No. Of Instances of Horizontal radius at 720m	1	6	3	3	2	8	6	5	6	3	3	5	5	5	5	3	2
No. Of Instances of Horizontal radius less than 720m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal:	1	6	3	3	2	8	6	5	6	3	3	5	5	5	5	3	2
1b) Horizontal - Length of limiting Horizontal Radii (m)																	
Combined length of Horizontal radii at 720m	730.24	4283.86	1874.14	1876.18	1003.66	3030.08	2296.75	2282.02	2969.36	1196.99	1095.23	2145.35	3638.07	2864.05	3432.06	1876.18	1592.33
Combined Horizontal radii less than 720m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total:	730.24	4283.86	1874.14	1876.18	1003.66	3030.08	2296.75	2282.02	2969.36	1196.99	1095.23	2145.35	3638.07	2864.05	3432.06	1876.18	1592.33
Scoring	7	1	6	6	7	3	5	5	4	7	7	5	2	4	3	6	6
2) Vertical - Length of use of 4% Gradient or Greater																	
Number of Occassions	9	11	6	3	1	2	3	2	5	2	3	4	7	5	7	3	1
Combined length of use of 4% gradient or greater	2175.29	2179	2012.81	847.42	311.38	0	435.88	236.81	1529.94	116.34	527.15	1189.18	1245.9	1615.56	1908.83	847.42	352.59
Scoring	2	2	2	5	6	7	6	7	3	7	5	4	4	3	3	5	6
Overall Scoring	**26**	**25**	**24**	**31**	**33**	**20**	**21**	**24**	**19**	**26**	**22**	**19**	**28**	**25**	**26**	**31**	**32**

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Criteria 9- Drainage

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Criteria 9 - Drainage Summary		
Route	**Area in flood Plain (m^2)**	**Score(1-7)**
Brown	186,825.51	7
Cyan	496,874.96	4
Yellow	293,489.32	6
Green	591,780.31	3
Purple	551,854.55	4
Orange	427,056.80	5
Yellow + Blue	290,138.12	6
Cyan + Yellow + Blue	510,065.29	4
Yellow + Purple	275,576.63	6
Purple + Yellow + Blue	565,725.61	3
Yellow + Cyan +Green	301,769.77	6
Yellow + Purple + Green	282,725.07	6
Brown + Purple	226,051.44	6
Cyan + Yellow + Purple	496,168.24	4
Green + Cyan	804,807.24	1
Orange + Green 1	651,892.51	3
Orange + Green 2	335,196.93	5

	Min	**186825.51**	
	Max	**804807.24**	
	Difference	**617981.73**	
	Scoring 1 to 7		**Range**
Highly Positive	Scoring 7 Min	186,825.51	Min = 186,826 Scoring 7
	Scoring 6	310,421.86	Between 186,825.51 and 310,421.86 Scoring 6
	Scoring 5	434,018.20	Between 310,421.86 and 434,018.20 Scoring 5
	Scroing 4	557,614.55	Between 434,018.20 and 557,614.55 Scoring 4
	Scoring 3	681,210.90	Between 557,614.55 and 681,210.90 Scoring 3
	Scoring 2	804,807.24	Between 681,210.90 and 804,807.24 Scoring 2
Highly Negative	Scoring 1 Max	804,807.24	Max= 804,807.24 Scoring 1

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Criteria 10- Construction

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Criteira 10 - Construction Summary					
Route	**Length (km)**	**Offline (km)**	**Online(km)**	**% Offline**	**Score (1-7)**
Brown	35.38	33.611	1.769	95	7
Cyan	32.66	29.394	3.266	90	6
Yellow	31.16	0.935	30.225	3	1
Green	29.755	25.29175	4.46325	85	6
Purple	31.62	20.553	11.067	65	5
Orange	30.29	28.7755	1.5145	95	7
Yellow + Blue	31.15	4.6725	26.4775	15	2
Cyan + Yellow + Blue	31.975	14.38875	17.58625	45	4
Yellow + Purple	30.985	12.394	18.591	40	4
Purple + Yellow + Blue	31.79	14.3055	17.4845	45	4
Yellow + Cyan +Green	31.02	7.755	23.265	25	3
Yellow + Purple + Green	31.085	10.87975	20.20525	35	3
Brown + Purple	35.76	32.184	3.576	90	6
Cyan + Yellow + Purple	31.805	23.85375	7.95125	75	5
Green + Cyan	31.185	26.50725	4.67775	85	6
Orange + Green 1	30.055	28.55225	1.50275	95	7
Orange + Green 2	30.43	28.9085	1.5215	95	7
			Min	**3.00**	
			Max	**95.00**	
			Difference	**92.00**	
			Scoring 1 to 7		**Range**
		Highly Positive	Scoring 7 Max	95.00	Max = 95% offline Scoring 7
			Scoring 6	76.60	Between 76.6 and 95% offline Scoring 6
			Scoring 5	58.20	Between 58.2 and 76.6% offline Scoring 5
			Scroing 4	39.80	Between 39.8 and 58.2% offline Scoring 4
			Scoring 3	21.40	Between 21.4 and 39.8% offline Scoring 3
			Scoring 2	3.00	Between 3 and 21.4% offline Scoring 2
		Highly Negative	Scoring 1 Min	3.00	Min= 3% offline Scoring 1

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Criteria 11- Service Conflicts

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Criteria 11 - Service Conflicts Summary						
Conflict	**220kV Overhead Crossings**	**110kV Overhead Crossings**	**38kV Overhead Crossings**		**Weighted**	
Weighting	**6**	**3**	**1**	**Total**	**Total**	**Score (1-7)**
Brown	2	3	2	7	23	6
Cyan	2	3	1	6	22	7
Yellow	2	3	1	6	22	7
Green	2	7	1	10	34	1
Purple	2	3	1	6	22	7
Orange	2	3	3	8	24	6
Yellow + Blue	2	3	1	6	22	7
Cyan + Yellow + Blue	2	3	1	6	22	7
Yellow + Purple	2	3	1	6	22	7
Purple + Yellow + Blue	2	3	1	6	22	7
Yellow + Cyan +Green	2	3	1	6	22	7
Yellow + Purple + Green	2	3	1	6	22	7
Brown + Purple	2	3	2	7	23	6
Cyan + Yellow + Purple	2	3	1	6	22	7
Green + Cyan	2	3	1	6	22	7
Orange + Green 1	2	7	1	10	34	1
Orange + Green 2	2	7	1	10	34	1
				Min	**22.00**	
				Max	**34.00**	
				Difference	**12.00**	
				Scoring 1 to 7		**Range**
			Highly Positive	Scoring 7 Min	22.00	Min = 22 Scoring 7
				Scoring 6	24	Between 22 and 24 Scoring 6
				Scoring 5	27	Between 24 and 27 Scoring 5
				Scroing 4	29	Between 27 and 29 Scoring 4
				Scoring 3	32	Between 29 and 32 Scoring 3
				Scoring 2	34	Between 32 and 34 Scoring 2
			Highly Negative	Scoring 1 Max	34.00	Max= 34 Scoring 1

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Criteria 12- Land & Property

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CRIT 12 Land & Property			
(a) Land Take Summary			
	Site Clearance (m^2)	**Area (Ha)**	**Score (1-7)**
Brown	2289675	225.69	2
Cyan	2080113	201.97	3
Yellow	1676395	111.72	7
Green	1674830	159.23	5
Purple	1991000	178.63	4
Orange	1617745	158.97	5
Yellow + Blue	1724665	123.48	6
Cyan + Yellow + Blue	1871983	154.66	5
Yellow + Purple	1920182	157.62	5
Purple + Yellow + Blue	1799487	147.60	5
Yellow + Cyan +Green	1843745	141.33	5
Yellow + Purple + Green	1933217	155.94	5
Brown + Purple	2406147	234.00	1
Cyan + Yellow + Purple	2068177	192.11	3
Green + Cyan	1809477	172.29	4
Orange + Green 1	1726055	169.83	4
Orange + Green 2	1743679	171.55	4
	Min	**111.72**	
	Max	**234.00**	
	difference	**122.28**	
			Range
	Highly Positive	111.72	Min = 111.7 Ha Scoring 7
		136.18	Between 111.7 and 136.2 Ha Scoring 6
		160.63	Between 136.2 and 160.6 Ha Scoring 5
		185.09	Between 160.6 and 185.1 Ha Scoring 4
		209.54	Between 185.1 and 209.5 Ha Scoring 3
		234.00	Between 209.5 and 234.0 Ha Scoring 2
	Highly Negative	234.00	Max= 234.0 Ha Scoring 1

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CRIT 12 Land & Property

(b) Property Summary

	Residential - Occupied 0-50m	Residential - Occupied 50-100m	Residential - Occupied 100-200m	Residential - Derelict 0-50m	Residential - Derelict 50-100m	Residential - Derelict 100-200m	Residential - Vacant 0-50m	Residential - Vacant 50-100m	Residential - Vacant 100-200m	Residential - Under Cons 0-50m	Residential - Under Cons 50-100m	Residential - Under Cons 100-200m	Total (0-50m) unfactored	Weighted total (0-50m)	Total (50-100m) unfactored	Weighted total 50-100m)	Total (10-200m) unfactored	Weighted total (100-200m)		
Weighting	**3**	**2**	**1**	**3**	**2**	**1**	**3**	**2**	**1**	**3**	**2**	**1**							**Total**	**Score (1-7)**
Brown	12	38	77	0	0	0	1	3	5	0	0	2	13	39	41	82	84	84	205	6
Cyan	10	36	74	0	0	0	0	2	1	0	0	3	10	30	38	76	78	78	184	6
Yellow	55	114	162	0	0	0	2	5	12	0	4	0	57	171	123	246	174	174	591	1
Green	14	45	86	0	0	0	0	3	3	0	0	1	14	42	48	96	90	90	228	6
Purple	22	82	149	0	0	0	1	4	13	0	0	2	23	69	86	172	164	164	405	4
Orange	1	29	76	0	0	0	0	2	4	0	0	0	1	3	31	62	80	80	145	7
Yellow + Blue	44	115	155	0	0	0	3	4	12	0	3	1	47	141	122	244	168	168	553	2
Cyan + Yellow + Blue	33	90	142	0	0	0	1	2	12	0	2	3	34	102	94	188	157	157	447	3
Yellow + Purple	28	92	150	0	0	0	3	5	13	0	2	2	31	93	99	198	165	165	456	3
Purple + Yellow + Blue	38	103	154	0	0	0	1	3	12	0	3	1	39	117	109	218	167	167	502	2
Yellow + Cyan +Green	33	104	156	0	0	0	2	4	12	0	3	0	35	105	111	222	168	168	495	3
Yellow + Purple + Green	25	90	154	0	0	0	3	4	13	0	2	2	28	84	96	192	169	169	445	3
Brown + Purple	12	50	98	0	0	0	1	1	2	0	0	3	13	39	51	102	103	103	244	5
Cyan + Yellow + Purple	17	67	137	0	0	0	1	3	13	0	1	4	18	54	71	142	154	154	350	4
Green + Cyan	17	37	78	0	0	0	0	4	3	0	0	2	17	51	41	82	83	83	216	6
Orange + Green 1	2	27	77	0	0	0	0	3	4	0	0	1	2	6	30	60	82	82	148	6
Orange + Green 2	1	30	79	0	0	0	0	3	2	0	0	0	1	3	33	66	81	81	150	6

	Min	**145.00**	
	Max	**591.00**	
	Difference	**446.00**	
	Scoring 1 to 7		**Range**
Highly Positive	Scoring 7 Min	145.00	Min = 145 Scoring 7
	Scoring 6	234.20	Between 145 and 234.2 Scoring 6
	Scoring 5	323.40	Between 234.2 and 323.4 Scoring 5
	Scoring 4	412.60	Between 323.4 and 412.6 Scoring 4
	Scoring 3	501.80	Between 412.6 and 501.8 Scoring 3
	Scoring 2	591.00	Between 501.8 and 591 Scoring 2
Highly Negative	Scoring 1 Max	591.00	Max= 591 Scoring 1

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Criteria 12 - land & Property Summary				
Route	**Land Take Score**	**Property Score**	**Total**	**Score (1-7)**
Brown	2	6	8	3
Cyan	3	6	9	4
Yellow	7	1	8	3
Green	5	6	11	6
Purple	4	4	8	3
Orange	5	7	12	7
Yellow + Blue	6	2	8	3
Cyan + Yellow + Blue	5	3	8	3
Yellow + Purple	5	3	8	3
Purple + Yellow + Blue	5	2	7	2
Yellow + Cyan +Green	5	3	8	3
Yellow + Purple + Green	5	3	8	3
Brown + Purple	1	5	6	1
Cyan + Yellow + Purple	3	4	7	2
Green + Cyan	4	6	10	5
Orange + Green 1	4	6	10	5
Orange + Green 2	4	6	10	5
		Min	**6.00**	
		Max	**12.00**	
		Difference	**6.00**	
		Scoring 1 to 7		**Range**
	Highly Positive	Scoring 7 Max	12.0	Max = 12 Scoring 7
		Scoring 6	10.8	Between 10.8 and 12 Scoring 6
		Scoring 5	9.6	Between 9.6 and 10.8 Scoring 5
		Scroing 4	8.4	Between 8.4 and 9.6 Scoring 4
		Scoring 3	7.2	Between 7.2 and 8.4 Scoring 3
		Scoring 2	6.0	Between 6 and 7.2 Scoring 2
	Highly Negative	Scoring 1 Min	6.0	Max = 6 Scoring 1

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Criteria 12 - land & Property Summary				
Route	**Land Take Score**	**Property Score**	**Total**	**Score (1-7)**
Brown	2	6	8	3
Cyan	3	6	9	4
Yellow	7	1	8	3
Green	5	6	11	6
Purple	4	4	8	3
Orange	5	7	12	7
Yellow + Blue	6	2	8	3
Cyan + Yellow + Blue	5	3	8	3
Yellow + Purple	5	3	8	3
Purple + Yellow + Blue	5	2	7	2
Yellow + Cyan +Green	5	3	8	3
Yellow + Purple + Green	5	3	8	3
Brown + Purple	1	5	6	1
Cyan + Yellow + Purple	3	4	7	2
Green + Cyan	4	6	10	5
Orange + Green 1	4	6	10	5
Orange + Green 2	4	6	10	5
		Min	**6.00**	
		Max	**12.00**	
		Difference	**6.00**	
		Scoring 1 to 7		**Range**
	Highly Positive	Scoring 7 Max	12.0	Max = 12 Scoring 7
		Scoring 6	10.8	Between 10.8 and 12 Scoring 6
		Scoring 5	9.6	Between 9.6 and 10.8 Scoring 5
		Scroing 4	8.4	Between 8.4 and 9.6 Scoring 4
		Scoring 3	7.2	Between 7.2 and 8.4 Scoring 3
		Scoring 2	6.0	Between 6 and 7.2 Scoring 2
	Highly Negative	Scoring 1 Min	6.0	Max = 6 Scoring 1

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Environmental Topic	Query	Ardee to Castleblaney									
		Brown	Cyan	Yellow	Green	Purple	Orange	Yellow + Blue	Cyan + Yellow + Blue	Yellow+Purple	Purple+Yellow1
Ecology	Ramsar (distance from centreline)	12.437	12.428	12.428	12.428	12.428	12.2	12.428	12.428	12.428	12.428
	SAC (and distance from centreline)	12.439	12.43	12.43	12.43	12.43	12.087	12.43	12.43	12.43	12.43
	SPA (and distance from centreline)	5.339	5.327	5.327	5.327	5.327	5.242	5.327	5.327	5.327	5.327
	NHA (direct intersections)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	NHA (distance from centreline)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	pNHA (direct intersections)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	pNHA (distance from centreline)	0.273	0.149	0.018	0.468	0.019	0.312	0.018	0.019	0.017	0.019
	pNHA (% of 400m corridor overlap)	0	0.014	0.27	0	0.27	0	0.27	0.27	0.28	0.27
	ASSI (distance from centreline)	5.437	5.06	3.926	4.497	5.059	3.013	4.032	4.032	5.059	4.032
	ALE Woodland (distance from centreline)	0.807	0.131	0.092	2.173	0.095	4.064	0.092	0.205	0.093	0.093
	ALE Woodland (% of 400m corridor overlap)	0	0.03	0.07	0	0.07	0	0.07	0	0.07	0.07
	Native Woodland (% of 400m corridor overlap)	0	0.27	0.25	0.005	0	0.33	0.25	0	0.26	0
	Semi-Natural Grasslands (% of 400m corridor overlap)	1.00	0	0	0	0	0	0	0	0	0
	No. of watercourse crossings	12	16	12	11	11	15	10	19	6	12
	No. waterbodies within 200m of centreline	0	7	6	0	4	5	5	3	5	4
	No. waterbodies 200-500m of centreline	7	6	5	3	3	1	5	9	3	5
	No. waterbodies 500-1000m of centreline	9	14	12	9	7	6	12	16	9	10
Geology and Soils	% of the 400m corridor within Peat (Blanket Peat, Fen Peat, Cutover Peat)	8.92	7.95	9.32	10.33	12.29	7.87	9.30	7.61	9.00	12.55
	No. Mines within the 400m corridor	3	9	5	3	8	3	5	6	9	4
	No. Quarries within the 400m corridor	0	0	0	0	0	0	0	0	0	0
	% of 400m corridor through Economic Deposits - Sand & Gravel	7.05	21.17	15.86	10.38	15.16	7.03	15.69	17.91	15.55	15.29
	% of 400m corridor through Economic Deposits - Potential Granular Aggregate (High/Very High)	2.65	4.65	6.44	3.17	6.24	1.66	6.45	6.28	6.36	6.32
	% of 400m corridor through Economic Deposits - Potential Crushed Rock (High/Very High)	51.96	47.11	51.76	46.14	49.84	58.40	54.49	51.71	51.00	53.25
	No. contaminated land sites within 400m corridor (Landfills, Infilled quarries, Former industrial sites	0	0	0	0	0	0	0	0	0	0
	No. Karst Landforms within 400m corridor	2	8	10	0	8	0	10	10	8	10
	% of 400m corridor through Geological Heritage Sites	0.00	1.74	0.27	0.00	0.28	0.00	0.27	1.75	0.29	0.26
Hydrogeology	% of 400m corridor within Vulnerable and Regionally Important Aquifer (Karstified bedrock (Rk), Fissured bedrock (Rf) and Extensive sand & gravel (Rg))	14.13	41.44	34.97	3.44	28.21	0.00	34.98	46.10	28.96	34.12
	% of 400m corridor within Sand & Gravel Aquifer	0	0	0	0	0	0	0	0	0	0
	% of 400m corridor within Groundwater Vulnerability (Extreme, High, Rock near surface or Karst)	75.44	70.17	70.57	75.16	73.34	85.25	73.27	71.85	71.22	75.32
	% of 400m corridor within Public & Group Supply Source Protection Area (Inner & Outer)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	% of 400m corridor within Group Water Schemes	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hydrology	No. crossings of High / Good Status WFD Waterbodies	7	11	3	1	1	3	3	11	0	1
	No. crossings of Unassigned Status WFD Waterbodies	2	2	1	4	3	4	1	1	2	2
	No. crossings of Moderate, Poor or Bad Status WFD Waterbodies	5	5	6	7	10	5	6	7	6	10
	No. crossings of other waterbodies / field ditches / drains	0	0	3	3	0	7	1	1	0	1

