N2 CLONTIBRET TO NORTHERN IRELAND BORDER ROAD SCHEME

Route Selection Report

April 2012

Prepared for:
Monaghan County Council

Prepared by:
Grontmij
Spectrum House
2 Powderhall Road
Edinburgh
EH7 4GB

T +44 131 550 6300
F +44 131 550 6499

www.grontmij.ie

Report Status:	Final		
Job No:	P45800		
	Name	**Signature**	**Date**
Prepared By:	Ronan Lyng		27/04/12
Checked By:	Steve Wallace		27/04/12
Approved By:	Steve Wallace		27/04/12

Table of Contents

Table of Appendices

1 Introduction & Description

1.1 Background

The existing 28 kilometre section of the N2 national primary route between Clontibret and the Northern Ireland border is of single carriageway standard which, apart from the recently constructed eastern bypass at Monaghan, offers a relatively poor level of service to users. The need for an improvement of the N2 over this section was initially identified in the National Road Needs Study published by the National Roads Authority (NRA) in 1998. An improvement scheme for the N2 in this area is compatible with local and national strategies and is referenced in a number of policy documents including the National Development Plan and the National Spatial Strategy 2002 – 2020 as well as county and regional development plans. The "N2 Clontibret to Northern Ireland Border Road Scheme" is also compatible with the "A5 Western Transport Corridor Scheme" being promoted in Northern Ireland. Both schemes upon their completion will bring about significantly improved linkage between Northern Ireland and the Republic of Ireland, with improved access between Donegal, Derry and Dublin in particular.

In December 2008 Monaghan County Council appointed Grontmij as their consulting engineer for the N2 Clontibret to the Northern Ireland Border Road Scheme, in particular to assist in the scheme development stages as set out in the NRA's Project Management Guidelines (published in 2008 and updated in 2010). The overall sequence covered in the guidelines is summarised in Table 1.1.

	Title	Coverage
Phase 1	***Scheme Concept & Feasibility Studies***	Identify the need for a scheme and establish a project management structure for the scheme including the appointment of service providers, where necessary. Phase 1 can also include feasibility studies that may be carried out on aspects of investigation into whether a scheme is warranted / necessary.
Phase 2	***Route Selection***	Identify a suitable study area for the examination of alternative routes, identify key constraints within that study area, develop feasible route options and carry out a systematic assessment of these options leading to the selection of a preferred route corridor which will form the basis for the detailed design to follow. Undertake public consultation associated with the development of routes and alternatives.
Phase 3	***Design***	Develop the design of a scheme to a stage where sufficient levels of detail exist to establish land-take requirements and to progress the scheme through the statutory processes.
Phase 4	***EIA /EAR & the Statutory Processes***	Prepare environmental assessments / reports / statements along with Compulsory Purchase Order mapping / documentation for land acquisition. Complete the statutory processes necessary to confirm that the proposed scheme is in accordance with planning and environmental legislative and procedural requirements.
Phase 5	***Advance Works & Construction Documents Preparation, Tender & Award***	Prepare advance works contracts and tender documentation, assessment of tenders and award of the main construction contract.
Phase 6	***Construction & Implementation***	Administration of the main construction contract and management of the scheme during the construction and implementation phase.
Phase 7	***Handover, Review & Closeout***	Complete outstanding contractual and residual issues relating to the scheme leading to the closeout of the project and review the scheme to ascertain key lessons learned for future schemes.

Table 1.1 - Summary of the NRA's project Management Guidelines Process

Phase 2 route selection is further divided into three stages:

- Stage 1 – Preliminary Options Assessment;
- Stage 2 – Project Appraisal; and
- Stage 3 – Selection of Preferred Route.

1.2 Purpose of Route Selection Report

This report summarises the route selection work undertaken during these stages which leads from taking into account physical constraints to recommending a preferred route corridor. The specific processes followed for the N2 scheme are described in the flowchart in Figure 1.1, which

compares these to the generic graphic contained in the NRA's Project Management Guidelines (PMGs).