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Environmental Topic	Query	Ardee to Castleblaney									
		Brown	Cyan	Yellow	Green	Purple	Orange	Yellow + Blue	Cyan + Yellow + Blue	Yellow+Purple	Purple+Yellow1
Landscape and Visual	No. Highly Sensitive Landscapes within 200m of centreline	0	1	1	0	1	0	1	1	1	1
	No. Highly Sensitive Landscapes within 200m-1.2km of centreline	5	5	6	3	7	3	6	7	7	6
	No. Highly Sensitive Landscapes within 1.2-2.2km of centreline	3	2	3	1	1	1	3	2	2	2
	No. Historic Designated Landscapes within 200m of centreline	5	6	3	4	4	2	3	4	3	4
	No. Historic Designated Landscapes within 200-700m of centreline	2	2	4	2	3	4	4	2	4	3
	No. Historic Designated Landscapes within 700m-1.2km of centreline	4	5	3	5	6	3	3	5	4	5
	No. designated scenic views/routes within 700m of centreline	1	1	1	1	1	0	1	1	1	1
	No. designated scenic views/routes within 700m-1.2km of centreline	1	0	0	1	0	0	0	0	0	0
	No. designated scenic views/routes 1.2-2.2km of centreline	2	3	4	3	3	5	4	4	3	4
	No. amenity & heritage views within 700m of centreline	0	0	1	0	1	1	1	1	1	1
	No. amenity & heritage views within 700m-1.2km of centreline	2	3	3	2	3	2	3	3	3	3
	No. amenity & heritage views within 1.2-2.2km of centreline	2	3	2	3	2	2	2	2	2	2
	No. of towns & villages within 700m of centreline	2	2	4	2	3	2	4	3	4	3
	No. of towns & villages within 700m-1.2km of centreline	1	1	0	1	1	1	0	1	0	1
	No. of towns & villages within 1.2-1.7km of centreline	0	1	0	0	0	1	0	0	0	0
Archaeological, Architectural & Cultural Heritage	No. of SMR points within <25m of centreline	2	6	10	4	6	2	11	7	12	5
	No. of SMR points 25-200m of centreline	18	18	26	16	23	24	26	26	25	24
	No. of SMR points 200-500m of centreline	44	59	48	43	34	41	46	46	41	39
	No. of NIAH points within <25m of centreline	0	0	1	0	0	0	0	0	0	0
	No. of NIAH points 25-200m of centreline	8	5	9	17	4	3	6	7	3	7
	No. of NIAH points 200-500m of centreline	14	17	4	4	5	6	5	9	6	4
	No. of demesnes within <25m of centreline	3	4	3	4	4	2	3	3	3	4
	No. of demesnes 25-200m of centreline	2	2	0	0	0	0	0	1	0	0
	No. of demesnes 200-500m of centreline	2	2	3	2	1	3	3	1	3	1
	No. of RMP constraint areas within <25m of centreline	11	9	5	8	9	8	6	10	7	8
	No. of RMP sites potentially directly impacted	7	7	0	5	6	4	1	6	3	4
	No. of Protected Structures potentially impacted	2	2	0	4	1	1	2	3	0	3
	No. of historic demesnes <25m of centreline	3	4	3	4	4	2	3	3	3	4
Material Assests (Agricultural)	% of 400m corridor through agricultural land	98.11	99.20	93.70	98.67	93.21	99.24	93.69	94.40	93.63	93.25
	No. of high sensitivity farm yards e.g. equine	1	2	1	0	1	0	1	1	1	1
Material Assests (Non-Agricultural)	No. Intersections with major infrastructure (within 400m corridor) Greenways, Cycle and Walking Routes	0	0	0	0	0	0	0	0	0	0
	No. Community Assets within 200m of the centreline (schools, churches, sports clubs, community halls etc)	1	2	1	0	0	0	3	4	0	3
	No. Community Assets 200–500m from the centreline (schools, churches, sports clubs, community halls etc)	1	4	6	0	1	2	4	3	3	2
Air Quality & Climate	Property counts within 0 to 50m from the centreline	19	18	69	21	28	4	58	42	39	47
	Nitrogen sensitive habitats* within 200m of centreline	0	1	1	0	0	0	1	1	1	1
Noise & Vibration	Property counts within 0 to 50m from the centreline	19	18	69	21	28	4	58	42	39	47
	Property counts within 50 to 100m from the centreline	51	48	145	50	96	41	142	109	114	124
	Property counts within 100 to 200m from the centreline	116	103	202	122	190	112	197	183	192	195
	Property counts within 200 to 300m from the centreline	119	97	263	98	261	91	265	271	251	275

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Environmental Topic	Query	Ardee to Castleblaney						
		Yellow+Cyan+Green	Yellow+Purple+Green	Brown+Purple	Cyan+Yellow+Purple	Green+Cyan	Orange+Green1	Orange+Green2
Ecology	Ramsar (distance from centreline)	12.428	12.428	12.437	12.428	12.428	12.2	12.2
	SAC (and distance from centreline)	12.43	12.43	12.438	12.43	12.43	12.088	12.087
	SPA (and distance from centreline)	5.327	5.327	5.338	5.327	5.327	5.241	5.241
	NHA (direct intersections)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	NHA (distance from centreline)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	pNHA (direct intersections)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	pNHA (distance from centreline)	0.018	0.018	0.273	0.019	0.468	0.311	0.312
	pNHA (% of 400m corridor overlap)	0.28	0.27	0	0.27	0	0	0
	ASSI (distance from centreline)	4.497	4.497	5.059	5.059	5.06	4.497	4.497
	ALE Woodland (distance from centreline)	0.091	0.092	0.807	0.205	2.174	2.172	4.064
	ALE Woodland (% of 400m corridor overlap)	0.07	0.07	0	0	0	0	0
	Native Woodland (% of 400m corridor overlap)	0.26	0.25	0	0	0.01	0.005	0.32
	Semi-Natural Grasslands (% of 400m corridor overlap)	0	0	0	0	0	0	0
	No. of watercourse crossings	9	9	13	18	9	13	11
	No. waterbodies within 200m of centreline	5	5	1	3	4	0	5
	No. waterbodies 200-500m of centreline	3	3	5	7	2	3	2
	No. waterbodies 500-1000m of centreline	13	9	8	13	6	11	7
Geology and Soils	% of the 400m corridor within Peat (Blanket Peat, Fen Peat, Cutover Peat)	8.64	8.72	7.15	7.32	10.48	9.40	6.99
	No. Mines within the 400m corridor	4	5	10	10	7	3	3
	No. Quarries within the 400m corridor	0	0	0	0	0	0	0
	% of 400m corridor through Economic Deposits - Sand & Gravel	16.64	15.74	7.64	17.80	15.86	10.24	7.17
	% of 400m corridor through Economic Deposits - Potential Granular Aggregate (High/Very High)	6.64	6.34	2.63	6.20	4.76	1.60	1.63
	% of 400m corridor through Economic Deposits - Potential Crushed Rock (High/Very High)	52.11	50.88	39.12	48.31	49.18	38.29	47.52
	No. contaminated land sites within 400m corridor (Landfills, Infilled quarries, Former industrial sites	0	0	1	0	0	0	0
	No. Karst Landforms within 400m corridor	11	8	12	8	8	0	0
	% of 400m corridor through Geological Heritage Sites	0.27	0.00	0.29	1.78	0.29	0.00	0.00
Hydrogeology	% of 400m corridor within Vulnerable and Regionally Important Aquifer (Karstified bedrock (Rk), Fissured bedrock (Rf) and Extensive sand & gravel (Rg))	36.17	28.86	21.22	40.29	26.06	3.40	1.26
	% of 400m corridor within Sand & Gravel Aquifer	0	0	0	0	0	0	0
	% of 400m corridor within Groundwater Vulnerability (Extreme, High, Rock near surface or Karst)	71.29	70.06	61.57	69.87	77.05	73.30	74.54
	% of 400m corridor within Public & Group Supply Source Protection Area (Inner & Outer)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	% of 400m corridor within Group Water Schemes	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hydrology	No. crossings of High / Good Status WFD Waterbodies	3	3	8	11	1	1	3
	No. crossings of Unassigned Status WFD Waterbodies	3	3	2	2	3	6	6
	No. crossings of Moderate, Poor or Bad Status WFD Waterbodies	6	6	5	7	8	9	5
	No. crossings of other waterbodies / field ditches / drains	0	0	0	0	0	3	3

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Environmental Topic	Query	Ardee to Castleblaney						
		Yellow+Cyan+Green	Yellow+Purple+Green	Brown+Purple	Cyan+Yellow+Purple	Green+Cyan	Orange+Green1	Orange+Green2
Landscape and Visual	No. Highly Sensitive Landscapes within 200m of centreline	1	1	0	1	0	0	0
	No. Highly Sensitive Landscapes within 200m-1.2km of centreline	6	7	5	8	4	3	3
	No. Highly Sensitive Landscapes within 1.2-2.2km of centreline	2	2	2	1	2	1	0
	No. Historic Designated Landscapes within 200m of centreline	3	3	5	4	5	3	2
	No. Historic Designated Landscapes within 200-700m of centreline	4	4	1	2	2	3	4
	No. Historic Designated Landscapes within 700m-1.2km of centreline	3	4	4	6	4	5	3
	No. designated scenic views/routes within 700m of centreline	0	0	1	1	1	1	1
	No. designated scenic views/routes within 700m-1.2km of centreline	1	1	0	0	0	1	1
	No. designated scenic views/routes 1.2-2.2km of centreline	4	4	3	3	3	2	2
	No. amenity & heritage views within 700m of centreline	1	1	0	1	0	0	0
	No. amenity & heritage views within 700m-1.2km of centreline	3	3	2	3	3	2	2
	No. amenity & heritage views within 1.2-2.2km of centreline	2	2	2	2	2	3	2
	No. of towns & villages within 700m of centreline	4	4	2	3	2	2	2
	No. of towns & villages within 700m-1.2km of centreline	0	0	1	1	1	1	1
	No. of towns & villages within 1.2-1.7km of centreline	0	0	0	0	1	0	0
Archaeological, Architectural & Cultural Heritage	No. of SMR points within <25m of centreline	11	13	2	8	3	5	4
	No. of SMR points 25-200m of centreline	27	25	21	25	17	22	23
	No. of SMR points 200-500m of centreline	51	40	43	41	50	42	44
	No. of NIAH points within <25m of centreline	0	0	0	0	0	0	0
	No. of NIAH points 25-200m of centreline	5	5	8	4	15	14	4
	No. of NIAH points 200-500m of centreline	6	6	15	10	11	6	6
	No. of demesnes within <25m of centreline	3	3	3	3	4	3	2
	No. of demesnes 25-200m of centreline	0	0	2	1	1	0	0
	No. of demesnes 200-500m of centreline	3	3	1	1	2	3	3
	No. of RMP constraint areas within <25m of centreline	7	8	14	11	6	8	11
	No. of RMP sites potentially directly impacted	2	4	6	8	3	5	7
	No. of Protected Structures potentially impacted	0	0	2	1	4	3	1
	No. of historic demesnes <25m of centreline	3	3	3	3	4	3	2
Material Assests (Agricultural)	% of 400m corridor through agricultural land	93.67	93.68	98.13	94.37	98.56	99.30	99.24
	No. of high sensitivity farm yards e.g. equine	0	0	1	2	0	0	0
Material Assests (Non-Agricultural)	No. Intersections with major infrastructure (within 400m corridor) Greenways, Cycle and Walking Routes	0	0	0	0	0	0	0
	No. Community Assets within 200m of the centreline (schools, churches, sports clubs, community halls etc)	1	0	1	1	1	0	0
	No. Community Assets 200–500m from the centreline (schools, churches, sports clubs, community halls etc)	3	3	1	2	3	0	1
Air Quality & Climate	Property counts within 0 to 50m from the centreline	45	36	21	23	24	6	5
	Nitrogen sensitive habitats* within 200m of centreline	1	1	0	1	0	0	0
Noise & Vibration	Property counts within 0 to 50m from the centreline	45	36	21	23	24	6	5
	Property counts within 50 to 100m from the centreline	132	113	59	81	52	37	41
	Property counts within 100 to 200m from the centreline	200	198	139	178	109	118	108
	Property counts within 200 to 300m from the centreline	264	253	97	256	99	99	87

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Appendix C. Economy – Stage 1 Option Comparison Estimates (OCEs)

Ref. No.	Drawing Title	Revision No.
1	OCE Level 2 Assumptions Sheet	R0
2	OCE Level 2 Cost Estimate Spreadsheet	R0

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OCE Assumptions Sheet

Level 2 Cost Estimates Assumptions & Supporting Information

Date: 23/09/2019

The following documents have been referenced as part of the preparation of this document:

- NRA Project Management Guidelines (2010)
- TII Project Manager's Manual for Major National Road Projects PE-PMG-02042 (February 2019)
- NRA Cost Management Manual (March 2010)
- TII Project Appraisal Guidelines (PAGs) for National Roads Unit, including Unit 6.2 – Preparation of Scheme Costs (October 2016)

The Cost Estimate for each route option is based on the Level 2 Cost Estimate Template as per the TII Cost Management Manual (2010).

The Level 2 cost estimate comprises of a Total (incl. VAT) of the following items:

1) Main Construction Contract
2) Land and Property
3) Planning and Design
4) Archaeology
5) Advance Works and Other Contracts
6) Main Contract Supervision
7) Residual Network
8) Project Specific Risk Contingency

This Appendix outlines the key assumptions made in the development of the Level 2 Cost Estimates

1) Main Construction Contract

The following figures have been obtained from the route option alignments. These figures are variable for all route options and form the basis of the quantities that make up the cost estimate for the MCC.

Length of Route (m), **L**
Site Clearance area (m2), **SC**
Earthworks Footprint (m2), **A**
No of Junctions on Route, **J**
Earthworks Bulk Cut (m3), **BC***
Earthworks Bulk Fill (m3), **BF***
Area of Blacktop (m2), **BT**

Volume of Subbase (BT x 0.15m)

* An adjustment has been carried out on the BC and BF quantities to allow for the roadbox volume due to the capping layer. In the instance of BC additional cut adjustments have been added to this volume to account for additional excavation due to the capping layer. In the instance of BF a fill adjustment has been carried out to reduce fill due to the inculsion of a capping layer. It should be noted that the original BC and BF volumes have already considered the variations in the Bulk Fill and Cut due to the roadbox of the upper pavement layers.

Site Clearance

- Site Clearance (SC) has allowed for the addition of 5m maintenance strips in their quantity.
- Property counts have been taken from a GIS query of the GeoDirectory Building Points database (Q2 2019). A manual check on these figures has also been carried out.

Fencing

B Fencing	
B.1 Permanent Boundary Fencing	Full length boundary of scheme with 5% addditional (L x 2) + 5%
B.2 Temporary Fencing	10% of L
B.3 Mammal Fencing	5% of L
B.4 Other Fencing (e.g. Palisade Security Fencing)	5% of L
B.5 Environmental Noise Barrier	5% of L

Safety Barrier

C Safety Barrier and Pedestrian Guardrails	
C.1 Safety Barrier (Single Sided Safety Barrier, N2 W2)	L + 50% of L
C.2 Median Barrier (Median Wire Rope Barrier)	L
C.3 Terminals (N2 W5 P4 Terminal)	Assume (L+50% of L)/500
C.4 Transitions (H4/H2 W5/W2 to Terminal Performance Class P2/P4)	Assume (L+50% of L)/1000
C.5 Pedestrian Guardrail	Assume required at Junctions (J x 150m)

Drainage and Service Ducts

D Drainage and Service Ducts	
D.1 Drainage - Sealed - Mainline and Link Roads (450mm Dia, 2-4m deep)	Assume L + 10%
D.2 Drainage - Open - Mainline and Link Roads (300mm Dia, 1-2m deep)	Assume L + 10%
D.3 Drainage - Piped Filter drains (225mm Dia, 1-2m deep)	Assume L x 2
D.4 Drainage and Service Ducts - Side Roads (300mm dia, 1-2m deep)	Assume 50% of L
D.5 Drainage to Junctions/Interchanges	Assume J x 700m
D.6 Drainage - Manholes (Chambers, Type C 1500mm Dia, 2-3m deep)	Assume Lx2/100m
D.7 Precast Concrete Box Culverts, 2,100mm x 2,100mm	Assume 2% of L
D.7 Outfalls (Pipe Culverts, 0.9m dia, 1-2m deep)	Assume 3% of L
D.8 Outfalls (Headwall and Outfall Works)	Taken from Stream Crossings in Matrix x 2 (Headwall each side)
D.9 Attenuation Ponds/Provision	L/1500
D.10 Service Ducts (UPvC 100mm Dia 4 Way 1-2m deep) - Mainline and Link Roads	Assume L + 5%
D.11 Service Ducts (UPvC 100mm Dia 4 Way 1-2m deep) - Junctions/Interchanges	Assume J x 700m
D.12 Service Ducts (UPvC 100mm Dia 4 Way 1-2m deep) - Side Roads	Assume J x 700m

Earthworks

E Earthworks Mainline & Link Roads	
E.1 Excavation - Topsoil	Assume A x 0.3
E.2 Excavation - Acceptable	Assume 65% of BC
E.3 Excavation - U1	Assume 30% of BC
E.4 Excavation - U2	
E.5 Extra Over Excavation for Hard Material	Assume 5% of BC
E.6 Processing (Specify source and end use)	Unknown at this stage
E.7. Deposition - Acceptable Material	E.2 - E13
E.8 Disposal - U1	E.3 + E.5
E.9 Disposal - U2 (Contaminated)	E.4
E.10 Geotextile - subgrade geotextile on peat replacement areas	Assumed area of peat works
E.11 Import and deposition of 6A for peat replacement	Revert to peat calculation tab
E.12 Import (Acceptable Material Fill Class 1 and 2)	BF-E.2
E.13 Disposal of acceptable material excluding Class 5A	E.2-BF
E.14 Import Capping Material to Class 6F1	BT @ 300mm deep
E.15 Compaction (Acceptable Material)	E.2 + E.12 + E.14
E.16 Compaction of Class 6A Material	E.11
E.17 Sub-formation and Formation	BT
E.18 Landscaping (Topsoiling 300mm at 10 degrees or less)	Assume 50% of (A-BT)
E.19 Landscaping (Topsoiling 300mm at more than 10 degrees)	Assume 50% of (A-BT)
E.20 Landscaping (Grass Seeding at 10 degrees or less)	Assume 50% of (A-BT)
E.21 Landscaping (Grass Seeding at more than 10 degrees)	Assume 50% of (A-BT)
Earthworks Sub-Total	
Junctions/Interchanges Quantify works as per Mainline	Percentage based on amount of online works
Earthworks Sub-Total	
Side Roads Quantify works as per Mainline	Percentage based on amount of online works

- Item E.1 – Earthworks footprint x 300mm depth.