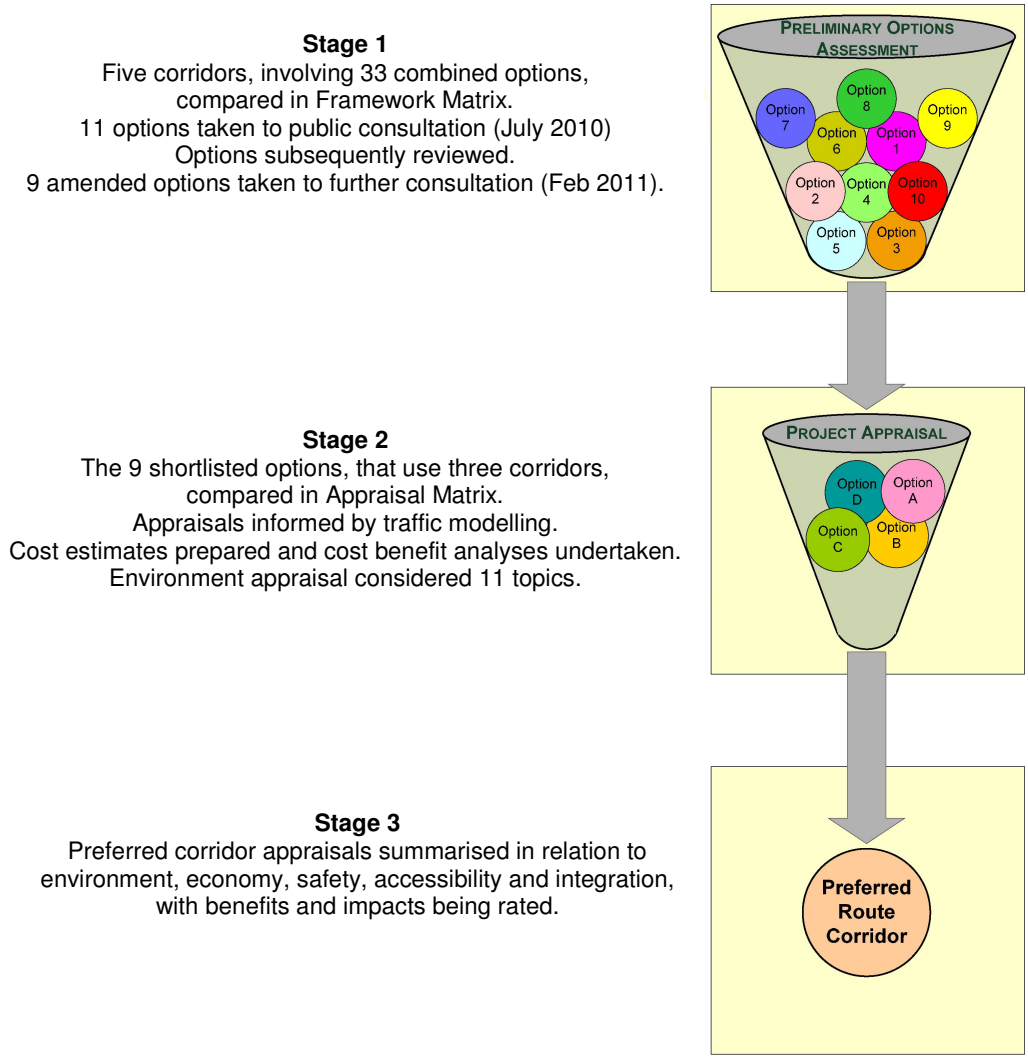


Figure 1.1 Corridor Selection Process for N2 Clontibret to NI Border Scheme

It should be noted that all option appraisals in Phase 2 relate to "route corridors", that in this instance are appraised as being 400 metres wide. The NRA Project Management Guidelines stipulate that junction strategy and carriageway standard are determined as part of the future design process in Phase 3. However, where necessary, assumptions relating to road type have been made to allow for comparison between the options. In terms of carriageway standard the possible layouts that could be considered in Phase 3 are shown in Table 1.2.

Type of Road	Edge Treatment	Total Surfacing Width	Comment
Standard Single Carriageway	2.5m hard shoulders	12.3m	
Type 3 Dual (divided 2+1 lanes)	1.0m hard strips	12.5m	Only appropriate for on-line improvement
Dual 2+2 Carriageways (divided 2+2 lanes)	0.5m hard strips	16.0m	

Table 1.2 - Carriageways Standards likely to be considered in Phase 3 – Design

1.3 Scheme Operational Objective

The N2 between Clontibret and the Northern Ireland border is part of a strategic link servicing Derry and the Northwest, currently providing a poor level of service for users and has sections of sub-standard road with a poor safety record. The need to improve the N2 as a strategic link is recognised in several policy documents as summarised in Chapter 2 of this report. In order to identify route options for appraisal we have determined a specific objective for the scheme based on providing an appropriate level of service as follows:

"to improve level of service and safety for users in accordance with applicable design standards."

The NRA's Design Manual for Roads and Bridges (DMRB) sets out current design standards applicable to National Primary routes and the broad concepts outlined in this have been taken into account in identifying and appraising the corridor options. Of particular relevance, at this stage, is the adoption of a 100 kph design speed, which for example influences the curves used in developing feasible corridors. Another key consideration is dealing with access, whereby the DMRB stipulates *"number of accesses should be minimised by concentrating turning movements where practicable"*[1].

1.4 Layout of this Report

The initial chapters of this report provide further background and methodology**,** with chapters 6, 7 and 8 recording the various appraisals undertaken in the three stage approach. The appendices contain further technical information that supports the various appraisals.

[1] NRA DMRB TA43/03 section 6.1.2

2 Identification of Need

The proposed N2 Scheme is compatible with local and national strategies and is referenced in a number of policy documents:

- The National Development Plan (NDP) 2007 – 2013
- The National Spatial Strategy (NSS) 2002 - 2020
- Monaghan County Development Plan 2007 – 2013
- Regional Planning Guidelines

Specific references are recited below to demonstrate the context of the proposed scheme.

2.1 The National Development Plan (NDP) 2007-2013

The National Development Plan 2007-2013 is a seven year plan which builds on the previous National Development Plan (2000-2006). The Plan recognises the fact that a good quality physical infrastructure is a key ingredient in overall competitiveness. Its objectives are to continue sustainable national economic and employment growth; to strengthen and improve Ireland's international competitiveness; to foster balanced regional development and to promote social inclusion. Specific reference is made in Chapter 3 of the plan to the planned schemes on the N2:

"Further improvements on the N2 route, in co-operation with the Northern Ireland Authorities, to greatly improve the road link to Dublin over the period of the Plan;"

It goes on to further state a timescale which was relevant at the time of publication:

"The Government's priorities for agreement on joint projects with Northern Ireland include the completion by 2013 of a high quality road network on the inter-urban routes linking the major population centres of Dublin, Belfast and the North West (especially the Letterkenny-Derry Gateway)."

The plan states that investment in road improvement and new roads can also assist in reducing the environmental impact of road transport. Traffic that flows more freely cuts down the level of pollution generated by stop-start driving and congestion generally. By-passed towns and villages will benefit from reduced congestion in many ways including reduced air emissions and noise.

The plan also recognises that strengthened cross-border transport infrastructure will enhance the potential for major economic and social gains for the whole of the island. The continued

investment in upgrading of cross-border routes is seen as a key North / South co-operation initiative.

2.2 The National Spatial Strategy (NSS) 2002 - 2020

The NSS is a national planning document taking into consideration 20 years of development. The NSS aims to achieve a better balance of social, economic and physical development across Ireland, supported by more effective planning. Within the document the importance of Monaghan Town as a medium hub for development has been identified.

NSS Section 3 (Future Spatial Structure) describes the development of gateways and hubs as the key to promoting balanced development in a region and states the advantages of cross-border cooperation in developing key infrastructure. It specifically describes the importance of the N2 national transport corridor:

> *"In border areas, and in a developing all-island economy, there is a renewed emphasis on co-operation for economic advantage between the State and Northern Ireland across a range of activities. The Dublin-Belfast Corridor and the Letterkenny/Derry gateway present two opportunities for large-scale co-operation. Proposals in respect of these have been set out earlier.*
>
> *With changing circumstances, advantage can also be derived from viewing the central part of the border area as a 'crossroads' between Dublin, Belfast, Derry, the Midlands and other strategic locations such as Sligo. Given its position on the N2 strategic road corridor, its position vis-à-vis towns in Northern Ireland whose cross-border links are strengthening, and opportunities for cross-border tourism, there is a particular role for Monaghan as a hub. This role will complement that of Dundalk as a gateway and will capitalise on Monaghan's midway position on the Dublin-Derry N2 route and its substantial capacity for development."*

It is also noted that Chapter 4 reinforces Monaghan Town's role of participating in the balanced regional development of the border region:

> *"Sligo, Letterkenny and Dundalk as gateways will be supported by Monaghan and Cavan as hubs. Monaghan will build on its strategic location between Dublin and Derry on the N2, its links to Armagh and its capacity for growth."*

Map 4 of the NSS demonstrates Monaghan town's role within the border region, as reproduced in Figure 2.1 below:

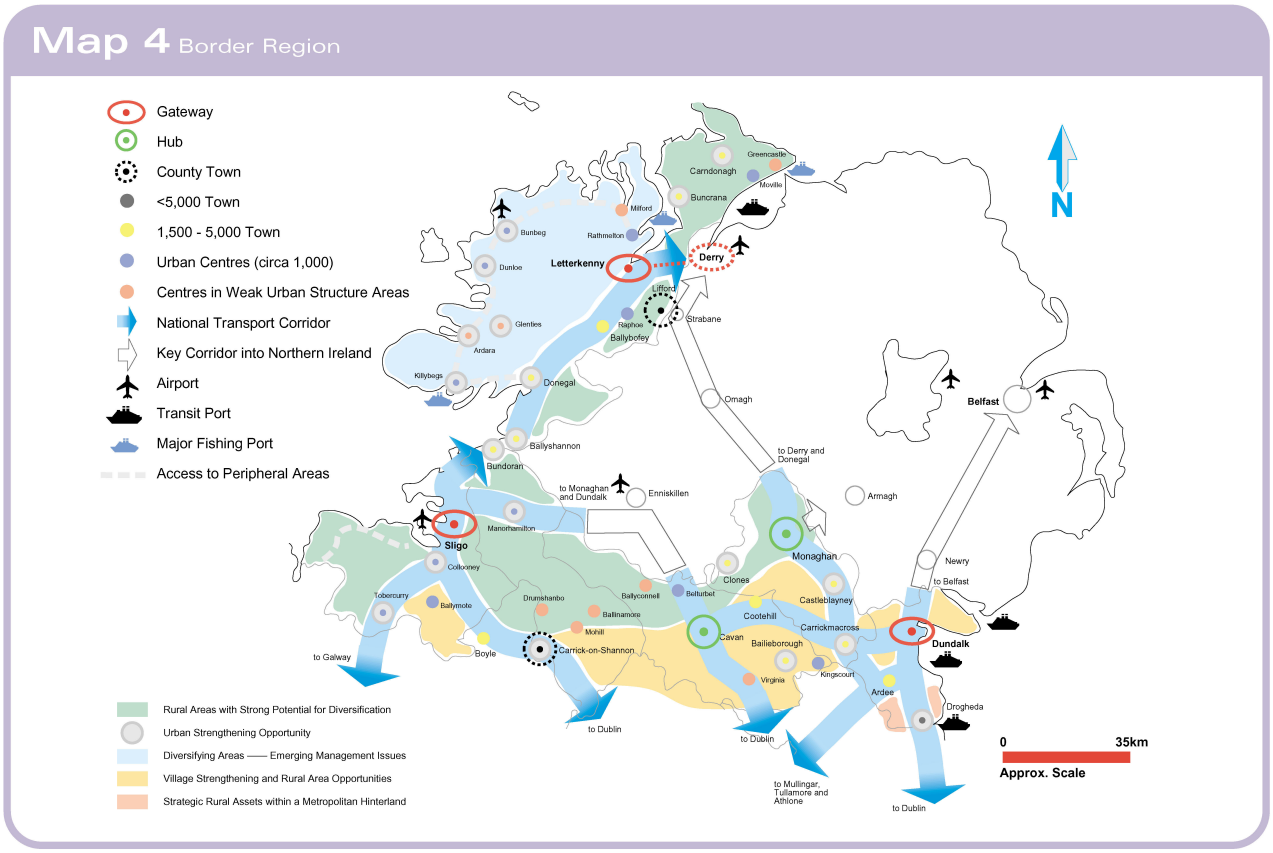


Figure 2.1 - NSS (2002 – 2020), Map 4 Border Region

2.3 Monaghan County Development Plan 2007 – 2013

The Monaghan County Development Plan prescribes the programme and objectives of County Monaghan through the stated period with Chapter 6 specifically addressing infrastructure and services. This chapter begins by describing the current role of the road network within the County and how motor vehicles are the principal form of transport due to the urban sprawl in and around Monaghan Town. It also prescribes the benefits achievable by enhancing the road network, specifically citing benefits for the villages and towns on the N2 National Route:

> *"The current Capital Road Works Programme to be completed over the life of this plan will address the negative impact of the National Road Network on Castleblayney and Monaghan towns and the villages of Annayalla, Clontibret and Emyvale it plays in the*

social life of both urban and rural dwellers. County Monaghan relies on its road network as the sole method of transport serving the county"

2.4 Regional Planning Guidelines

In Section 2.6 of the Regional Planning Guidelines for the Border Region the importance of inter-regional linkages to Dublin are stated:

"The Dublin and Mid Eastern Region has geographical boundaries with Cavan, Monaghan and Louth. The M1/N1 Dublin–Belfast, N2 Dublin–Letterkenny, N3 Dublin–Cavan, N4 Dublin–Sligo are key transport linkages of national and international importance. Rail linkages include the Dublin–Belfast and Dublin–Sligo lines. The Region possesses both Dublin International Airport and major passenger and freight ports in Dublin, Dun Laoghaire and Louth.