- Item E.2 to E.5 – Assumed percentages of the Earthworks Bulk Cut material. These percentages are assumed at this stage and are based on engineering judgement and experience.
- E10 to E11 – A percentage of each route that lies within peat was calculated from a GIS query from Geology-Subsoils dataset. This percentage was calculated as an area of the route to estimate a volume of peat material.
- E14 – Capping layer assumed at 300mm depth.
- Earthworks estimates for junctions/interchanges and side roads has been assumed as a percentage of the value of the earthworks section as per the Cost Management Manual. Percentage scales are based on the length of each route to be either predominantly offline or online. It is an assumption that online routes will require more works to provide carrier/link roads and tie in to existing network. A range of percentages based on the offline lengths of each route options was determined as follows. These percentages are considered appropriate based on industry norms and the current stage of the scheme development.

% offline	% applied to Junction/Side Roads
90-100	2
80-89	4
70-79	6
60-69	8
50-59	10
40-49	12
30-39	14
20-29	16
10-19	18
0-9	20

Pavement

F Pavement Mainline	
F.1 Sub-Base (Type B Cl 804. 150mm thick)	BT at 150mm thick (m3)
F.2 Roadbase (AC 32 Dense Base 40/60 mix. 100mm thick)	BT
F.3 Base Course (AC 20 Dense bin 40/60 mix. 55mm thick)	BT
F.4 Wearing Course (HRA 30/14 F surf 40/60. 45mm thick)	BT

Junctions/Interchanges Quantify works as per Mainline	Percentage based on amount of online works
Pavement Sub-Total	
Side Roads Quantify works as per Mainline	Percentage based on amount of online works

- Mainline Pavement costs all calculated from BT quantity.
- Pavement estimates for junctions/interchanges and side roads has been assumed as a percentage of value of the pavement section as per the Cost Management Manual. Percentage scales are based on the length of each route to be either predominantly offline or online. It is an assumption that online routes will require

more works to provide carrier/link roads and tie in to existing network. A range of percentages based on the offline lengths of each route options was determined as follows. These percentages are considered appropriate based on industry norms and the current stage of the scheme development.

% offline	% applied to Pavement
90-100	2
80-89	4
70-79	6
60-69	8
50-59	10
40-49	12
30-39	14
20-29	16
10-19	18
0-9	20

Kerbs/Signage/Lining/Lighting/Landscaping

- Sum values and percentages for these items are considered appropriate based on industry norms and the current stage of the scheme development.

Structures

- GIS queries have provided road and river crossings for each route.
- A manual review of the aerial imagery on ProjectMapper has been carried out to verify these GIS queries.
- Road crossings have been subdivided into National Primary, National Secondary, Regional and Local roads.
- An assumption that 50% of the local roads will require either an underpass or overpass. This assumption is based on the principle that local roads will be collected into a feeder road and thus lowering the number of local road crossings required.
- Structures deck areas have been calculated based on the span required for each road classification.
- National Primary/National Secondary – span length of 22m
- Regional Roads – span length of 18m
- Local Roads – span length of 16m
- River crossings have been obtained from a GIS query on Surface Water features. Based on the Strahler stream order numbers designation by the EPA, surface water crossings have been subdivided into larger watercourses (Stream Order 3 to 5) and stream/smaller watercourse (Stream Order 1 to 2).
- An assumption was made that Stream Order 1 to 2 do not require structures but could be culverted instead. These counts were removed from the structure's elements.
- Stream Orders 3 to 5 were manually reviewed to determine the spans required as they cross each route. These spans range from 15 to 30m.

Accommodation Works/Stat Authorities/Contractor's Obligations

- Sum values and percentages for these items are considered appropriate based on industry norms and the current stage of the scheme development.

- Preliminaries have been set at 15%. This percentage is considered appropriate based on industry norms and the current stage of the scheme development.

Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney
Phase 2 Stage 1 Assessment -Brown Route

Issue Date: September 4th 2019
Base Date: September 2019

Jacobs | Estimator: EC/LH

			Quantity	Unit	Rate €	Total €
1	**Main Construction Contract (See attached for breakdown presented to Level 2 detail)**					
	a	Site Clearance				€472,934.92
	b	Fencing				€2,550,898.00
	c	Safety Barriers and Pedestrian Guardrails				€4,421,736.10
	d	Drainage and Service Ducts				€20,343,994.47
	e	Earthworks				€57,632,072.63
	f	Pavement				€32,467,164.60
	g	Kerbs, Footways and Paved Areas				€1,921,089.57
	h	Traffic Signs				€1,568,644.18
	j	Roadmarking				€1,851,668.51
	k	Lighting and Electrical				€1,269,599.61
	l	Landscaping and Environmental				€4,089,162.70
	m	Structures (Including Tunnels - to be seperately identified)				€15,960,000.00
	n	Accommodation Works				€981,235.21
	p	Statutory Authorities & Utilities				€1,408,441.74
	q	Other Costs				€1,782,247.45
	r	Preliminaries				€22,308,133.45
	Total Base Cost for Main Construction Contract (Excluding VAT)					€171,029,023.15
	Add Project Specific Risk Contingency			15	%	€25,654,353.47
	Sub-Total exclusive of VAT					€196,683,376.62
	Add VAT at			13.5	%	€26,552,255.84
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€223,235,632.46
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	226	Ha.	€123,500.00	€27,873,309.12
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€400,000.00	€400,000.00
	Total Base Cost for Land and Property					€28,273,309.12
	Add Project Specific Risk Contingency			15	%	€4,240,996.37
	Total L&P Base Cost plus Project Specific Risk Contingency					€32,514,305.48
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€5,307,000.00
	Add Project Specific Risk Contingency			15	%	€796,050.00
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€6,103,050.00
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,852,948.53
	Add Project Specific Risk Contingency			15	%	€727,942.28
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€5,580,890.81
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€6,794,127.94
	Add Project Specific Risk Contingency			15	%	€1,019,119.19
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€7,813,247.14
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€3,882,358.83
	Add Project Specific Risk Contingency			15	%	€582,353.82
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€4,464,712.65
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€284,810,426.79
Mainline Length			35.38	km	Rate per km	€8,050,040.33

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 NRA Cost Management Manual for information on coverage and format of back-up.
See attached Budget Assumptions Sheet for Further Scheme Information.

Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney
Phase 2 Stage 1 Assessment -Cyan Route

Issue Date: September 4th 2019
Base Date: September 2019

Jacobs

Estimator: EC/LH

			Quantity	Unit	Rate €	Total €
1	**Main Construction Contract (See attached for breakdown presented to Level 2 detail)**					
	a	Site Clearance				€446,022.66
	b	Fencing				€2,354,786.00
	c	Safety Barriers and Pedestrian Guardrails				€4,107,315.20
	d	Drainage and Service Ducts				€18,976,427.93
	e	Earthworks				€52,090,608.11
	f	Pavement				€29,971,102.20
	g	Kerbs, Footways and Paved Areas				€1,779,707.90
	h	Traffic Signs				€1,453,200.56
	j	Roadmarking				€1,715,395.85
	k	Lighting and Electrical				€1,176,164.04
	l	Landscaping and Environmental				€3,788,222.72
	m	Structures (Including Tunnels - to be seperately identified)				€16,052,000.00
	n	Accommodation Works				€909,021.67
	p	Statutory Authorities & Utilities				€1,304,788.14
	q	Other Costs				€1,651,083.80
	r	Preliminaries				€20,666,377.02
	Total Base Cost for Main Construction Contract (Excluding VAT)					€158,442,223.80
	Add Project Specific Risk Contingency			15	%	€23,766,333.57
	Sub-Total exclusive of VAT					€182,208,557.37
	Add VAT at			13.5	%	€24,598,155.25
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€206,806,712.62
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	202	Ha.	€123,500.00	€24,943,199.90
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€600,000.00	€600,000.00
	Total Base Cost for Land and Property					€25,543,199.90
	Add Project Specific Risk Contingency			15	%	€3,831,479.99
	Total L&P Base Cost plus Project Specific Risk Contingency					€29,374,679.89
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,899,000.00
	Add Project Specific Risk Contingency			15	%	€734,850.00
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,633,850.00
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,495,798.10
	Add Project Specific Risk Contingency			15	%	€674,369.72
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€5,170,167.82
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€6,294,117.34
	Add Project Specific Risk Contingency			15	%	€944,117.60
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€7,238,234.94
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€3,596,638.48
	Add Project Specific Risk Contingency			15	%	€539,495.77
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€4,136,134.25
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€263,458,367.77
Mainline Length			32.66	km	Rate per km	€8,066,698.34

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 NRA Cost Management Manual for information on coverage and format of back-up.
See attached Budget Assumptions Sheet for Further Scheme Information.

Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney
Phase 2 Stage 1 Assessment -Yellow Route

Issue Date: September 4th 2019
Base Date: September 2019

Jacobs | Estimator: EC/LH

			Quantity	Unit	Rate €	Total €
1	**Main Construction Contract (See attached for breakdown presented to Level 2 detail)**					
	a	Site Clearance				€365,279.04
	b	Fencing				€2,246,636.00
	c	Safety Barriers and Pedestrian Guardrails				€3,881,010.20
	d	Drainage and Service Ducts				€17,829,912.93
	e	Earthworks				€28,166,026.04
	f	Pavement				€38,492,727.00
	g	Kerbs, Footways and Paved Areas				€1,492,300.12
	h	Traffic Signs				€1,218,520.96
	j	Roadmarking				€1,438,373.92
	k	Lighting and Electrical				€986,223.49
	l	Landscaping and Environmental				€3,176,456.78
	m	Structures (Including Tunnels - to be seperately identified)				€12,992,000.00
	n	Accommodation Works				€762,222.36
	p	Statutory Authorities & Utilities				€1,094,075.89
	q	Other Costs				€1,384,447.72
	r	Preliminaries				€17,328,931.87
	Total Base Cost for Main Construction Contract (Excluding VAT)					€132,855,144.33
	Add Project Specific Risk Contingency			15	%	€19,928,271.65
	Sub-Total exclusive of VAT					€152,783,415.98
	Add VAT at			13.5	%	€20,625,761.16
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€173,409,177.14
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	112	Ha.	€123,500.00	€13,797,778.39
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€1,100,000.00	€1,100,000.00
	Total Base Cost for Land and Property					€14,897,778.39
	Add Project Specific Risk Contingency			15	%	€2,234,666.76
	Total L&P Base Cost plus Project Specific Risk Contingency					€17,132,445.15
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,674,000.00
	Add Project Specific Risk Contingency			15	%	€701,100.00
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,375,100.00
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€3,769,764.72
	Add Project Specific Risk Contingency			15	%	€565,464.71
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€4,335,229.43
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€5,277,670.61
	Add Project Specific Risk Contingency			15	%	€791,650.59
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€6,069,321.20
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€1,507,905.89
	Add Project Specific Risk Contingency			15	%	€226,185.88
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€1,734,091.77
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€213,153,952.94
Mainline Length			31.16	km	Rate per km	€6,840,627.50

N.B. Figures above are INCLUSIVE of VAT - VAT rates utilised are : { PLEASE INSERT RATES HERE FOR EACH COST HEADING }
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Total base costs to include for ALL qualifying costs under each cost heading.
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See attached Budget Assumptions Sheet for Further Scheme Information.

Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney
Phase 2 Stage 1 Assessment - Green Route

Issue Date: September 4th 2019
Base Date: September 2019

Jacobs | Estimator: EC/LH

			Quantity	Unit	Rate €	Total €
1	**Main Construction Contract (See attached for breakdown presented to Level 2 detail)**					
	a	Site Clearance				€344,966.01
	b	Fencing				€2,145,426.00
	c	Safety Barriers and Pedestrian Guardrails				€3,708,542.50
	d	Drainage and Service Ducts				€17,067,554.50
	e	Earthworks				€39,087,171.10
	f	Pavement				€28,355,473.58
	g	Kerbs, Footways and Paved Areas				€1,497,288.29
	h	Traffic Signs				€1,222,593.99
	j	Roadmarking				€1,443,181.84
	k	Lighting and Electrical				€989,520.04
	l	Landscaping and Environmental				€3,187,074.42
	m	Structures (Including Tunnels - to be seperately identified)				€13,612,000.00
	n	Accommodation Works				€764,770.16
	p	Statutory Authorities & Utilities				€1,097,732.95
	q	Other Costs				€1,389,075.38
	r	Preliminaries				€17,386,855.61
	Total Base Cost for Main Construction Contract (Excluding VAT)					€133,299,226.37
	Add Project Specific Risk Contingency			15	%	€19,994,883.96
	Sub-Total exclusive of VAT					€153,294,110.33
	Add VAT at			13.5	%	€20,694,704.89
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€173,988,815.22
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	159	Ha.	€123,500.00	€19,664,410.01
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€400,000.00	€400,000.00
	Total Base Cost for Land and Property					€20,064,410.01
	Add Project Specific Risk Contingency			15	%	€3,009,661.50
	Total L&P Base Cost plus Project Specific Risk Contingency					€23,074,071.51
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,463,250.00
	Add Project Specific Risk Contingency			15	%	€669,487.50
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,132,737.50
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€3,782,365.55
	Add Project Specific Risk Contingency			15	%	€567,354.83
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€4,349,720.38
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€5,295,311.77
	Add Project Specific Risk Contingency			15	%	€794,296.77
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€6,089,608.53
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€3,025,892.44
	Add Project Specific Risk Contingency			15	%	€453,883.87
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€3,479,776.30
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€221,213,317.70
Mainline Length			29.755	km	Rate per km	€7,434,492.28

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Total base costs to include for ALL qualifying costs under each cost heading.
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See attached Budget Assumptions Sheet for Further Scheme Information.

Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney
Phase 2 Stage 1 Assessment - Purple Route

Issue Date: September 4th 2019
Base Date: September 2019

Jacobs | Estimator: EC/LH

			Quantity	Unit	Rate €	Total €
1	**Main Construction Contract (See attached for breakdown presented to Level 2 detail)**					
	a	Site Clearance				€418,200.05
	b	Fencing				€2,279,802.00
	c	Safety Barriers and Pedestrian Guardrails				€3,979,166.40
	d	Drainage and Service Ducts				€18,372,492.20
	e	Earthworks				€47,064,591.21
	f	Pavement				€32,364,809.10
	g	Kerbs, Footways and Paved Areas				€1,713,869.25
	h	Traffic Signs				€1,399,440.75
	j	Roadmarking				€1,651,936.36
	k	Lighting and Electrical				€1,132,652.94
	l	Landscaping and Environmental				€3,648,080.92
	m	Structures (Including Tunnels - to be seperately identified)				€14,932,000.00
	n	Accommodation Works				€875,393.25
	p	Statutory Authorities & Utilities				€1,256,518.71
	q	Other Costs				€1,590,003.48
	r	Preliminaries				€19,901,843.49
	Total Base Cost for Main Construction Contract (Excluding VAT)					€152,580,800.12
	Add Project Specific Risk Contingency			15	%	€22,887,120.02
	Sub-Total exclusive of VAT					€175,467,920.13
	Add VAT at			13.5	%	€23,688,169.22
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€199,156,089.35
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	179	Ha.	€123,500.00	€22,060,320.07
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€700,000.00	€700,000.00
	Total Base Cost for Land and Property					€22,760,320.07
	Add Project Specific Risk Contingency			15	%	€3,414,048.01
	Total L&P Base Cost plus Project Specific Risk Contingency					€26,174,368.08
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,743,000.00
	Add Project Specific Risk Contingency			15	%	€711,450.00
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,454,450.00
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,329,480.20
	Add Project Specific Risk Contingency			15	%	€649,422.03
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€4,978,902.23
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€6,061,272.28
	Add Project Specific Risk Contingency			15	%	€909,190.84
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€6,970,463.13
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€3,463,584.16
	Add Project Specific Risk Contingency			15	%	€519,537.62
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€3,983,121.79
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€251,815,982.84
Mainline Length			31.62	km	Rate per km	€7,963,819.82

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Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney
Phase 2 Stage 1 Assessment -Orange Route

Issue Date: September 4th 2019
Base Date: September 2019

Jacobs

Estimator: EC/LH

			Quantity	Unit	Rate €	Total €
1	**Main Construction Contract (See attached for breakdown presented to Level 2 detail)**					
	a	Site Clearance				€328,548.98
	b	Fencing				€2,183,909.00
	c	Safety Barriers and Pedestrian Guardrails				€3,773,808.80
	d	Drainage and Service Ducts				€17,371,428.23
	e	Earthworks				€28,814,905.98
	f	Pavement				€27,796,224.30
	g	Kerbs, Footways and Paved Areas				€1,331,366.83
	h	Traffic Signs				€1,087,112.68
	j	Roadmarking				€1,283,256.17
	k	Lighting and Electrical				€879,866.74
	l	Landscaping and Environmental				€2,833,899.93
	m	Structures (Including Tunnels - to be seperately identified)				€12,492,000.00
	n	Accommodation Works				€680,022.44
	p	Statutory Authorities & Utilities				€976,088.07
	q	Other Costs				€1,235,145.50
	r	Preliminaries				€15,460,137.55
	Total Base Cost for Main Construction Contract (Excluding VAT)					€118,527,721.21
	Add Project Specific Risk Contingency			15	%	€17,779,158.18
	Sub-Total exclusive of VAT					€136,306,879.39
	Add VAT at			13.5	%	€18,401,428.72
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€154,708,308.10
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	159	Ha.	€123,500.00	€19,633,123.84
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€200,000.00	€200,000.00
	Total Base Cost for Land and Property					€19,833,123.84
	Add Project Specific Risk Contingency			15	%	€2,974,968.58
	Total L&P Base Cost plus Project Specific Risk Contingency					€22,808,092.41
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,543,500.00
	Add Project Specific Risk Contingency			15	%	€681,525.00
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,225,025.00
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€3,363,224.09
	Add Project Specific Risk Contingency			15	%	€504,483.61
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€3,867,707.70
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,708,513.72
	Add Project Specific Risk Contingency			15	%	€706,277.06
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€5,414,790.78
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€2,690,579.27
	Add Project Specific Risk Contingency			15	%	€403,586.89
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€3,094,166.16
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€200,216,678.42
Mainline Length			30.29	km	Rate per km	€6,609,992.68

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Total base costs to include for ALL qualifying costs under each cost heading.
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Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney Phase 2 Stage 1 Assessment -Yellow + Blue Route					Issue Date: September 4th 2019 Base Date: September 2019	
Jacobs			Estimator: EC/LH			
	Main Construction Contract (See attached for breakdown presented to Level 2 detail)		Quantity	Unit	Rate €	Total €
1	a	Site Clearance				€359,933.09
	b	Fencing				€2,245,915.00
	c	Safety Barriers and Pedestrian Guardrails				€3,879,778.00
	d	Drainage and Service Ducts				€17,814,298.17
	e	Earthworks				€31,739,105.87
	f	Pavement				€37,380,934.50
	g	Kerbs, Footways and Paved Areas				€1,517,250.45
	h	Traffic Signs				€1,238,893.87
	j	Roadmarking				€1,462,422.64
	k	Lighting and Electrical				€1,002,712.53
	l	Landscaping and Environmental				€3,229,565.15
	m	Structures (Including Tunnels - to be seperately identified)				€12,292,000.00
	n	Accommodation Works				€774,966.24
	p	Statutory Authorities & Utilities				€1,112,368.15
	q	Other Costs				€1,407,594.82
	r	Preliminaries				€17,618,660.77
	Total Base Cost for Main Construction Contract (Excluding VAT)					€135,076,399.24
	Add Project Specific Risk Contingency			15	%	€20,261,459.89
	Sub-Total exclusive of VAT					€155,337,859.13
	Add VAT at			13.5	%	€20,970,610.98
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€176,308,470.11
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	123	Ha.	€123,500.00	€15,250,171.30
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€500,000.00	€500,000.00
	Total Base Cost for Land and Property					€15,750,171.30
	Add Project Specific Risk Contingency			15	%	€2,362,525.69
	Total L&P Base Cost plus Project Specific Risk Contingency					€18,112,696.99
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,672,500.00
	Add Project Specific Risk Contingency			15	%	€700,875.00
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,373,375.00
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€3,832,792.83
	Add Project Specific Risk Contingency			15	%	€574,918.92
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€4,407,711.75
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€5,365,909.96
	Add Project Specific Risk Contingency			15	%	€804,886.49
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€6,170,796.45
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€1,533,117.13
	Add Project Specific Risk Contingency			15	%	€229,967.57
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€1,763,084.70
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€217,234,723.26
Mainline Length			31.15	km	Rate per km	€6,973,827.39

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Total base costs to include for ALL qualifying costs under each cost heading.
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Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney
Phase 2 Stage 1 Assessment - Cyan + Yellow + Blue

Issue Date: September 4th 2019
Base Date: September 2019

Jacobs

Estimator: EC/LH

			Quantity	Unit	Rate €	Total €
1	**Main Construction Contract (See attached for breakdown presented to Level 2 detail)**					
	a	Site Clearance				€394,396.68
	b	Fencing				€2,305,397.50
	c	Safety Barriers and Pedestrian Guardrails				€3,981,434.50
	d	Drainage and Service Ducts				€18,322,516.42
	e	Earthworks				€37,288,310.23
	f	Pavement				€34,985,286.38
	g	Kerbs, Footways and Paved Areas				€1,582,661.04
	h	Traffic Signs				€1,292,304.16
	j	Roadmarking				€1,525,469.53
	k	Lighting and Electrical				€1,045,940.74
	l	Landscaping and Environmental				€3,368,795.81
	m	Structures (Including Tunnels - to be seperately identified)				€12,992,000.00
	n	Accommodation Works				€808,376.02
	p	Statutory Authorities & Utilities				€1,160,323.76
	q	Other Costs				€1,468,278.03
	r	Preliminaries				€18,378,223.62
	Total Base Cost for Main Construction Contract (Excluding VAT)					€140,899,714.40
	Add Project Specific Risk Contingency			15	%	€21,134,957.16
	Sub-Total exclusive of VAT					€162,034,671.56
	Add VAT at			13.5	%	€21,874,680.66
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€183,909,352.22
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	155	Ha.	€123,500.00	€19,100,976.72
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€700,000.00	€0.00
	Total Base Cost for Land and Property					€19,100,976.72
	Add Project Specific Risk Contingency			15	%	€2,865,146.51
	Total L&P Base Cost plus Project Specific Risk Contingency					€21,966,123.22
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,796,250.00
	Add Project Specific Risk Contingency			15	%	€719,437.50
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,515,687.50
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€3,998,029.40
	Add Project Specific Risk Contingency			15	%	€599,704.41
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€4,597,733.81
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€5,597,241.15
	Add Project Specific Risk Contingency			15	%	€839,586.17
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€6,436,827.33
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€1,599,211.76
	Add Project Specific Risk Contingency			15	%	€239,881.76
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€1,839,093.52
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€229,363,405.85
Mainline Length			31.975	km	Rate per km	€7,173,210.50

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Total base costs to include for ALL qualifying costs under each cost heading.
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Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney Phase 2 Stage 1 Assessment - Yellow & Purple					Issue Date: September 4th 2019 Base Date: September 2019	
Jacobs			Estimator: EC/LH			
	Main Construction Contract (See attached for breakdown presented to Level 2 detail)		Quantity	Unit	Rate €	Total €
1	a	Site Clearance				€404,036.44
	b	Fencing				€2,234,018.50
	c	Safety Barriers and Pedestrian Guardrails				€3,859,446.70
	d	Drainage and Service Ducts				€17,721,654.52
	e	Earthworks				€46,429,451.39
	f	Pavement				€33,902,082.83
	g	Kerbs, Footways and Paved Areas				€1,705,998.66
	h	Traffic Signs				€1,393,014.11
	j	Roadmarking				€1,644,350.19
	k	Lighting and Electrical				€1,127,451.46
	l	Landscaping and Environmental				€3,631,327.86
	m	Structures (Including Tunnels - to be seperately identified)				€14,312,000.00
	n	Accommodation Works				€871,373.19
	p	Statutory Authorities & Utilities				€1,250,748.41
	q	Other Costs				€1,582,701.72
	r	Preliminaries				€19,810,448.40
	Total Base Cost for Main Construction Contract (Excluding VAT)					€151,880,104.37
	Add Project Specific Risk Contingency			15	%	€22,782,015.65
	Sub-Total exclusive of VAT					€174,662,120.02
	Add VAT at			13.5	%	€23,579,386.20
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€198,241,506.22
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	158	Ha.	€123,500.00	€19,466,671.74
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€700,000.00	€700,000.00
	Total Base Cost for Land and Property					€20,166,671.74
	Add Project Specific Risk Contingency			15	%	€3,025,000.76
	Total L&P Base Cost plus Project Specific Risk Contingency					€23,191,672.50
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,647,750.00
	Add Project Specific Risk Contingency			15	%	€697,162.50
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,344,912.50
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,309,597.96
	Add Project Specific Risk Contingency			15	%	€646,439.69
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€4,956,037.66
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€6,033,437.15
	Add Project Specific Risk Contingency			15	%	€905,015.57
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€6,938,452.72
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€1,723,839.18
	Add Project Specific Risk Contingency			15	%	€258,575.88
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€1,982,415.06
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€245,753,584.91
Mainline Length			30.985	km	Rate per km	€7,931,372.76

N.B. Figures above are INCLUSIVE of VAT - VAT rates utilised are : { PLEASE INSERT RATES HERE FOR EACH COST HEADING }
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Total base costs to include for ALL qualifying costs under each cost heading.
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See attached Budget Assumptions Sheet for Further Scheme Information.

Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney
Phase 2 Stage 1 Assessment - Purple + Yellow + Blue

Issue Date: September 4th 2019
Base Date: September 2019

Jacobs

Estimator: EC/LH

			Quantity	Unit	Rate €	Total €
1	**Main Construction Contract (See attached for breakdown presented to Level 2 detail)**					
	a	Site Clearance				€399,036.44
	b	Fencing				€2,292,059.00
	c	Safety Barriers and Pedestrian Guardrails				€3,958,638.80
	d	Drainage and Service Ducts				€18,188,643.23
	e	Earthworks				€33,229,590.97
	f	Pavement				€34,782,869.55
	g	Kerbs, Footways and Paved Areas				€1,519,128.83
	h	Traffic Signs				€1,240,427.64
	j	Roadmarking				€1,464,233.14
	k	Lighting and Electrical				€1,003,953.91
	l	Landscaping and Environmental				€3,233,563.41
	m	Structures (Including Tunnels - to be seperately identified)				€12,992,000.00
	n	Accommodation Works				€775,925.66
	p	Statutory Authorities & Utilities				€1,113,745.28
	q	Other Costs				€1,409,337.45
	r	Preliminaries				€17,640,473.00
	Total Base Cost for Main Construction Contract (Excluding VAT)					€135,243,626.33
	Add Project Specific Risk Contingency			15	%	€20,286,543.95
	Sub-Total exclusive of VAT					€155,530,170.28
	Add VAT at			13.5	%	€20,996,572.99
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€176,526,743.27
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	160	Ha.	€123,500.00	€19,719,479.33
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€500,000.00	€500,000.00
	Total Base Cost for Land and Property					€20,219,479.33
	Add Project Specific Risk Contingency			15	%	€3,032,921.90
	Total L&P Base Cost plus Project Specific Risk Contingency					€23,252,401.23
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,768,500.00
	Add Project Specific Risk Contingency			15	%	€715,275.00
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,483,775.00
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€3,837,537.90
	Add Project Specific Risk Contingency			15	%	€575,630.68
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€4,413,168.58
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€5,372,553.06
	Add Project Specific Risk Contingency			15	%	€805,882.96
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€6,178,436.01
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€1,535,015.16
	Add Project Specific Risk Contingency			15	%	€230,252.27
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€1,765,267.43
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€222,718,379.77
Mainline Length			31.79	km	Rate per km	€7,005,925.76

N.B. Figures above are INCLUSIVE of VAT - VAT rates utilised are : { PLEASE INSERT RATES HERE FOR EACH COST HEADING }
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Total base costs to include for ALL qualifying costs under each cost heading.
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See attached Budget Assumptions Sheet for Further Scheme Information.

Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney Phase 2 Stage 1 Assessment - Yellow + Cyan + Green				Issue Date: September 4th 2019 Base Date: September 2019		
Jacobs			Estimator: EC/LH			
	Main Construction Contract (See attached for breakdown presented to Level 2 detail)		Quantity	Unit	Rate €	Total €
1	a	Site Clearance				€378,749.06
	b	Fencing				€2,236,542.00
	c	Safety Barriers and Pedestrian Guardrails				€3,863,759.40
	d	Drainage and Service Ducts				€17,746,306.20
	e	Earthworks				€49,621,228.99
	f	Pavement				€37,224,930.60
	g	Kerbs, Footways and Paved Areas				€1,780,644.47
	h	Traffic Signs				€1,453,965.31
	j	Roadmarking				€1,716,298.58
	k	Lighting and Electrical				€1,176,782.99
	l	Landscaping and Environmental				€3,790,216.27
	m	Structures (Including Tunnels - to be seperately identified)				€12,992,000.00
	n	Accommodation Works				€909,500.04
	p	Statutory Authorities & Utilities				€1,305,474.78
	q	Other Costs				€1,651,952.68
	r	Preliminaries				€20,677,252.71
	Total Base Cost for Main Construction Contract (Excluding VAT)					€158,525,604.09
	Add Project Specific Risk Contingency			15	%	€23,778,840.61
	Sub-Total exclusive of VAT					€182,304,444.71
	Add VAT at			13.5	%	€24,611,100.04
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€206,915,544.74
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	141	Ha.	€123,500.00	€17,454,783.30
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€400,000.00	€400,000.00
	Total Base Cost for Land and Property					€17,854,783.30
	Add Project Specific Risk Contingency			15	%	€2,678,217.50
	Total L&P Base Cost plus Project Specific Risk Contingency					€20,533,000.80
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,653,000.00
	Add Project Specific Risk Contingency			15	%	€697,950.00
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,350,950.00
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,498,164.02
	Add Project Specific Risk Contingency			15	%	€674,724.60
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€5,172,888.62
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€6,297,429.62
	Add Project Specific Risk Contingency			15	%	€944,614.44
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€7,242,044.07
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€1,799,265.61
	Add Project Specific Risk Contingency			15	%	€269,889.84
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€2,069,155.45
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€252,382,171.92
Mainline Length			31.02	km	Rate per km	€8,136,111.28

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Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney
Phase 2 Stage 1 Assessment - Yellow, Purple, Green

Issue Date: September 4th 2019
Base Date: September 2019

Jacobs

Estimator: EC/LH

			Quantity	Unit	Rate €	Total €
1	**Main Construction Contract (See attached for breakdown presented to Level 2 detail)**					
	a	Site Clearance				€396,643.47
	b	Fencing				€2,241,228.50
	c	Safety Barriers and Pedestrian Guardrails				€3,871,768.70
	d	Drainage and Service Ducts				€17,782,802.18
	e	Earthworks				€51,900,754.42
	f	Pavement				€35,108,642.40
	g	Kerbs, Footways and Paved Areas				€1,802,895.77
	h	Traffic Signs				€1,472,134.36
	j	Roadmarking				€1,737,745.80
	k	Lighting and Electrical				€1,191,488.32
	l	Landscaping and Environmental				€3,837,579.60
	m	Structures (Including Tunnels - to be seperately identified)				€14,312,000.00
	n	Accommodation Works				€920,865.35
	p	Statutory Authorities & Utilities				€1,321,788.27
	q	Other Costs				€1,672,595.82
	r	Preliminaries				€20,935,639.95
	Total Base Cost for Main Construction Contract (Excluding VAT)					€160,506,572.91
	Add Project Specific Risk Contingency			15	%	€24,075,985.94
	Sub-Total exclusive of VAT					€184,582,558.85
	Add VAT at			13.5	%	€24,918,645.44
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€209,501,204.29
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	156	Ha.	€123,500.00	€19,258,839.86
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€400,000.00	€400,000.00
	Total Base Cost for Land and Property					€19,658,839.86
	Add Project Specific Risk Contingency			15	%	€2,948,825.98
	Total L&P Base Cost plus Project Specific Risk Contingency					€22,607,665.84
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,662,750.00
	Add Project Specific Risk Contingency			15	%	€699,412.50
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,362,162.50
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,554,374.01
	Add Project Specific Risk Contingency			15	%	€683,156.10
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€5,237,530.11
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€6,376,123.61
	Add Project Specific Risk Contingency			15	%	€956,418.54
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€7,332,542.15
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€1,821,749.60
	Add Project Specific Risk Contingency			15	%	€273,262.44
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€2,095,012.04
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€257,234,705.18
Mainline Length			31.085	km	Rate per km	€8,275,203.64

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Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney Phase 2 Stage 1 Assessment - Brown + Purple					Issue Date: September 4th 2019 Base Date: September 2019	
Jacobs			Estimator: EC/LH			
	Main Construction Contract (See attached for breakdown presented to Level 2 detail)		Quantity	Unit	Rate €	Total €
1	a	Site Clearance				€516,229.33
	b	Fencing				€2,578,296.00
	c	Safety Barriers and Pedestrian Guardrails				€4,468,559.70
	d	Drainage and Service Ducts				€20,562,355.60
	e	Earthworks				€59,679,557.83
	f	Pavement				€32,815,879.20
	g	Kerbs, Footways and Paved Areas				€1,979,247.75
	h	Traffic Signs				€1,616,132.60
	j	Roadmarking				€1,907,725.07
	k	Lighting and Electrical				€1,308,034.89
	l	Landscaping and Environmental				€4,212,956.13
	m	Structures (Including Tunnels - to be seperately identified)				€17,280,000.00
	n	Accommodation Works				€1,010,940.67
	p	Statutory Authorities & Utilities				€1,451,080.25
	q	Other Costs				€1,836,202.39
	r	Preliminaries				€22,983,479.61
	Total Base Cost for Main Construction Contract (Excluding VAT)					€176,206,677.00
	Add Project Specific Risk Contingency			15	%	€26,431,001.55
	Sub-Total exclusive of VAT					€202,637,678.55
	Add VAT at			13.5	%	€27,356,086.60
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€229,993,765.16
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	234	Ha.	€123,500.00	€28,898,884.39
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€1,100,000.00	€1,100,000.00
	Total Base Cost for Land and Property					€29,998,884.39
	Add Project Specific Risk Contingency			15	%	€4,499,832.66
	Total L&P Base Cost plus Project Specific Risk Contingency					€34,498,717.05
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€5,364,000.00
	Add Project Specific Risk Contingency			15	%	€804,600.00
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€6,168,600.00
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,999,864.46
	Add Project Specific Risk Contingency			15	%	€749,979.67
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€5,749,844.13
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€6,999,810.24
	Add Project Specific Risk Contingency			15	%	€1,049,971.54
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€8,049,781.78
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€3,999,891.57
	Add Project Specific Risk Contingency			15	%	€599,983.74
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€4,599,875.30
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€294,159,171.67
Mainline Length			35.76	km	Rate per km	€8,225,927.62

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Total base costs to include for ALL qualifying costs under each cost heading.
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Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney Phase 2 Stage 1 Assessment - Cyan + Yellow + Purple				Issue Date: September 4th 2019 Base Date: September 2019		
Jacobs			Estimator: EC/LH			
	Main Construction Contract (See attached for breakdown presented to Level 2 detail)		Quantity	Unit	Rate €	Total €
1	a	Site Clearance				€433,635.31
	b	Fencing				€2,293,140.50
	c	Safety Barriers and Pedestrian Guardrails				€3,960,487.10
	d	Drainage and Service Ducts				€18,227,065.38
	e	Earthworks				€48,379,527.04
	f	Pavement				€31,431,609.30
	g	Kerbs, Footways and Paved Areas				€1,717,405.80
	h	Traffic Signs				€1,402,328.49
	j	Roadmarking				€1,655,345.12
	k	Lighting and Electrical				€1,134,990.15
	l	Landscaping and Environmental				€3,655,608.70
	m	Structures (Including Tunnels - to be seperately identified)				€14,932,000.00
	n	Accommodation Works				€877,199.62
	p	Statutory Authorities & Utilities				€1,259,111.52
	q	Other Costs				€1,593,284.44
	r	Preliminaries				€19,942,910.77
	Total Base Cost for Main Construction Contract (Excluding VAT)					€152,895,649.26
	Add Project Specific Risk Contingency			15	%	€22,934,347.39
	Sub-Total exclusive of VAT					€175,829,996.65
	Add VAT at			13.5	%	€23,737,049.55
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€199,567,046.20
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	192	Ha.	€123,500.00	€23,725,318.83
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€700,000.00	€700,000.00
	Total Base Cost for Land and Property					€24,425,318.83
	Add Project Specific Risk Contingency			15	%	€3,663,797.82
	Total L&P Base Cost plus Project Specific Risk Contingency					€28,089,116.65
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,770,750.00
	Add Project Specific Risk Contingency			15	%	€715,612.50
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,486,362.50
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,338,414.05
	Add Project Specific Risk Contingency			15	%	€650,762.11
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€4,989,176.16
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€6,073,779.67
	Add Project Specific Risk Contingency			15	%	€911,066.95
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€6,984,846.62
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€3,470,731.24
	Add Project Specific Risk Contingency			15	%	€520,609.69
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€3,991,340.92
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€254,206,477.30
Mainline Length			31.805	km	Rate per km	€7,992,657.67

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Total base costs to include for ALL qualifying costs under each cost heading.
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Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney
Phase 2 Stage 1 Assessment - Green + Cyan

Issue Date: September 4th 2019
Base Date: September 2019

Jacobs

Estimator: EC/LH

			Quantity	Unit	Rate €	Total €
1	**Main Construction Contract (See attached for breakdown presented to Level 2 detail)**					
	a	Site Clearance				€381,895.36
	b	Fencing				€2,248,438.50
	c	Safety Barriers and Pedestrian Guardrails				€3,904,828.20
	d	Drainage and Service Ducts				€17,983,599.85
	e	Earthworks				€43,799,058.53
	f	Pavement				€29,718,213.53
	g	Kerbs, Footways and Paved Areas				€1,636,809.30
	h	Traffic Signs				€1,336,518.31
	j	Roadmarking				€1,577,661.08
	k	Lighting and Electrical				€1,081,725.96
	l	Landscaping and Environmental				€3,484,053.86
	m	Structures (Including Tunnels - to be seperately identified)				€16,006,000.00
	n	Accommodation Works				€836,033.33
	p	Statutory Authorities & Utilities				€1,200,022.41
	q	Other Costs				€1,518,512.85
	r	Preliminaries				€19,007,005.66
	Total Base Cost for Main Construction Contract (Excluding VAT)					€145,720,376.73
	Add Project Specific Risk Contingency			15	%	€21,858,056.51
	Sub-Total exclusive of VAT					€167,578,433.25
	Add VAT at			13.5	%	€22,623,088.49
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€190,201,521.73
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	172	Ha.	€123,500.00	€21,278,289.76
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€700,000.00	€700,000.00
	Total Base Cost for Land and Property					€21,978,289.76
	Add Project Specific Risk Contingency			15	%	€3,296,743.46
	Total L&P Base Cost plus Project Specific Risk Contingency					€25,275,033.23
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,677,750.00
	Add Project Specific Risk Contingency			15	%	€701,662.50
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,379,412.50
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,134,815.69
	Add Project Specific Risk Contingency			15	%	€620,222.35
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€4,755,038.04
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€5,788,741.97
	Add Project Specific Risk Contingency			15	%	€868,311.29
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€6,657,053.26
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€3,307,852.55
	Add Project Specific Risk Contingency			15	%	€496,177.88
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€3,804,030.43
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€241,170,677.45
Mainline Length			31.185	km	Rate per km	€7,733,547.46

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 NRA Cost Management Manual for information on coverage and format of back-up.
See attached Budget Assumptions Sheet for Further Scheme Information.

Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney Phase 2 Stage 1 Assessment - Orange & Green 1					Issue Date: September 4th 2019 Base Date: September 2019	
Jacobs			Estimator: EC/LH			
	Main Construction Contract (See attached for breakdown presented to Level 2 detail)		Quantity	Unit	Rate €	Total €
1	a	Site Clearance				€350,210.95
	b	Fencing				€2,166,965.50
	c	Safety Barriers and Pedestrian Guardrails				€3,765,589.60
	d	Drainage and Service Ducts				€17,384,131.22
	e	Earthworks				€38,328,141.06
	f	Pavement				€27,580,571.85
	g	Kerbs, Footways and Paved Areas				€1,450,620.20
	h	Traffic Signs				€1,184,487.69
	j	Roadmarking				€1,398,200.16
	k	Lighting and Electrical				€958,678.28
	l	Landscaping and Environmental				€3,087,738.39
	m	Structures (Including Tunnels - to be seperately identified)				€11,494,000.00
	n	Accommodation Works				€740,933.50
	p	Statutory Authorities & Utilities				€1,063,518.36
	q	Other Costs				€1,345,780.12
	r	Preliminaries				€16,844,935.03
	Total Base Cost for Main Construction Contract (Excluding VAT)					€129,144,501.90
	Add Project Specific Risk Contingency			15	%	€19,371,675.28
	Sub-Total exclusive of VAT					€148,516,177.18
	Add VAT at			13.5	%	€20,049,683.92
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€168,565,861.10
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	170	Ha.	€123,500.00	€20,973,435.48
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€200,000.00	€200,000.00
	Total Base Cost for Land and Property					€21,173,435.48
	Add Project Specific Risk Contingency			15	%	€3,176,015.32
	Total L&P Base Cost plus Project Specific Risk Contingency					€24,349,450.80
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,508,250.00
	Add Project Specific Risk Contingency			15	%	€676,237.50
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,184,487.50
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€3,664,475.24
	Add Project Specific Risk Contingency			15	%	€549,671.29
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€4,214,146.53
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€5,130,265.34
	Add Project Specific Risk Contingency			15	%	€769,539.80
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€5,899,805.14
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€2,931,580.19
	Add Project Specific Risk Contingency			15	%	€439,737.03
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€3,371,317.22
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€216,683,656.54
Mainline Length			30.055	km	Rate per km	€7,209,571.00

N.B. Figures above are INCLUSIVE of VAT - VAT rates utilised are : { PLEASE INSERT RATES HERE FOR EACH COST HEADING }
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Total base costs to include for ALL qualifying costs under each cost heading.
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See attached Budget Assumptions Sheet for Further Scheme Information.

Appendix C

Level 2 Estimate Summary

National Roads Authority Cost Management Manual

N2 Ardee to Castleblayney
Phase 2 Stage 1 Assessment - Orange & Green 2

Issue Date: September 4th 2019
Base Date: September 2019

Jacobs — Estimator: EC/LH

			Quantity	Unit	Rate €	Total €
1	**Main Construction Contract (See attached for breakdown presented to Level 2 detail)**					
	a	Site Clearance				€353,735.71
	b	Fencing				€2,194,003.00
	c	Safety Barriers and Pedestrian Guardrails				€3,811,797.10
	d	Drainage and Service Ducts				€17,579,684.97
	e	Earthworks				€36,546,770.90
	f	Pavement				€27,924,698.10
	g	Kerbs, Footways and Paved Areas				€1,464,299.45
	h	Traffic Signs				€1,195,657.32
	j	Roadmarking				€1,411,385.09
	k	Lighting and Electrical				€967,718.55
	l	Landscaping and Environmental				€3,116,855.55
	m	Structures (Including Tunnels - to be seperately identified)				€13,612,000.00
	n	Accommodation Works				€747,920.45
	p	Statutory Authorities & Utilities				€1,073,547.27
	q	Other Costs				€1,358,470.73
	r	Preliminaries				€17,003,781.63
	Total Base Cost for Main Construction Contract (Excluding VAT)					€130,362,325.83
	Add Project Specific Risk Contingency			15	%	€19,554,348.87
	Sub-Total exclusive of VAT					€149,916,674.70
	Add VAT at			13.5	%	€20,238,751.08
	Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€170,155,425.79
2	**Land and Property - All-In Costs**		Quantity	Unit	Rate €	
	a	Mainline and Link Roads - Agricultural	172	Ha.	€123,500.00	€21,186,805.65
	b	Mainline and Link Roads - Zoned/Other		Ha.		
	c	Junction/Interchanges - Agricultural		Ha.		
	d	Junction/Interchanges - Zoned		Ha.		
	e	Properties (See attached breakdown)		Item	€200,000.00	€200,000.00
	.					€21,386,805.65
	Add Project Specific Risk Contingency			15	%	€3,208,020.85
	Total L&P Base Cost plus Project Specific Risk Contingency					€24,594,826.50
3	**Planning and Design**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,433,555.00
	Add Project Specific Risk Contingency			15	%	€665,033.25
	Total P&D Base Cost plus Project Specific Risk Contingency					€5,098,588.25
4	**Archaeology**					
	Provision to take account of Actual Costs and Contract Amounts where known					€4,564,500.00
	Add Project Specific Risk Contingency			15	%	€684,675.00
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT					€5,249,175.00
5	**Advance Works and Other Contracts**					
	Provision to take account of Actual Costs and Contract Amounts where known					€3,699,031.00
	Add Project Specific Risk Contingency			15	%	€554,854.65
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€4,253,885.64
6	**Main Contract Supervision (Employer's Costs)**					
	Provision to take account of Actual Costs and Contract Amounts where known					€5,178,643.39
	Add Project Specific Risk Contingency			15	%	€776,796.51
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€5,955,439.90
7	**Residual Network (Provision to be subject to the approval of the NRA Regional Manager)**					
	Provision based on percentage of Main Construction Contract Base Cost. Refer to Table 2 in Rates Tab					€2,959,224.80
	Add Project Specific Risk Contingency			15	%	€443,883.72
	Total Residual Network Base Cost plus Project Specific Risk Contingency					€3,403,108.52
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT						€218,710,449.60
Mainline Length			30.43	km	Rate per km	€7,187,329.92

N.B. Figures above are INCLUSIVE of VAT - VAT rates utilised are : { PLEASE INSERT RATES HERE FOR EACH COST HEADING }
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See attached Budget Assumptions Sheet for Further Scheme Information.

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Appendix D. Road Safety Impact Assessment Report

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N2 Ardee to Castleblayney Road Scheme

ROAD SAFETY IMPACT ASSESMENT REPORT
PHASE 2 – STAGE 1

N2-JAC-HWG-A2C-RP-OS-0002 | P00

September 2019

Monaghan County Council

N2 Ardee to Castleblayney Road Scheme

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Jacobs Engineering Ireland Limited

Merrion House
Merrion Road
Dublin 4, D04 R2C5
Ireland
T +353 1 269 5666
F +353 1 269 5497
www.jacobs.com

Document history and status

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Contents

1. Introduction

This Report has been undertaken in accordance with the requirements of TII's Standard documents; *PE-PMG-02005 Road Safety Impact Assessment Guidelines (December 2017)* and *PE-PMG-02001 Road Safety Impact Assessment (December 2017).* It is also noted that the TII's Standard document the *Project Manager's Manual (PMM) for Major National Road Projects* PE-PMG-02042 (February 2019), specifically states: *'A RSIA will be carried out a report prepared in accordance with PE-PMG-02001 Road Safety Impact Assessment as part of Stage 1 (Preliminary Options Assessment). This will contribute to the refinement of the number of options…'*

TII Standard Document *PE-PMG-02005 (Road Safety Impact Assessment Guidelines)* describes the requirements for carrying out Road Safety Impact Assessments and outlines that the Phase 1(Feasibility) Road Safety Impact Assessment (RSIA) should be reviewed when new alternatives or changes in conditions arise. This RSIA is a result of the Phase 2 (Option Selection Process) Stage 1 Preliminary Options Assessment process. The Phase 2 Stage 1 RSIA report addresses only the changes to the assessment since the previous Phase 1 review and should be read in conjunction with that Report (*N2 Ardee to Castleblayney Road Scheme Phase 1 RSIA Report January 2019*).

This report considers the "Do Minimum" and "Do Something" options. An assessment of the "Do Nothing" option was carried out at the Phase 1 assessment stage and the Phase 1 RSIA report concluded that the "Do Nothing" option will not achieve the desired road safety objectives from an RSIA perspective. Additionally, it was estimated that the projected cost of resultant personal injury collisions will exceed the cost of any interventional infrastructure scheme.

The objective of this assessment is to consider the proposed project from a road safety point of view and by carrying out a comparative analysis of the road safety implications of each option identified during Phase 2 Stage 1. Consequently, a determination of which option would give the best road safety outcome can be made from an RSIA perspective.

The assessment has been carried out on the options that are being assessed during Stage 2 of the Route Selection Process. The assessment reviews the alignment designs prepared at the time of writing, which are route selection designs only, and are not developed to preliminary design level.

1.1 Road Safety Objectives

The road safety objectives of the proposed scheme are to decrease collision frequency and severity on the N2 Ardee to Castleblayney route. This can be achieved by:

- Providing safe overtaking opportunities for motorists along the route in accordance with design standards.
- Reducing the frequency and severity of collisions by providing a safer route for all users.
- Reducing junction numbers and conflict points for N2 traffic.
- Improving safety for vulnerable road users and provide better environment for vulnerable road users within the study area.
- Supporting the RSA Road Safety Strategy 2013-2020.

1.2 Existing Road Safety Problems

The existing road safety issues are outlined in detail in the Phase 1 RSIA Report. The existing problems fall into four key categories:

- Infrastructure deficits: existing infrastructure is currently below the current design standards with respect to overtaking opportunities.
- 85th% road traffic speeds in excess of the posted 100kph speed limits on the N2.
- Inadequate Level of Service (LOS): the present AADT is nearing capacity for Level of Service D.
- A high number of direct accesses along the route.

Each of the above items are largely interdependent, with LOS being influenced by cross-section, and collision numbers being influenced by high speeds.

2. Description of Proposals

2.1 Option 1 – Do-Nothing

The Do-Nothing Alternative/Option was considered in detail as part of the Stage 1 RSIA. It was determined that a Do-Nothing Option was undesirable as it would not work towards meeting the road safety objectives for the project.

2.2 Option 2 – Do Minimum

In accordance with the *TII's Project Appraisal Guidelines Unit 4.0 – Consideration of Alternatives and Options (October 2016)*, the Do-Minimum Alternative/Option provides the baseline for establishing the economic, integration, safety, environmental and accessibility impacts of all options. The Do-Minimum Alternative/Option is referred to as the Base Case within the Common Appraisal Framework for Transport Projects and Programmes (March 2016).

As per the TII's PAG Unit 4.0, the Do-Minimum Alternative/Option should include transportation facilities and services that are defined as ***'committed'*** as opposed to *'planned'*. The definition and differentiation between *'committed'* and *'planned'* schemes as outlined in Clause 4.1 of TII's PAG Unit 4.0 is as follows:

*'**Committed and Planned Schemes***

There are often two possible definitions of complementary projects that should be considered in the appraisal of the scheme in question. Choice among these is determined by the local situation, particularly the degree of certainty that other transportation improvements will be made between now and the horizon year.

The possible definitions include:

a) *"Planned" improvements that are included in the fiscally constrained long-range plan for which the need, commitment, financing, and public and political support are identified and may be reasonably expected to be implemented; and*
b) *"Committed" improvements that have been progressed through planning and are either under construction or are programmed into the capital expenditure budget.*

***The Do Minimum option should consider "committed" schemes alone** as the inclusion of "planned" improvements may lead to a set of scheme options that incorporate projects that may not happen.'*

Furthermore, TII's PAG Unit 4.0 further defines the Do-Minimum Alternative/Option and 'committed' schemes, by stating:

'To provide a basis of comparison the Do-Minimum Option must include the following features:

- *The maintenance of existing facilities and services in the study corridor and region;*
- ***The completion and maintenance of committed projects or policies in the study corridor that have successfully completed their environmental review**; and*
- *The continuation of existing transportation policies.'*

In relation to the final statement above, and the definition of the Do-Minimum Alternative/Option for the N2 Ardee to Castleblayney Road Scheme, it is noted that the *'Maintenance of existing facilities …'* was defined and assessed as part of the Do-Nothing Alternative/Option in the RSIA Phase 1, where this alternative has been discounted from further consideration.

In terms of *'committed'* schemes, a list of projects within Study Area which have been identified by TII, Monaghan and Louth County Councils. Schemes outside of the Study Area which would likely impact on scheme appraisal were also considered. A list of the 'committed' schemes for the N2 Ardee to Castleblayney Road Scheme is provided in Table 2-1 below.

Ref. No.	Scheme Name	Authority	General Description	Approx. Length (km)	Status
1	**N52 Ardee Bypass Scheme**	Louth County Council & TII	Single Carriageway link road on the north-eastern environs of Ardee own connecting the existing N52 in the Townland of Mandistown to N2 in the Townland of Mandistown, approximately 700m North of the existing Carrickmacross Road Roundabout (N2/N33/R171/ Carrick Road)	4.5	Advance Fencing and Site Clearance Contract Ongoing. Alternative Junction and pedestrian/ cyclists arrangements are currently being prepared by LCC.
2	**N2 Ardee to Aclint Minor Improvements Scheme**	Louth County Council & TII	Minor localised online safety improvements at 4 No. locations (Approach to Carrickmacross Roundabout, Cookstown Cross, L1201 Reaghstown Junction, & South of Aclint Bridge) on the existing N2 between Ardee and Aclint. Works include additional signage, re-surfacing, and junction re-alignment within the existing carriageway.	3.4	Works are envisaged to be completed by Q1 2020

Table 2-1 – List of 'committed' schemes for the N2 Ardee to Castleblayney Road Scheme

2.3 Option 3 – Do-Something – Public Transport Alternative

Under this Do-Something Alternative, various public transport modes which could present a potential viable alternative to other Do-Something Options (including a new feasible route option), are considered and assessed from a safety perspective.

2.3.1 Public Transport Alternative – Bus

There are currently a number of national public bus services, local community-based initiatives and private operators going through and operating within the Study Area.

In relation to national bus services, Bus Éireann operates services along the existing N2 between Dublin and Letterkenny with stops including Ardee, Carrickmacross and Castleblayney. In addition, Bus Eireann provides links from Ardee and Castleblayney to all other major towns and cities within the region such as Dublin (including Dublin Airport), Dundalk, Drogheda, Cavan, Letterkenny and Belfast. Translink (Ulsterbus) offers similar services within the Study Area.

Regarding local initiatives, 17 National Transport Co-ordination Units (TCUs) were set-up in 2014 on behalf of the National Transport Authority to manage the Rural Transport Programme in Ireland, and provide transport services where public services are not readily available. Within the N2 Ardee to Castleblayney Road Scheme Study Area, 2 TCUs operate; 'Cavan Monaghan LocalLink' in the county of Monaghan and 'Louth, Meath and Fingal LocalLink' (Trading as Flexibus) in the county of Louth, which manage services connecting local areas and villages to Ardee, Carrickmacross, and Castleblayney. In addition to the public and local initiative services, there are a number of private operators providing bus services including Collins Coaches (Ballybay-Carrickmacross-Ardee-Dublin). Separately, it is noted that bus transportation cannot reasonably serve the transportation of freight and large goods.

2.3.2 It is recognised that public transport will be further prioritised in the future with increased investment, as outlined in the National Planning Framework (NPF) 2040, which will lead to potentially greater coverage, accessibility, and frequency of bus services and stops. Notwithstanding this, at this preliminary assessment stage, it is considered due to the dispersed geographical nature of the population across the study area, private vehicle transportation will still be the predominant mode of transport in the Study Area, and bus transportation cannot solely meet the expected increased transport demands in the future. Potential modal shift will be considered in further detail in the subsequent Stage 2 assessment of the scheme. Public Transport Alternative – Rail & Air

There are no existing operating rail services within the Study Area. The nearest operating train stations to the Study Area are Drogheda and Dundalk on the Dublin to Belfast line, which are approximately 12km and 19.5km (to the nearest point of the Study Area boundary), respectively.

Regarding Irish Rail's future infrastructure plans, the 2030 Rail Network Strategy Review (2011) outlines Irish Rail's future development requirements. There is no reference to any new rail routes within or within close proximity to the Study Area.

2.4 Option 4 – Do Something - Traffic Management Alternative

The existing operational and safety issues identified under the Do-Nothing Alternative, in terms of Road Layout, Traffic Capacity and Composition, Collision Occurrence, Overtaking Opportunities, Vulnerable Road Users and Traffic Speeds, were used to inform and define the particular Traffic Management Alternative(s) for this scheme, whilst recognising that the Traffic Management Alternative, as per TII PAG Unit 4.0 is *'near-term'* and utilises *'the existing infrastructure'*. In this regard, the following Traffic Management Alternatives, which could be potentially delivered through smaller targeted investment, are identified below and described in further detail in the N2 Ardee to Castleblayney Road Scheme Phase 2 – Stage 1 Assessment Working Paper Report (September 2019) :

2.4.1 Localised Operational and Safety Infrastructure Improvements

These improvements would vary in nature and location, whereby the improvements identified in Table 2-2 could consist of:

Scope	Description
Localised Junction Improvements	Potential improvements could consist of installation of ghost-island right-turning lanes, minor side road re-alignment to improve visibility, blocking traffic crossing the N2 from low volume local roads at particular sub-standard staggers/direct crossroads through left-in-left-out measures, and local road additional/revised road marking.
Targeted Localised Road Widening	Targeted localised improvements to particular bends and widening of verges may improve forward visibility / stopping site distances and could have the benefit of increasing the lengths of permitted and safe overtaking sections on the N2.
Additional & Improved Road Signage, Marking and Lighting	Addressing comments raised in the 2017 TII Road Safety Inspection relating to incorrectly positioned, misleading or missing road signage and markings.
Reduction in Number of Accesses	Removal of direct accesses (public roads, domestic, commercial and agricultural) to reduce the number of potential conflict points. As a near term measure, this may be achieved by blocking traffic crossing the N2 from particular local roads through the introduction of left-in and left-out junctions and accesses, where appropriate and feasible.
Removal and Set-Back of Existing Road Side Hazards	Addressing comments raised in the 2017 TII Road Safety Inspection relating to setting back of roadside furniture/ features outside the clearzone such as electricity poles, trees, boundary walls and post and rail fences.