The Region has strong socio–economic links to the capital city of Dublin, while the Dublin–Belfast economic corridor and catchment area encourages growth and sustainable development such as the town of Drogheda, which is a designated Primary Development Centre in these Guidelines and also in the SPG's for the GDA and the NSS.

Dublin is a major employment centre whilst Monaghan/Cavan/Louth serve as commuting towns for Dublin city and area."

3 Traffic Assessment

3.1 Modelled Traffic Flows

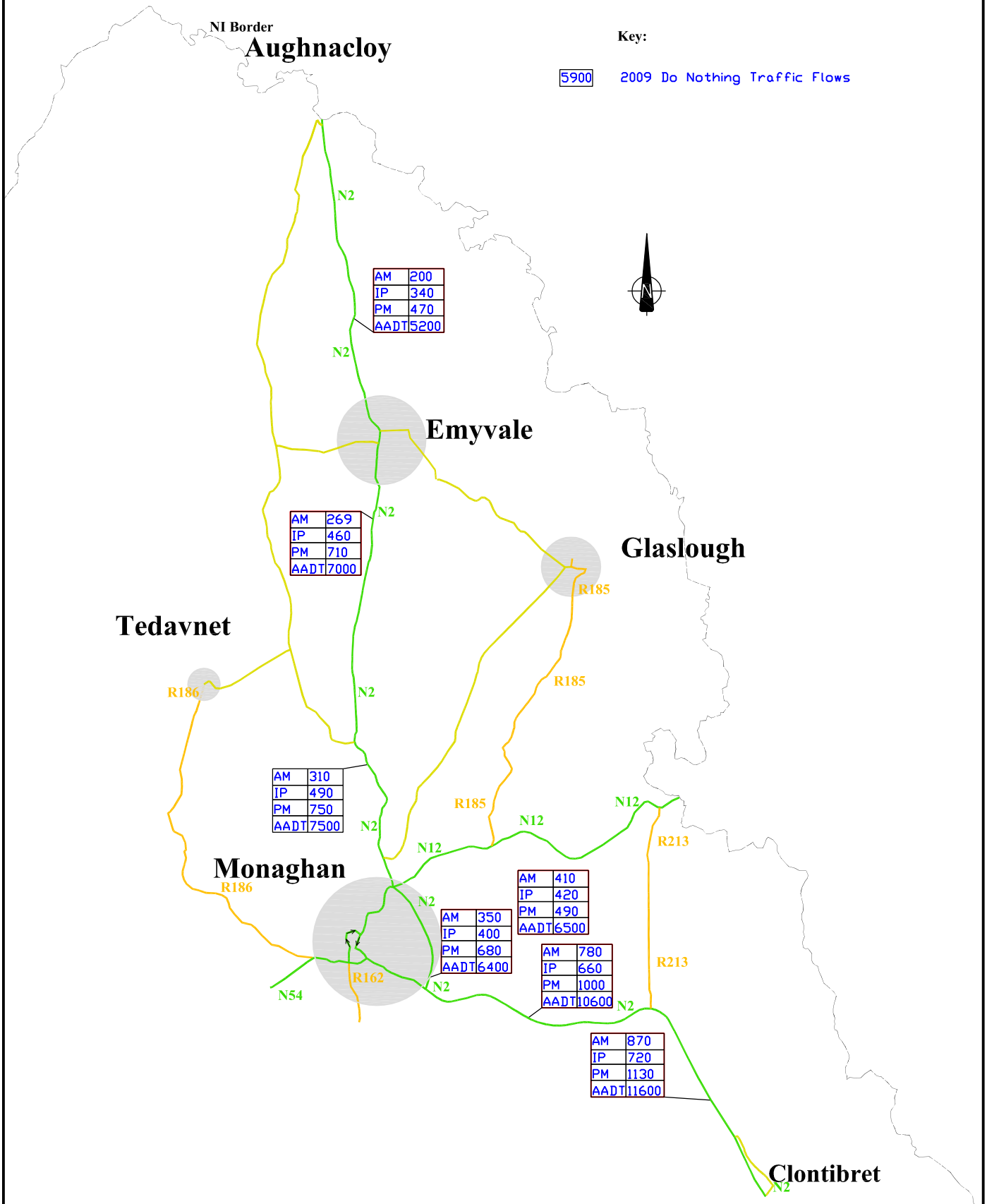
As part of the route selection process a local traffic model has been prepared to inform the economy and environment appraisals. This model has been built using SATURN software to cover the existing road network in and around the corridor options being considered. This includes main routes such as national primary, national secondary and regional roads as well as several local roads along which traffic flow changes may result as a consequence of the scheme. Traffic flows used in the modelling have been based on an extensive programme of surveys carried out in September 2009. The survey results were used to inform the Stage 1 Preliminary Options Appraisal in Chapter 6 and the examination of the do-nothing and do-minimum scenarios as described in Section 5.1.2 of this report. The traffic model itself has been used to compare the options at Stage 2 (Project Appraisal), as reported in Chapter 7. Figure 3.1 shows the existing road network that is simulated in the traffic model, with the various numbers indicating two-way traffic flow on the main routes in four time periods:

AM – the morning peak hour period starting at 0800;
IP – a typical “inter–peak” hour during the middle of the day;
PM – the evening peak hour starting at 1800; and
AADT – Annual Average Daily Traffic flow.

The main links in the modelled network have been allocated speed flow relationships so that as traffic flows increase the operating speeds reduce. The model is also set up to model junction delays. Taking these two factors into account the model assigns traffic onto the road network being modelled. This assignment process is carried out both in simulating the existing traffic patterns and then network containing the options being appraised. To run the traffic model for the various options and scenarios it is necessary to assume where there would be junctions on new routes. However these are preliminary assumptions since junction strategy is determined at a later stage of scheme development following the route selection process.

3.2 Traffic Forecasting

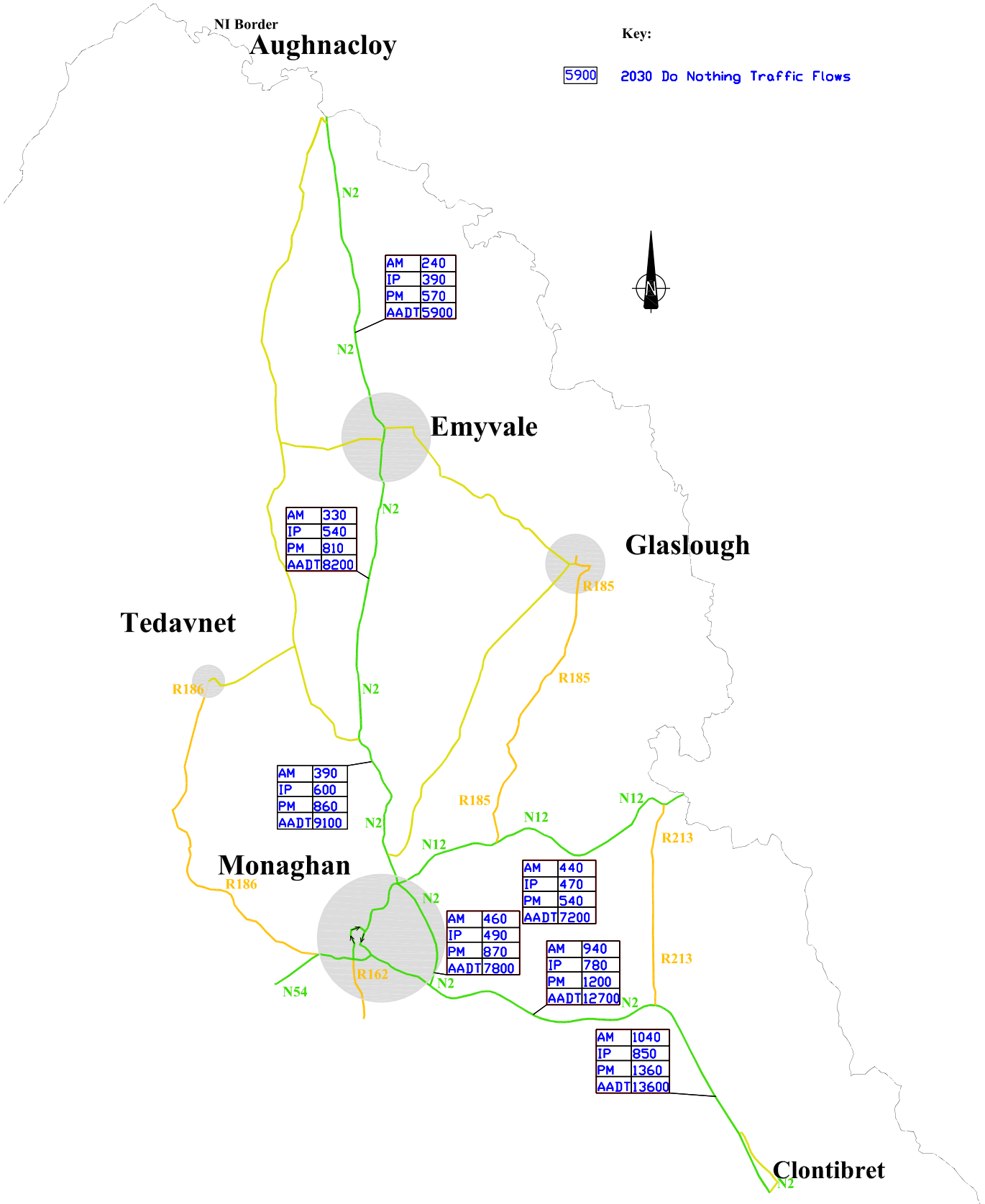
An appraisal year of 2030 has been used to compare the operational performance of options and scenarios, this being a requirement for assessing NRA road schemes where the appraisal year is 15 years after the assumed opening year. The latest NRA guidance in Unit 5.4 of the Project Appraisal Guidelines (January 2011) has been used to predict traffic growth between 2010 and 2030. This takes into account zone–based projections revised following the economic downturn. The actual annual change recorded on the route between the 2009 base year and 2010 has also been used, this being a reduction of 5.9%. Given the scheme's location the local traffic forecast derived have also taken into account slightly different traffic growth for trips associated with Northern Ireland. In this respect the latest data (TEMPRO – NI) has been provided by Roads Service Northern Ireland. The traffic forecasting used in the route selection process has been based on a "medium growth" projection to allow comparison between the performance of the options (the model is also capable of producing both high and low forecasts if required). Traffic flows for the existing network in 2030 are shown in Figure 3.2.