Scope	Description
	The retrofitting of non-compliant road restraint systems identified in the Phase 2 RSIA would also be addressed.
Provision of Rest Areas for Drivers	Provision of a dedicated rest area/ layby to mitigate the risk of driver fatigue.

Table 2-2 – List of proposed Localised Operational and Safety Infrastructure Improvements

2.4.2 Speed Reduction Measures

For the Speed Reduction Measures Traffic Management Alternative, three specific measures outlined in table 2-3 were considered:

Scope	Description
Increased Speed Monitoring and Enforcement	Increase in enforcement time in the monitoring of speed by Garda National Traffic Bureau (GNTB) and the Go Safe Programme on active safety zones along the N2 between Ardee and Castleblayney.
Reduced Posted Speed Limits	Implementing a lower speed limit along the N2 with appropriate Garda Síochána enforcement.
Average Speed Cameras	Introduction of point-to-point (P2P) speed cameras that measures persistent or sustained speeding over a certain distance, rather than the transitory speed of a vehicle at a particular point on the road, as detected by the traditional methods.

Table 2-3 – List of proposed Speed Reduction Measures

2.5 Do-Something Alternative – Stage 1 Feasible Route Corridor Options

As per the Section 4.2 of TII's PAG Unit 4.0, a feasible route corridor is defined as *'a corridor improvement* (which) *can be delivered through a major investment to widen an existing road, or to develop a new alignment'*

A description of each Stage 1 feasible route corridor options for this scheme is outlined in Table 2-4 overleaf. A layout plan of the Stage 1 feasible route corridor options is provided in Appendix A of this report.

Table 2-4: N2 Ardee to Castleblayney – Key Details and Route Description of Stage 1 Feasible Route Corridor Options

Ref. No.	Option Ref. Name	Corridor Type/ Short Description	Online / Offline	Length (km)	General Route Description
Full-Length Coloured Route Corridor Option / 'Root' Option					
1	**Brown**	Full Length Coloured Route Option / Root Option	Approx. 95% Offline / 5% Online	35.380	Starting at the commencement point, Start, the Brown Option is online up to the townland of Harristown where it goes offline in a north-westerly direction just South of Cookstown. Continuing in a north-western direction, it traverses the townlands of Rathgeenan and Lagan where it crosses the River Lagan/Glyde. At this crossing, the option enters Co. Monaghan and travels along the western extremity of the Study Area, passing to the West of Lough Fea through the townlands of Clonsedy and Drumgoosat, crossing the River Lurgans and the R179 Kingscourt Road. At this point the Blue Option travels in a more northerly direction where it passes Carrickmacross on the western side of the town through the townland of Corrinshigagh. It continues North crossing the R178 Shercock Road as well as the R180 Ballybay Road and continues to the West of Lisdoonan Village. Further North it travels to the East of Lough Egish traversing through the townlands of Corravoo and Knockavolis, terminating at the end point in the townland of Tullyvin.
2	**Cyan**	Full Length Coloured Route Option / Root Option	Approx. 90% Offline / 10% Online	32.660	Starting at the commencement point, Start, the Cyan Option is online up to the townland of Harristown where it goes offline in a north-westerly direction just South of Cookstown. Travelling in a more northerly direction it crosses the River Lagan/River Glyde and traverses the townlands of Drumboory and Shanmullagh where it crosses the existing N2. As it continues North, it crosses the River Proules and veers to the East of Monalty Lough and Carrickmacross, crossing the R178 Dundalk Road and R179. At this point it takes a westerly direction to the East of Donaghmoyne and avoiding Moylan Lough. Veering northwards again, it crosses the N2 and traverses the townlands of Lisnagunnion, Corlygorm and Corrinshigagh. At this point, it travels along the western side of the existing N2 and Broomfield. The cyan option joins the existing N2 near the townland of Carrickagarvan and terminates at the southern roundabout of the Castleblayney Bypass.

Ref. No.	Option Ref. Name	Corridor Type/ Short Description	Online / Offline	Length (km)	General Route Description
3	**Yellow**	Full Length Coloured Route Option / Root Option	Approx. 3% Offline / 97% Online	31.160	Starting at the commencement point, Start, the Yellow Option is online along the existing N2 passing through Cookstown, Edmonstown, Reaghstown, Aclint Bridge and online through the Carrickmacross By-pass and the existing N2 section from Creevy to Tullyvaragh Upper. At this point, there is a slight offline improvement at Tullyvaragh Lower where it re-joins online again at the townland of Corlygorm. The Yellow Option continues online along the N2 passing through the townlands of Garranroe, Brackagh, Drumganus Upper and Lower and passing through Broomfield, Mullaghanee, Clonavogy, Carrickgarvan, Tullyvin and terminating at the southern roundabout at Castleblayney.
4	**Green**	Full Length Coloured Route Option / Root Option	Approx. 85% Offline / 15% Online	29.755	Starting at the commencement point, Start, the Green Option is online up to the crossroads at Cookstown. Running in a north western direction this option continues towards Arthurstown and to the East of Reaghstown/ Edmonstown. At this point it follows a north easterly direction and crosses the River Glyde and enters Co. Monaghan. Following onwards adjacent to the River Proules, it traverses the townland of Tullygowan and to the East of Killanny. To the West of Essexford, it crosses the R178 Dundalk Road and the R179 passing through the townlands of Cordrummans to the East of Donaghmoyne. From this point, it veers in a more westerly direction to cross the existing N2 at the townlands of Garranroe and Cornamucklagh. Running in a more northerly direction and running parallel to the existing N2, the Green Option passes through the townlands of Clonavogy, Brackagh and Cornahawla to the West of Broomfield. The Green Option continues northwards where it re-joins online with the existing N2 at Clonavogy and Carrickgarvan and terminates at the southern roundabout at Castleblayney.
5	**Purple**	Full Length Coloured Route Option / Root Option	Approx. 65% Offline / 35% Online	31.620	Starting at the commencement point, Start, the Purple Option is online up to the crossroads at Cookstown. Running in a north western direction this option continues towards Arthurstown and to the East of Reaghstown/ Edmonstown. To the East of Aclint Bridge, it crosses the River Glyde and enters Co. Monaghan. Going through the townlands of Ballyregan and Corradoran it re-joins the N2 as an online option at Clonturk at the southern end of the Carrickmacross By-pass. It continues North along the online section of the N2 as far as North of Carrickmacross by-pass where it goes offline at the townland of Creevy. Continuing in a northerly direction, the purple option passes through the townlands of Laragh, Corlea and to the East of Lisdoonan Village. It

Ref. No.	Option Ref. Name	Corridor Type/ Short Description	Online / Offline	Length (km)	General Route Description
					continues further North on the West of the existing N2 where it re-joins the N2 online at Carrickgarvan and terminates at the southern roundabout at Castleblayney.
6	**Orange**	Full Length Coloured Route Option / Root Option	Approx. 95% Offline / 5% Online	30.290	Starting at the commencement point, Start, the Orange Option is offline passing through the townlands of Glebe and Mullacloe and running parallel to the R171 Dundalk Road. Following a northerly direction, it passes to the West of Pepperstown and to the East of Charlestown, crossing to the East of Arthurstown Crossroads. From here it runs to the West of Thomastown and Philipstown where it crosses the River Glyde. Continuing in a northerly direction, the Orange Option passes through the townlands of Tully and Drumgowna and to the East of the Red Bog where it crosses the R178 Dundalk Road. Following a more north westerly direction, the option passes through the townlands of Drumgristin Upper, Kiltybegs and Drumneil where it crosses the R179. Further North, it traverses the townlands of Feegavla, Lisnamoyle, Drumaconvern, Knockreagh Lower and Drumganus Upper where it passes to the West of Annalittin. From this point the Orange Option re-joins the N2 online at Clonavogy and terminates at the southern roundabout at Castleblayney.
Amalgamated Route Corridor Options					
7	**Yellow + Blue**	Yellow to Node N + Blue till End	Approx. 15% Offline / 85% Online	31.150	Starting at the commencement point, Start, the Yellow + Blue Option follows the Yellow Option to Node Point N. It then transfers to the Blue Option to the West of Broomfield going through the townlands of Corrinshigagh, Taplagh, Brackagh, Lisaquil, Cornahawla, Drumganus Lower, Aghadreenan, Mullaghanee, and Annalitten. In the townlands of Mullanghanee and Annalitten, the Blue Option returns to the existing N2, and follows the existing N2 (similar to the Yellow Option) and terminates at the southern roundabout at Castleblayney.
8	**Cyan+ Yellow + Blue**	Cyan (Start to Node C) + Yellow (Node C to N) + Blue till End	Approx. 45% Offline / 55% Online	31.975	Starting at the commencement point, Start, this option follows the Cyan Option to Node Point C where it connects to the Yellow Option. This option then continues along the Yellow Option to Node Point N where it then transfers to Blue Option West of Broomfield, going through the townlands of Corrinshigagh, Taplagh, Brackagh, Lisaquil, Cornahawla, Drumganus Lower, Aghadreenan, Mullaghanee and Annalitten. In the townlands of Mullanghanee and Annalitten, the Blue Option returns to the existing N2, and follows the existing N2 (similar to the Yellow Option) and and terminates at the southern roundabout at Castleblayney.

Ref. No.	Option Ref. Name	Corridor Type/ Short Description	Online / Offline	Length (km)	General Route Description
9	**Yellow + Purple**	Yellow till Node F + Purple till End	Approx. 40% Offline / 60% Online	30.985	Starting at the commencement point, Start, this option follows the Yellow Option to Node Point F. From this node point, the option then follows the Purple Option where it terminates at the southern roundabout at Castleblayney.
10	**Purple + Yellow + Blue**	Purple till Node F + Yellow (Node F to N) + Blue till End	Approx. 45% Offline / 55% Online	31.790	Starting at the commencement point, Start, this option follows the Purple Option to Node Point F. From this node point, the option then follows the Yellow Option to Node Point N, where it then transfers to Blue Option West of Broomfield, going through the townlands of Corrinshigagh, Taplagh, Brackagh, Lisaquil, Cornahawla, Drumganus Lower, Aghadreenan, Mullaghanee and Annalitten. In the townlands of Mullanghanee and Annalitten, the Blue Option returns to the existing N2, and follows the existing N2 (similar to the Yellow Option) and and terminates at the southern roundabout at Castleblayney.
11	**Yellow + Cyan+ Green**	Yellow till Node J + Link J-K + Cyan (K to O) + Link O-P + Green (P to End)	Approx. 25% Offline / 75% Online	31.020	Starting at the commencement point, Start, this option follows the Yellow Option to Node Point J. From this node point, it then connects to the Cyan Option using the J to K Link and going through the townlands of Tullyvaragh Lower and Corlygorm at Node Point K on the Cyan Route. This option then follows the O to P Link from Node Point O to connect to the Green Option at Node Point P going through the townlands of Cornagall, Cornahawla, Agheeshal and Drumharriff North. From Node Point P, this option follows the Green Option where it terminates at the southern roundabout at Castleblayney.
12	**Yellow + Purple + Green**	Yellow till Node F + Purple (Node F to Q) + Link Q-R + Green (R to End)	Approx. 35% Offline / 65% Online	31.085	Starting at the commencement point, Start, this option follows the Yellow Option to Node Point F. From this node point, it then connects to the Purple Option. The option then follows the Purple Option to Node Point Q and uses the Q to R Link to connect to the Green Option and going through the townlands of Corrateean, Agheeshal, Drrumharriff North and Cornalough. From Node Point R, the option follows the Green Option where it terminates at the southern roundabout at Castleblayney.
13	**Brown+ Purple**	Brown (Start to Node G) + Link G-H +	Approx. 90% Offline	35.760	Starting at the commencement point, Start, this option follows the Brown Option to Node Point G. From this node point, the option then connects to the Purple Option using the G to H Link and going through the townlands of Barndonagh, Lossets, Titagarvan, Beagh, Lisnaguiveragh,

Ref. No.	Option Ref. Name	Corridor Type/ Short Description	Online / Offline	Length (km)	General Route Description
		Purple (Node H to End)	/ 10% Online		Drumbroagh, Greaghdrumneesk, Cornasleeve, Cormoy, Corlea, Cashlan East, Drumlurg, and Beagh. From Node Point H, this option then follows the Purple Option where it terminates at the southern roundabout at Castleblayney.
14	**Cyan + Yellow + Purple**	Cyan (Start to Node C) + Yellow (Node C to F) + Purple (F to End)	Approx. 75% Offline / 25% Online	31.805	Starting at the commencement point, Start, this option follows the Cyan Option to Node Point C. From Node Point C, the option follows the Yellow Option to Node Point F. From Node Point F, the option then follows the Purple Option where it terminates at the southern roundabout at Castleblayney.
15	**Green + Cyan**	Green (Start to Node D) + Link D-E + Cyan (Node E to End)	Approx. 85% Offline / 15% Online	31.185	Starting at the commencement point, Start, this option follows the Green Option to Node Point D. From this node point, the option then connects to the Cyan Option using the D to E Link and going through the townlands of Garlegobban, Ballinagarry, Kinallybrane and Rossdreenagh. From Node Point E, this option then follows the Cyan Option where it terminates at the southern roundabout at Castleblayney.
16	**Orange+ Green 1**	Orange (Start to Node A) + Link A-B + Green (Node B till End)	Approx. 95% Offline / 5% Online	30.055	Starting at the commencement point, Start, this option follows the Orange Option to Node Point A. From this node point, the option then connects to the Green Option using the A to B Link and going through the townlands of Thomastown, Nicholastown and Tully. From Node Point B, this option then follows the Green Option where it terminates at the southern roundabout at Castleblayney.
17	**Orange+ Green 2**	Orange (Start to Node L) + Link L-M + Green (M till End)	Approx. 95% Offline / 5% Online	30.430	Starting at the commencement point, Start, this option follows the Orange Option to Node Point L. From this node point, the option then connects to the Green Option using the L to M Link and going through the townlands of Mullanavannog, Lisamoyle Etra, Coolcair and Drumillard. From Node Point M, this option then follows the Green Option where it terminates at the southern roundabout at Castleblayney.

3. Assessment of Impacts on Road Safety of the Do Minimum Alternative

3.1 Assessment of Effects on All Road Users, Including Vulnerable Road Users

The aim of any preferred solution is to carefully balance the demands of all users improving safety and increasing accessibility and operational efficiency for all.

It is noted that the difference between the Do-Nothing Alternative and Do-Minimum Alternative, is the addition of two *'committed'* schemes; N52 Ardee Bypass Scheme, and N2 Ardee to Aclint Minor Improvements Scheme. The N52 Ardee Bypass Scheme does not improve the N2 itself, whilst N2 Ardee to Aclint Minor Improvements Scheme consists of minor localised safety improvements at 4 No. locations as described in Table 2-1 above. Therefore, at this stage, it is identified that the anticipated effects of the Do Minimum option would be:

- **Car Driver**: Drivers will continue to be vulnerable at some junctions where ghost islands are not present. Right turning drivers at these locations will have to wait to make their manoeuvre within a gap of oncoming traffic while adding to congestion on the N2 mainline as traffic waits behind or undertakes in the hard shoulder. This may result in risk-taking by right-turning driver. They will also continue to suffer driver frustration in waiting for appropriate location to overtake slowly moving vehicles.

- **Goods Vehicle/Bus Driver/ Agricultural Vehicles**: Drivers of slower moving goods/ agricultural vehicles and buses will continue to experience pressure to facilitate overtaking by moving into the hard shoulder as they drive on the N2 mainline creating a potential conflict with vehicles existing from side road junctions to join the mainline traffic.

- **Pedestrian:** Pedestrians will continue to use the hard-shoulder, due to the lack of formal provision for walking. It is expected that pedestrian numbers are low, simply due to the high safety risks that pedestrians would face in attempting to walk along the N2. If nothing is implemented to address this, it is likely this lack of pedestrian use will continue.

- **Cyclist**: Cyclists will continue to use the N2 as they currently do, obliged to commanding sufficient space in the carriageway or utilising the hard shoulder. Cyclists are increasingly vulnerable to the significant number of accesses and junctions and motorists who drive partly in the hard shoulder to facilitate overtaking. This results in a route that is not inviting for cyclists to use.

3.2 Assessment of Effects on Traffic Flow and Traffic Patterns

As no traffic modelling has been conducted for the scheme yet, the monetary effects on traffic flow and traffic patterns have not yet been derived. However, it's evident that a Do-Minimum Alternative will result in a continuation of the existing conditions on the N2, with congestion experienced at peak times, while there will be increased potential for conflict as traffic volumes on side roads and accesses increase.

It is considered that the N52 Ardee Bypass Scheme may change traffic flow and traffic patterns on the N2 and in particular the Carrickmacross Road Roundabout (N2/N33/R171).

3.3 Do Minimum Assessment Conclusion

Notwithstanding the inclusion of these two schemes, and as per the Do-Nothing Alternative, it is considered at this stage that the Do-Minimum Option does not meet the road safety objectives for the scheme.

4. Assessment of Impacts on Road Safety of the Do Something - Public Transport Alternative

4.1 Public Transport Alternative – Bus

4.1.1 Assessment of Effects on All Road Users, Including Vulnerable Road Users

Bus Services would have no effect on road users such as Goods or Agricultural Vehicles which are all slower moving vehicles. Similar to the Do Minimum Alternative, these vehicle types would continue to face pressure to facilitate overtaking by faster moving vehicles.

The provision of bus services on the N2 or in its vicinity would require improved bus stop facilities to encourage any modal shift. The introduction of bus stops would generate pedestrian desire lines requiring improved pedestrian facilities such as footpaths and formal controlled and uncontrolled crossing facilities depending on the particular location. Furthermore, the introduction of these facilities would necessitate public lighting to highlight the presence of pedestrians during hours of darkness. These measures would improve safety and provide a better environment for vulnerable road users along the N2.

The provision of bus stops on the N2 may introduce conflicts between buses/ cars in the pick-up/ drop off of passengers, and cyclists who utilise the carriageway or hard shoulder.

4.1.2 This alternative from a RSIA perspective would not address the provision of safe overtaking opportunities or the reduction of junction numbers and conflict points for N2 traffic. Assessment of Effects on Traffic Flow and Traffic Patterns

As outlined in Section 2.3.1, It is recognised that public transport will be further prioritised in the future with increased investment, as outlined in the NPF 2040, which will lead to potentially greater coverage, accessibility, and frequency of bus services and stops. Notwithstanding this, at this preliminary assessment stage, it is considered due to the dispersed geographical nature of the population across the study area, private vehicle transportation will still be the predominant mode of transport in the Study Area, and bus transportation cannot solely meet the expected increased transport demands in the future. Potential modal shift will be considered in further detail in the subsequent Stage 2 assessment of the scheme.

4.2 Public Transport Alternative – Rail & Air

It is noted as there is no existing operating rail infrastructure within (or within close proximity) to the Study Area, and that there are no future plans or objectives for new rail infrastructure within (or within close proximity) to the Study Area. Therefore, it is assessed at this stage that the primary transport infrastructure for private, commercial and freight is and will be road-based.

4.3 Do Something - Public Transport Alternative Assessment Conclusion

It is considered at this stage that the Do-Something – Public Transport Options does not meet the road safety objectives for the scheme.

5. Assessment of Impacts on Road Safety of the Do Something - Traffic Management Alternative

5.1 Localised Operational and Safety Infrastructure Improvements

5.1.1 Assessment of Effects on All Road Users, Including Vulnerable Road Users

The actioning of issues raised in the TII N2 Road Safety Inspection Report (January 2017), as summarised in Phase 1 RSIA Report, to remove/ set back existing roadside furniture/ features would reduce the risk of collisions due to errant vehicles temporarily leaving the carriageway.

In terms of head-on-collisions, it is noted that these targeted localised road widening improvements and any other localised operational and safety improvements would not address the safety issue of an errant vehicles crossing into the path of a vehicle in the opposing lane. The most effective method of preventing these types of collisions from occurring is to install a safety barrier to separate opposing streams of traffic, and this would not be permitted on a single carriageway.

The proposed improvements may result in an inconsistent approach to junction layouts along the route leading to driver confusion. As "near term" solutions (as defined in TII PAG Unit 4.0), there may have to be compromises with respect to the design as additional land may not be available, as only existing infrastructure could be utilised.

The proposed measure would not provide safe facilities for vulnerable road users or provide a better environment for vulnerable road users within the study area.

5.1.2 Assessment of Effects on Traffic Flow and Traffic Patterns

It is noted that the number of overtaking opportunities may reduce with the expected traffic growth on the N2 leading to increases in driver frustration.

5.2 Speed Reduction Measures

5.2.1 Assessment of Effects on All Road Users, Including Vulnerable Road Users

The implementation of the proposed speed reduction measures through enforcement and technology whether in isolation or in combination would result in reduced speeds along the N2 and therefore contribute to a reduced frequency and severity of collisions.

These measures may still result in driver frustration as they may reduce a motorist's ability to over-take slower moving vehicles.

5.2.2 Assessment of Effects on Traffic Flow and Traffic Patterns

The proposed enforcement measures may result in motorists choosing alternative routes to avoid fixed speed cameras and evade fines/ penalty points resulting in alternations to traffic patterns.

5.3 Do Something – Traffic Management Alternative Assessment Conclusion

The assessment of the proposed Localised Safety Infrastructure Improvements concludes that the six identified measures in Table 2-2 could offer potential safety benefits, either separately or in combination but may fail to fully

mitigate against the risk of head on type collisions which formed a significant component of historic collision statistics.

The proposed speed reduction measures would have a positive impact on speed (& collisions) reduction. However these measures whether a sole solution or collectively would only meet some of the Road Safety Objectives (i.e. Safety – *'Reduce the frequency and severity of collisions…'* and *'Support the RSA Road Safety Strategy 2013-2020'*). Also, it is noted that reductions in speed alone is not the only contributor to a reduction in collisions and to a safer road environment. Safety issues as outlined in the Do-Nothing Alternative in the RSIA Stage 1 Report and the Phase 2 – Stage 1 Assessment Working Paper Report, such as the high number of accesses/junctions, lack of an adequate number of overtaking opportunities, and growing traffic demand, will still exist if this measure is pursued.

Therefore, it is considered at this stage that the Do-Something – Traffic Management Options do not meet all of the road safety objectives for the scheme.

6. Assessment of Impacts on Road Safety of the Do Something – Stage 1 Feasible Route Corridor Options

With reference to Section 2.5 above, and the layout plan shown in Appendix A, the 400m corridor for each option formed the basis of the RSIA Stage 1 Assessment. Though, for certain criteria, as outlined below, it was necessary for the options to be assessed based on the Stage 1 indicative working alignments.

6.1 Analysis of Impacts on Road Safety

Each route option will influence various aspects of the operation of the road network in the locality which in turn have an impact on road safety. Ten Sub-Criterion Elements were initially selected and assessed for Stage 1 Road Safety Impact Assessment (RSIA);

1) Effects on Traffic Flow and Traffic Patterns.
2) Impact on Non-Motorised User Travel.
3) Tie-in Location.
4) Seasonal Conditions.
5) Possibility of Seismic Conditions.
6) Safe Parking Areas.
7) Forgiving Roadsides.
8) Susceptibility to Climatic Changes at Higher Elevations.
9) Geometric Standards Impacting Driver Comfort – Vertical Alignment.
10) Geometric Standards Impacting Driver Comfort – Horizontal Alignment.

As described in further detail below, ten sub-criterion elements were initially selected and assessed. In the case of the N2 Ardee to Castleblayney Road Scheme, it was determined that four of these sub-criterion elements (Impact on Non-Motorised User Travel, Seasonal Conditions, Possibility of Seismic Activity, and Safe Parking Areas) were determined to be neutral or have a negliable difference across all options for this initial stage of the options selection process. Therefore, the remaining six sub-criterion elements formed the basis as the differentiation between the Stage 1 Feasible Route Corridor Options.

As further described in the N2 Ardee to Castleblayney Road Scheme Phase 2 – Stage 1 Assessment Working Paper Report (September 2019), the prescribed seven-point performance scoring system as per TII's PAG Unit 7.0 (Multi - Criteria Analysis) was employed for the Stage 1 RSIA comparative assessment. As per PAG Unit 7.0, an impact level (*Highly Positive to Highly Negative*) was assessed by the RSIA Auditor for each sub-criterion element and an associated performance score based on the seven-point scale (i.e. '7- Highly Positive, 1- Highly Negative) was assigned to each sub-criterion element.

6.1.1 RSIA Sub-Criterion Element: Effects on Traffic Flow and Traffic Patterns

At this initial stage of the scheme development, in the absence of a completed scheme specific traffic model, it is recognised that there is insufficient traffic data to determine the influence of each option on traffic travel patterns, and the impact on regional and local roads, used as potential rat runs to access the proposed route. Furthermore, it is recognised the junction strategy is yet to be developed. Therefore, in terms of assessing the impact of options on traffic flow and patterns at this initial stage, consideration of the degree of off-line and on-line construction in terms of safety and its influence on existing travel patterns has been identified as an appropriate Sub-Criterion Element.

An off-line alignment may be considered safer from a road safety perspective; particularly where there is extensive roadside development on the existing road and where there is evidence of collision clusters. The offline options are considered to provide a greater opportunity to construct a newer safer road layout. At this initial stage of scheme development, the online options present a greater probability of being potentially compromised by the need to cater for comparatively higher densities of existing development. Also, at this this initial stage of scheme development, an online option may also prove more difficult to achieve compliant design in accordance with TII Publications compared to an offline option.

The basis of the performance scoring for this Sub-Criterion is that offline sections of Options being favoured over online sections due to the segregation of local and strategic traffic. The offline sections are also favoured, as it is considered that the online sections will need to accommodate a greater number of existing accesses via new accommodation and side roads, parallel to the mainline. This would provide an increased number of potential road safety conflict points between (i) the accesses and the accommodation road, and (ii) the accommodation road and the nearest adjacent Local Rd/ Regional Rd when compared to offline sections.

As part of the Phase 2 Stage 1 RSIA, the RSIA team derived the following scoring system for this sub-criterion element:

- <= 10 % Online =7
- 11 to <=20% Online = 6,
- 21 to <=30% Online = 5,
- 31 to <=40% Online = 4,
- 41 to <=50% Online = 3,
- 51 to <=60% Online = 2,
- 61 to <=70% Online = 1

6.1.2 RSIA Sub-Criterion Element: Impact on Non-Motorised User Travel

The proposed routes will all consider the needs of all road users including cyclists and pedestrians and that facilities are sufficiently set back from the carriageway edge. Therefore, this criterion was determined to be Non-Applicable (N/A) due to the negligible difference across all options for this initial stage of the options selection process.

6.1.3 RSIA Sub-Criterion Element: Tie-In Location

This Sub-Criterion relates to consideration of the tie-locations of the corridors at the start and end points only.

It is recognised that the Junction Strategy is yet to be developed and confirmed. However, for the basis of this assessment, it is assumed that the proposed scheme will tie-in to the existing Castleblayney Roundabout at the northern end and the proposed N52 Bypass at the southern end. Thereby, introducing additional arms to these roundabouts for some of the options. An additional arm introduces another conflict point which increases the risk of collisions. In relation to scoring of this Sub-Criterion, the RSIA team comparatively assessed the options based on the likelihood of additional arms to the identified roundabouts and the general alignments on the approach to these roundabouts.

6.1.4 RSIA Sub-Criterion Element: Seasonal Conditions

The variable weather in Ireland throughout the year can cause flooding and icy conditions on the road network which in turn cause maintenance issues such as potholes and other road defects. The variable conditions combined with the resultant defects can cause collisions of all degrees of severity. The construction or upgrade of any of these proposals of a national route would ensure safety to drivers during icy conditions by providing a well maintained route.

Therefore, this criterion was determined to be Non-Applicable (N/A) across all options due to the negligible difference across all options for this initial stage of the options selection process.

6.1.5 RSIA Sub-Criterion Element: Possibility of Seismic Conditions

It was deemed that the possibility of Seismic Conditions within the study area in Co Monaghan/ Co Louth was low from a review of data on the Irish National Seismic Network website.

Therefore, this criterion was determined to be Non-Applicable (N/A) across all options due to the negligible difference across all options for this initial stage of the options selection process.

6.1.6 RSIA Sub-Criterion Element: Safe Parking Areas

No parking areas have been identified along the different route options at this stage. The design team should ensure that lay bys are included as part of the preliminary design to allow motorists to rest, as tiredness can lead to an increased risk of collisions. Therefore, this criterion was determined to be Non-Applicable (N/A) due to the negligible difference across all options for this initial stage of the options selection process.

6.1.7 RSIA Sub-Criterion Element: Forgiving Roadsides

It is considered that 'Forgiving Roadside Approach' as defined in the TII Standards will be more difficult to achieve on online route options due to the proximity of housing boundaries, the properties themselves and other existing roadside hazards. This may lead to less desirable mitigation measures from a safety perspective (a higher level of safety barriers, employment of steeper slopes, etc.) within the clearzone of the carriageway. For this assessment, options which had significant lengths of online sections were scored negatively.

As part of the Phase 2 Stage 1 RSIA, the RSIA team derived the following scoring system for this sub-criterion element:

- <= 10 % Online =7
- 11 to <=20% Online = 6,
- 21 to <=30% Online = 5,
- 31 to <=40% Online = 4,
- 41 to <=50% Online = 3,
- 51 to <=60% Online = 2,
- 61 to <=70% Online = 1

6.1.8 RSIA Sub-Criterion Element: Susceptibility to Climatic Changes at Higher Elevations

This assessment comprised of the identification of instances where the indicative mainline alignment is greater than an elevation of 180m OD Malin. At heights greater than 180m OD Malin, it is considered that road users would be more susceptible to greater and more extreme climatic changes (snow, frost, etc.), which would adversely affect the safety of road users.

In relation to performance scoring, options which have the highest numbers of instances above 180m OD Malin, were allocated a score 1.

6.1.9 Engineering Design Review

A review of the geometric design parameters of the indicative working alignment of each route corridor option was undertaken in further understanding the differences between the options.. Although all route options fall within the permissible design criteria set out in TII Publication DN-GEO-03031, there are elements of the indicative design which are close to the limiting value of the design standards. From a RSIA perspective, this results in a lesser degree

of comfort for road users over the minimum standard and limits the potential future flexibility to amend the design. The assessment considered horizontal radii, vertical crest and sag curves and gradients. Limiting criteria for a design speed of 100kph are shown in Table 6-1 below:

Table 6-1 Criteria reviewed to determine designs approaching limiting values

	Desirable Minimum	Desirable Maximum
Horizontal Radii	720m	
Vertical Crest	100	
Vertical Sag	37	
Vertical Gradient		4%

6.1.9.1 RSIA Sub-Criterion Element: Potential Geometric Standards Impacting Driver Comfort – Horizontal

A working indicative mainline alignment has been developed within the 400m corridor of each Option. All of these indicative alignments have been designed in accordance to TII's Design Standards and are all above or to Desirable Minimum Standards/1-Step relaxations. No Departures to Standard has been applied at this early stage of the design. Although, all of these alignments are subject to change, the RSIA team has determined that the alignments can be considered to be generally representative of the corridors in broad geometric terms, and that their high-level properties (i.e. mainline horizontal and vertical) can be used as a basis for comparative properties for the Stage 1 assessment.

For this Sub-Criterion, the indicative mainline horizontal alignment was reviewed from a RSIA perspective to identify bends, which although acceptable to employ from a TII Standard perspective, may result in a lesser degree of driving comfort for road users. As part of the review, and with reference to TII Design Standard *Rural Road Link Design* - Standard *DN-GEO-03031 (2017),* the following parameters were identified and estimated for each option:

- Application of Horizontal Radii at 720m (Desirable) and <720m (1 Step Relaxation) – Number of Instances & Combined Length

As part of the Stage 1 RSIA, the RISA team derived the following scoring system for this sub-criterion element:

- > 4000m Combined Length of Radii at or below 720m Radius = 1
- >3500, <4000 = 2
- >3000, <3500 = 3
- >2500, <3000 = 4
- >2000, <2500 = 5
- >1500, <2000 = 6
- <1500 = 7

6.1.9.2 RSIA Sub-Criterion Element: Potential Geometric Standards Impacting Driver Comfort – Vertical

Similar to horizontal alignment, for this Sub-Criterion, the indicative mainline vertical alignment was reviewed from a RSIA perspective to identify gradients, which although acceptable to employ from a TII Standard perspective, may result in a lesser degree of driving comfort for al road users (vehicles, pedestrians and cyclists). As part of the review, and with reference to TII Design Standard *Rural Road Link Design* - Standard *DN-GEO-03031 (2017),* the following parameters were identified and estimated for each option:

- Application of Vertical Gradients at Desirable (4%) and >4% (1 Step Relaxation) – Number of Instances & Combined Length

It is noted that there was no discernible difference between route options with respect to the vertical alignment as each options used desirable minimum crest and sag curves, whilst meeting minimum vertical curve lengths.

As part of the Stage 1 RSIA, the RSIA Team derived the following scoring system for this sub-criterion element:

- >2500m Combined length of use of 4% gradient or greater= 1
- >2000, <2500 = 2
- >1500, <2000 = 3
- >1000, <1500 = 4
- >500, <1000 = 5
- >250, <500 = 6
- <250 = 7

6.1.10 Summary

Following the allocation of individual scores to each Sub-Criterion Element, each of these scores were combined to provide an Element Total. As shown in Appendix B, the option with the highest Element Total (i.e. Highest positivity/lowest impact) was awarded a final performance score for the sub-criterion of RSIA of 7, the option with the lowest Element Total was awarded a score of 1, and options with Element Totals in between were proportionally scored based on the difference between the highest and lowest Element Totals. Table 6-1 below shows a summary of performance scoring matrix for the Stage 1 RSIA.

Table 6-1 Performance scoring matrix for the Stage 1 RSIA

Routes	Effect on Traffic Flow and Traffic Patterns	Tie-in Location	Forgiving Roadsides	Susceptibility to Climatic Changes at Higher Elevations	Geometric Standards Impacting Driver Comfort – Horizontal	Geometric Standards Impacting Driver Comfort – Vertical	Element Total	Overall Score
Brown	7	2	7	1	7	2	26	**4**
Cyan	7	4	7	4	1	2	25	**4**
Yellow	1	4	1	4	3	7	20	**2**
Green	6	4	6	4	6	5	31	**6**
Purple	4	4	4	4	6	2	24	**3**
Orange	7	2	7	4	7	6	33	**7**
Yellow + Blue	1	4	1	4	5	6	21	**2**
Cyan + Yellow + Blue	2	4	2	4	5	7	24	**3**
Yellow + Purple	2	4	2	4	4	3	19	**1**
Purple + Yellow + Blue	2	4	2	4	7	7	26	**4**
Yellow + Cyan + Green	1	4	1	4	7	5	22	**3**
Yellow+ Purple + Green	1	4	1	4	5	4	19	**1**
Brown + Purple	7	4	7	4	2	4	28	**5**
Cyan + Yellow + Purple	5	4	5	4	4	3	25	**4**
Green + Cyan	6	4	6	4	3	3	26	**4**
Orange + Green 1	7	2	7	4	6	5	31	**6**
Orange + Green 2	7	2	7	4	6	6	32	**6**

Notes: The sub-criterion elements which were deemed to be N/A are not shown.

With reference to Table 6-1 above, the orange route obtained the highest performance score, followed by Orange + Green Routes 1 & 2 and the Green route, whilst the Yellow + Purple + Green Route, and Yellow + Purple Route were obtained the lowest performance score.

7. Comparison of Alternatives - Summary

This section compares route options by considering information outlined to date in a qualitative and quantitative manner.

7.1 Qualitative Description

	Benefits	Disbenefits
Do Minimum – Committed Infrastructure	Localised safety improvements over a 3.4km section of the existing N2 between Ardee and Clint	Driver vulnerability at existing junctions Does not provide safe overtaking opportunities for motorists along the route Does not reduce the frequency and severity of collisions by providing a safer route for all users over the entire route. Does not reduce the junction numbers and conflict points for N2 traffic. Does not provide safety for vulnerable road users and provide better environment for vulnerable road users within the study area. Does not remove existing roadside furniture/ features outside the clearzone over the entire route.
Do Something – Public Transport Alternative - Bus	Depending on the route, convenient access to bus stops the frequency of the service, a bus alternative may result in a reduction in traffic volumes through changes to modal shifts, and thus potentially a lower number of collisions.	
Do Something – Public Transport Alternative – Rail & Air		No existing/ proposed Rail or Aviation infrastructure within the Study Area
Do Something – Traffic Management Alternative - Localised Operational and Safety Infrastructure Improvements	Improved driver vulnerability at certain existing junctions Would provide safer overtaking opportunities at certain locations for motorists along the route The introduction of left-in and left-out junctions and accesses, where appropriate and feasible, would reduce the number of vehicles crossing the N2, and thus the number of conflict points. Would remove existing roadside furniture/ features outside the clearzone which may reduce loss of control type collisions.	Would not address the safety issue of an errant vehicles crossing into the path of a vehicle in the opposing lane May result in an inconsistent approach to junction layouts along the route leading to driver confusion Does not provide safety for vulnerable road users and provide better environment for vulnerable road users within the study area. Would not address increased traffic volumes in the future that would limit overtaking opportunities leading to increases in driver frustration.

Do Something – Traffic Management Alternative – Speed reduction measures	The implementation of the proposed speed reduction measures through enforcement and technology would result in reduced speeds along the N2 and therefore contribute to a reduced frequency and severity of collisions	These measures may still result in driver frustration as they may reduce a motorist's ability to over-take slower moving vehicles. Motorists may choose alternative routes to avoid fixed speed cameras and evade fines/ penalty points resulting in alternations to traffic patterns, and utilising local and regional roads with a lower level of service.
Do-Something – Stage 1 Feasible Route Corridor Options	Refer to Section 6 above and Appendix B of this Report	Refer to Section 6 above and Appendix B of this Report.

7.2 Quantitative cost benefit analysis of the road safety aspects

At this Phase 2 Stage 1 (Preliminary Options Assessment), no Cost-Benefit Analysis (CBA) of each route corridor option has been undertaken. Therefore, it is not possible to comparatively assess the options in order of monetary value of safety.