Grontmij

2009 Do Nothing Model Traffic Flows

Figure 3.1



Grontmij

2030 Do Nothing Model Traffic Flows
(Medium Growth)

Figure 3.2

4 Constraints Study

4.1 Introduction

An initial step in the route selection process is to identify the nature and extent of significant constraints within the study area. The constraints identified in the N2 Clontibret to Northern Ireland Border study area are documented in the Constraints Study Report, March 2010. The information collected has provided a basis for the development of the feasible route corridor options assessed. A summary of the main findings is given below, with Figures 4.1 to 4.4 showing constraints for four of the topics areas considered.

4.2 Summary of Findings

The study area is primarily rural in nature but the proliferation of one-off detached housing offers a high level of constraint to the development of the route corridor options. In conjunction with rural housing developments, the main population centres within County Monaghan such as Monaghan Town and Emyvale Village require careful consideration.

The Blackwater, Mountain Water and Corr Rivers are considered to be major constraints due to the engineering and environmental requirements when crossing river channels. The route corridor options should therefore minimise the number of river crossings where possible.

ESB transmission lines, public and private water and waste water supply facilities are all present throughout the study area presenting varying levels of constraints to the development of route corridor options.

The key ecological constraints are represented by seven designated pNHA conservation areas within or adjacent to the boundaries of the study area.

The bedrock geology to the north of Monaghan Town poses no major constraint. To the south of Monaghan Town areas of bedrock outcrops are mapped which may require cuttings to be formed. In these areas rock extracted for the formation of cuttings may be suitable for re-use during the construction phase of the road. Where rock outcrops are encountered to the north of the study area they are likely to be softer compared to those in the southern part of the study area. Formation of cuttings in the softer material is achievable but will require further investigation

during the detailed design and construction phases of the scheme. The geology in the area runs from north to south and therefore the N2 route is likely to encounter each of the rock types. An area of limestone aquifer exists to the north of Monaghan Town and therefore care should be taken as there is the potential for karst solution features within this area.

There are two main type of deposits identified within the study area as being potentially unstable ground; these are peat and alluvial deposits.

In general route corridor options should be acceptable from an aquatic constraints standpoint as a wide range of mitigation measures are available during road design, construction and operational phases.

The evaluation of landscape and visual constraints within the study area has identified a number of landscape and visual constraints. These vary in terms of impact significance depending on the sensitivity of the landscape or receptor, the magnitude of the impact and its duration.