Full CBA, including the road safety benefits and dis-benefits of each route corridor option, and a comparative assessment of the options in these terms, will be undertaken for the Phase 2 Stage 2 Route Options assessment and included in the Options Selection Report.

8. Conclusions and Summary

This Report was prepared in accordance with the requirements of TII's Standard documents; *PE-PMG-02005 Road Safety Impact Assessment Guidelines (December 2017)*, *PE-PMG-02001 Road Safety Impact Assessment (December 2017) and Project Manager's Manual (PMM) for Major National Road Projects* PE-PMG-02042 (February 2019),

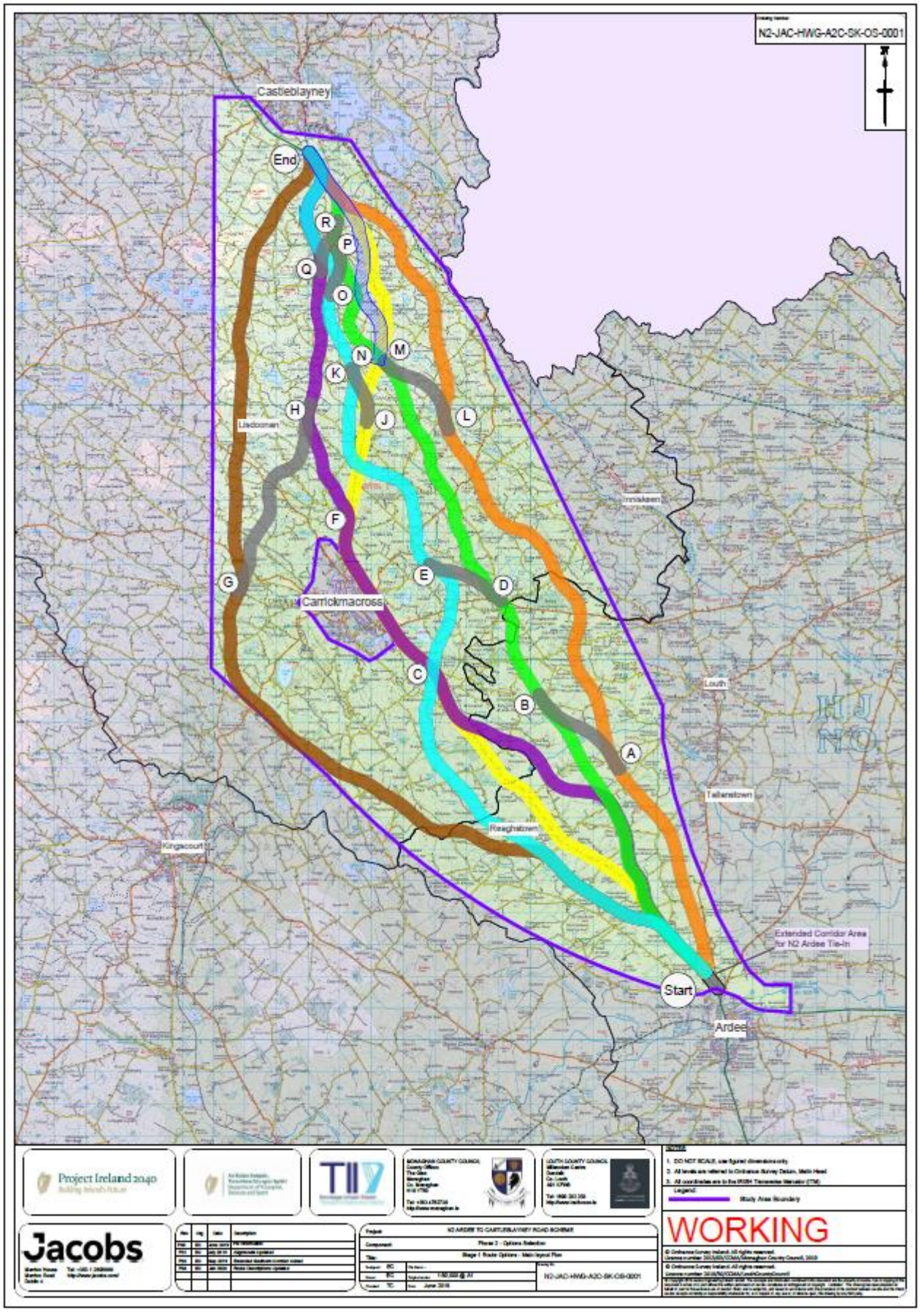
The Stage 1 RSIA considered and assessed the Do-Nothing, Do-Minimum and Do-Something Alternatives (Including Public Transport, Traffic Management, and Stage 1 Feasible Route Corridors Options) against the defined safety objectives of the Scheme. The assessment was based on the level of scheme development that was undertaken at the time of the assessment (i.e. TII Phase 2 – Stage 1 – Preliminary Options Assessment).

At this stage of the scheme development, and from a RSIA perspective, it was determined that the Do-Nothing, Do-Minimum and Do-Something Alternatives of Public Transport and Traffic Management do not meet all of the road safety objectives for the scheme.

In relation to the Do-Something Alternative – Stage 1 Feasible Route Corridor Options, a comparative analysis of each route corridor option was undertaken from an RSIA perspective. The prescribed seven-point performance scoring system as per *TII's PAG Unit 7.0 (Multi - Criteria Analysis)* was employed for the Stage 1 RSIA comparative assessment. A list of sub-criterion elements was identified by the RSIA Team, and a performance score was assessed for each option against these sub-criterion elements. Following the allocation and summation of the individual scores for each of the sub-criterion element, an overall performance score between 1 to 7 was determined for each option for comparative purposes. Consequently, a determination of which route corridor option would give the best and worst road safety performance from an RSIA perspective could be made. With reference to Table 6-1 above, the orange route obtained the highest performance score, followed by Orange + Green Routes 1 & 2 and the Green route, whilst the Yellow + Purple + Green Route, and Yellow + Purple Route were obtained the lowest performance score.

In accordance with TII's PMM, the results of this Stage 1 RSIA comparative assessment of the route corridor options was used to inform the overall Stage 1 Preliminary Options Assessment, which is documented in the *N2 Ardee to Castleblayney Road Scheme Phase 2 – Stage 1 Assessment Working Paper Report (September 2019).*

Appendix A. Stage 1 Feasible Route Corridor Options Drawing



Appendix B. RSIA Phase 2 Stage 1 Assessment Matrix and Summary

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Criteria 8 - RSIA Summary												
Route	Effect on Traffic Flow and Traffic Patterns (1-7)	Impact on Non Motorised User Travel (1-7)	Tie In Location (1-7)	Seasonal Conditions (1-7)	Possibility of Seismic Activity (1-7)	Safe Parking Areas (1-7)	Forgiving road sides (1-7)	Susceptibility to Higher Climatic Impacts (snow) (1-7)	Less than Desirable Standards Impacting Driver Comfort (1-7)	Vertical - Length of use of 4% Gradient or Greater (1-7)	Total	Score 1-7
Brown	7	N/A	2	N/A	N/A	N/A	7	1	7	2	26	4
Cyan	7	N/A	4	N/A	N/A	N/A	7	4	1	2	25	4
Yellow	1	N/A	4	N/A	N/A	N/A	1	4	3	7	20	2
Green	6	N/A	4	N/A	N/A	N/A	6	4	6	5	31	6
Purple	4	N/A	4	N/A	N/A	N/A	4	4	6	2	24	3
Orange	7	N/A	2	N/A	N/A	N/A	7	4	7	6	33	7
Yellow + Blue	1	N/A	4	N/A	N/A	N/A	1	4	5	6	21	2
Cyan + Yellow + Blue	2	N/A	4	N/A	N/A	N/A	2	4	5	7	24	3
Yellow + Purple	2	N/A	4	N/A	N/A	N/A	2	4	4	3	19	1
Purple + Yellow + Blue	2	N/A	4	N/A	N/A	N/A	2	4	7	7	26	4
Yellow + Cyan +Green	1	N/A	4	N/A	N/A	N/A	1	4	7	5	22	3
Yellow + Purple + Green	1	N/A	4	N/A	N/A	N/A	1	4	5	4	19	1
Brown + Purple	7	N/A	4	N/A	N/A	N/A	7	4	2	4	28	5
Cyan + Yellow + Purple	5	N/A	4	N/A	N/A	N/A	5	4	4	3	25	4
Green + Cyan	6	N/A	4	N/A	N/A	N/A	6	4	3	3	26	4
Orange + Green 1	7	N/A	2	N/A	N/A	N/A	7	4	6	5	31	6
Orange + Green 2	7	N/A	2	N/A	N/A	N/A	7	4	6	6	32	6

	Min	**19.00**	
	Max	**33.00**	
	Difference	**14.00**	
	Scoring 1 to 7		**Range**
Highly Positive	Scoring 7 Max	33.00	Max = 33 Scoring 7
	Scoring 6	30.20	Between 30 and 33 Scoring 6
	Scoring 5	27.40	Between 27 and 30 Scoring 5
	Scroing 4	24.60	Between 25 and 27 Scoring 4
	Scoring 3	21.80	Between 22 and 25 Scoring 3
	Scoring 2	19.00	Between 19 and 22 Scoring 2
Highly Negative	Scoring 1 Min	19.00	Min= 19 Scoring 1

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N2 Ardee to Castleblayney Scheme
Summary Table - RSIA Criteria

	Primary Routes						Combinations											
	Brown Route	**Cyan Route**	**Purple Route**	**Green Route**	**Orange Route**	**Yellow Route**	**Yellow + Blue**	**Cyan + Yellow + Blue**	**Yellow + Purple**	**Purple + Yellow + Blue**	**Yellow + Cyan + Green**	**Yellow+Purple+Green**	**Brown + Purple Route**	**Cyan+Yellow+Purple**	**Green + Cyan**	**Orange + Green 1**	**Orange + Green 2**
Effect on Traffic Flow and Traffic Patterns	The route includes the provision of a new Type 2 Dual Carriageway Road between the two tie in points at Ardee and Castleblayney. The route option would replace the existing N2 as the national route and the new route would be constructed offline. The current N2 would remain as a functioning link, in the form of a down graded regional road. Maintaining the N2 will help segreate local traffic from strategic traffic and reduced congestion and lower strategic traffic volumes create a better environment for vulnerable road users.		The proposed route follows a 35% portion of the existing N2 alignment which will require numerous accesses to be closed and accommodation roads to be built parallel to the mainline on both sides. This will provide an increased number of potential conflict points between (i) the accesses and the accommodation road , and (ii) the accommodation road and the nearest adjacent Local Rd/ Regional Rd.	The route includes the provision of a new Type 2 Dual Carriageway Road between the two tie in points at Ardee and Castleblayney. The route option would replace the existing N2 as the national route and the new route would be constructed offline. The current N2 would remain as a functioning link, in the form of a down graded regional road. Maintaining the N2 will help segreate local traffic from strategic traffic and reduced congestion and lower strategic traffic volumes create a better environment for vulnerable road users.		The proposed route follows the majority of the existing N2 alignment which will require numerous accesses to be closed and accommodation roads to be built parallel to the mainline on both sides. This will provide an increased number of potential conflict points between (i) the accesses and the accommodation road , and (ii) the accommodation road and the nearest adjacent Local Rd/ Regional Rd.	The proposed route follows a portion of the existing N2 alignment which will require numerous accesses to be closed and accommodation roads to be built parallel to the mainline on both sides. This will provide an increased number of potential conflict points between (i) the accesses and the accommodation road , and (ii) the accommodation road and the nearest adjacent Local Rd/ Regional Rd.					The proposed route follows a 10% portion of the existing N2 alignment which will require numerous accesses to be closed and accommodation roads to be built parallel to the mainline on both sides. This will provide an increased number of potential conflict points between (i) the accesses and the accommodation road , and (ii) the accommodation road and the nearest adjacent Local Rd/ Regional Rd.	The proposed route follows a 25% portion of the existing N2 alignment which will require numerous accesses to be closed and accommodation roads to be built parallel to the mainline on both sides. This will provide an increased number of potential conflict points between (i) the accesses and the accommodation road , and (ii) the accommodation road and the nearest adjacent Local Rd/ Regional Rd.	The route includes the provision of a new Type 2 Dual Carriageway Road between the two tie in points at Ardee and Castleblayney. The route option would replace the existing N2 as the national route and the new route would be constructed offline. The current N2 would remain as a functioning link, in the form of a down graded regional road. Maintaining the N2 will help segreate local traffic from strategic traffic and reduced congestion and lower strategic traffic volumes create a better environment for vulnerable road users.		
	The towns of Castleblayney and Carrickmacross are already bypassed. Retention of the existing N2 will continue to serve local traffic as it currently does.		Utilises existing Carrickmacross Bypass (Single Carriageway)	The towns of Castleblayney and Carrickmacross are already bypassed. Retention of the existing N2 will continue to serve local traffic as it currently does.		The closure of direct accesses on the N2 will segregate local traffic from strategic traffic										The towns of Castleblayney and Carrickmacross are already bypassed. Retention of the existing N2 will continue to serve local traffic as it currently does.		
	At this stage, it is assumed that a design principal of the scheme will be to retain local and regional roads disecting the proposed route by means of overbridges/ underbridges. Therefore, no significant effects on traffic patterns are anticipated. Where there is severance of any route, an alternative local road connection will be provided			At this stage, it is assumed that a design principal of the scheme will be to retain local and regional roads disecting the proposed route by means of overbridges/ underbridges. Therefore, no significant effects on traffic patterns are anticipated. Where there is severance of any route, an alternative local road connection will be provided										At this stage, it is assumed that a design principal of the scheme will be to retain local and regional roads disecting the proposed route by means of overbridges/ underbridges. Therefore, no significant effects on traffic patterns are anticipated. Where there is severance of any route, an alternative local road connection will be provided		
	The proposed alignment may result in junctions to serve with one or more of the R178, R179 and R180 due to the additional traffic attracted from Carrickmacross, and may alter traffic patterns on the regional and local roads in the area		The closure of direct accesses ono the N2 will segregate local traffic from strategic traffic The closure of direct accesses onto the N2 will displace local traffic from thse accommodation roads and onto the local, regional road network to proposed junctions on the N2	The proposed alignment may result in junctions to serve with one or more of the R178 and R179 due to the additional traffic attracted from Carrickmacross, and may alter traffic patterns on the regional and local roads in the area		The closure of direct accesses onto the N2 will displace local traffic onto the local, regional road network to proposed junctions on the N2 via the accommodation roads							The proposed alignment may result in junctions to serve with one or more of the R178, R179 and R180 due to the additional traffic attracted from Carrickmacross, and may alter traffic patterns on the regional and local roads in the area	The closure of direct accesses ono the N2 will segregate local traffic from strategic traffic The closure of direct accesses onto the N2 will displace local traffic onto the local, regional road network to proposed junctions on the N2 via the accommodation roads	The proposed alignment may result in junctions to serve with one or more of the R178 and R179 due to the additional traffic attracted from Carrickmacross, and may alter traffic patterns on the regional and local roads in the area		
Scoring	7	7	4	6	7	1	1	2	2	2	1	1	7	5	6	7	7
Impact on Non Motorised User Travel	An off road two way cycle lane is included as part of the proposed road cross section																
Scoring	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tie In Location	To the north, the proposed alignment will create a forth arm on the roundabout, and closure of an existing accommodation road to faciliatate the new arm. A fifth arm on the roundabout would not be desirable.	To the north and south, the proposed alignment will tie into the roundabout on the same alignment as the existing N2	To the north and south, the proposed alignment will tie into the roundabout on the same alignment as the existing N2	To the north and south, the proposed alignment will tie into the roundabout on the same alignment as the existing N2	To the north, the proposed alignment will tie into the roundabout on the same alignment as the existing N2 To the south, the proposed alignment will create a forth arm on the proposed roundabout which connects to the proposed N52 Ardee Bypass. This roundabout is in close proximity to an existing roundabout junction, which may lead to an increased risk of rear shunt type collisions	To the north and south, the proposed alignment will tie into the roundabout on the same alignment as the existing N2									To the south, the proposed alignment will create a new junction with the N2 in close proximity to an existing roundabout junction, which may lead to an increased risk of rear shunt type collisions To the north, the proposed alignment will tie into the roundabout on the same alignment as the existing N2	To the south, the proposed alignment will create a new junction with the N2 in close proximity to an existing roundabout junction, which may lead to an increased risk of rear shunt type collisions To the north, the proposed alignment will tie into the roundabout on the same alignment as the existing N2
Scoring	2	4	4	4	2	4	4	4	4	4	4	4	4	4	4	2	2
Seasonal Conditions	No Impacts on road safety anticipated due to Seasonal Conditions																
Scoring	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Possibility of Seismic Activity	Not deemed to be applicable in Co Monaghan/ Co Louth																
Scoring	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Safe Parking Areas	No safe parking areas indicated. Recommend consideration of provision of such at next design stage																
Scoring	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Forgiving road sides	Embankment/ Cutting slopes of 1V:3H assumed																
Scoring	7	7	4	6	7	1	1	2	2	2	1	1	7	5	6	7	7
Susceptibility to Higher Climatic Impacts (snow)																	
The highest elevation (m) of the alignment	195.08	158.10	160.09	140.02	115.60	121.80	134.39	134.47	160.21	134.41	151.35	160.11	160.13	160.22	158.10	140.02	140.03
Location (Chainage)	27+786.49	29889	27187	25591	26130	26571	24913	25736	26551	25544	26466	26549	31325	27372	28415	25889	26264
Scoring	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Less than Desirable Standards Impacting Driver Comfort																	
1a) Horizontal - Use of Limiting Horizontal Radii																	
No. Of Instances of Horizontal radius at 720m	1	6	3	3	2	8	6	5	6	3	3	5	5	5	5	3	2
No. Of Instances of Horizontal radius less than 720m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal:	1	6	3	3	2	8	6	5	6	3	3	5	5	5	5	3	2
1b) Horizontal - Length of limiting Horizontal Radii (m)																	
Combined length of Horizontal radii at 720m	730.24	4283.86	1874.14	1876.18	1003.66	3030.08	2296.75	2282.02	2969.36	1196.99	1095.23	2145.35	3638.07	2864.05	3432.06	1876.18	1592.33
Combined Horizontal radii less than 720m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total:	730.24	4283.86	1874.14	1876.18	1003.66	3030.08	2296.75	2282.02	2969.36	1196.99	1095.23	2145.35	3638.07	2864.05	3432.06	1876.18	1592.33
Scoring	7	1	6	6	7	3	5	5	4	7	7	5	2	4	3	6	6
2) Vertical - Length of use of 4% Gradient or Greater																	
Number of Occassions	9	11	6	3	1	2	3	2	5	2	3	4	7	5	7	3	1
Combined length of use of 4% gradient or greater	2175.29	2179	2012.81	847.42	311.38	0	435.88	236.81	1529.94	116.34	527.15	1189.18	1245.9	1615.56	1908.83	847.42	352.59
Scoring	2	2	2	5	6	7	6	7	3	7	5	4	4	3	3	5	6
Overall Scoring	**26**	**25**	**24**	**31**	**33**	**20**	**21**	**24**	**19**	**26**	**22**	**19**	**28**	**25**	**26**	**31**	**32**

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