Based on the assessment of the cultural heritage constraints within the study area, the following sites are considered as key constraints:

- Ringfort (CSS 111a) in Tiravera townland and known locally as 'Doonduff' listed in the Register of Historic Monuments as No. 1928;
- three sites listed in the Record of Protected Structures that are also RMP sites (CSS 11a, CSS 101a and CSS 133a) and the one graveyard, Mousewood graveyard (CSS 213), which is listed on the RPS only;
- two site specific cultural heritage features (CSS 223 and CSS 224);
- all other sites (key constraints) listed of which there are 213;
- all other RMP sites, which are afforded statutory protection, should be considered as constraints;
- all unregistered cultural heritage sites should be considered as constraints; and
- Areas of Archaeological Potential.

In terms of architectural heritage within the study area, the following sites are considered as key constraints:

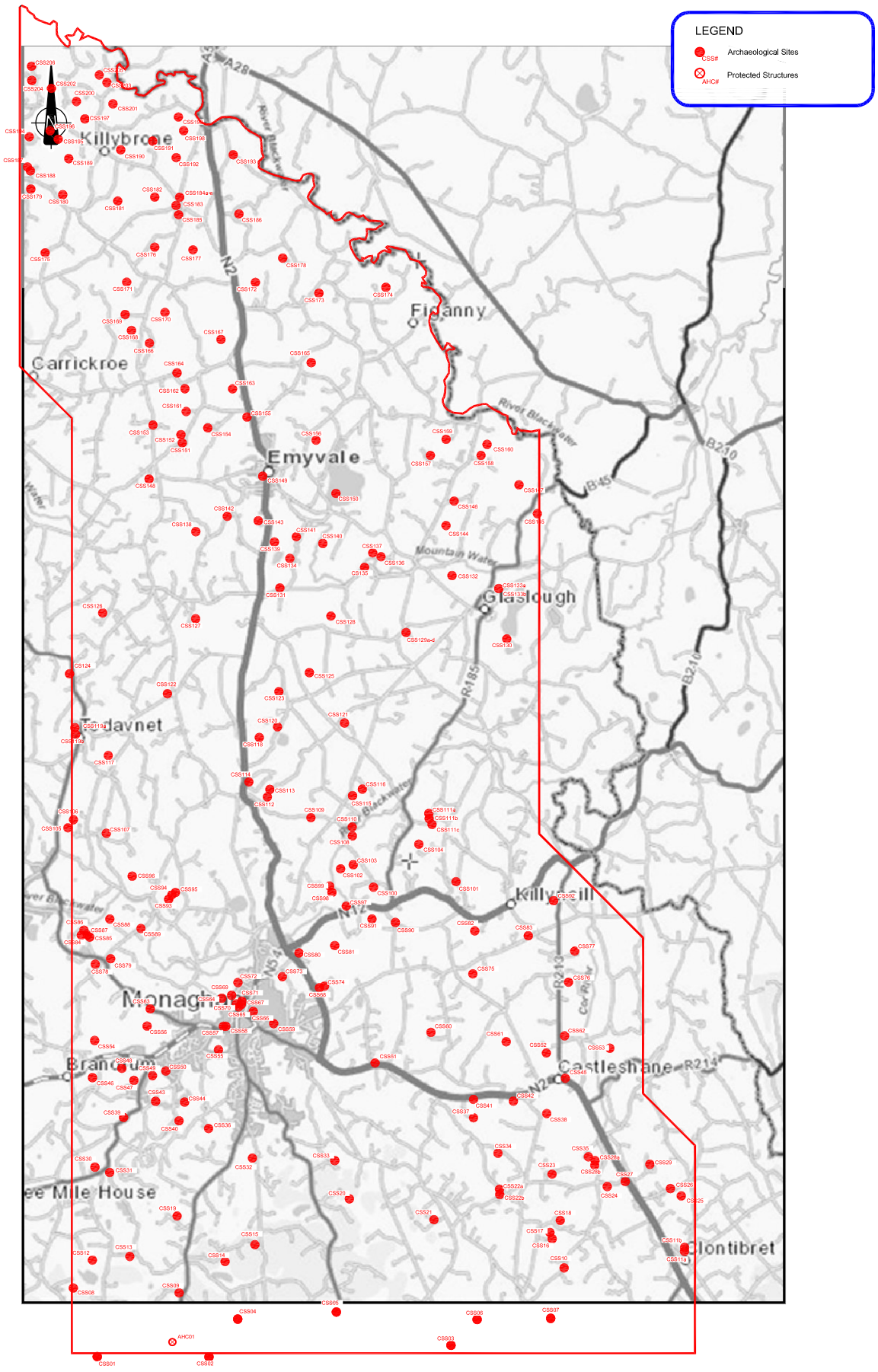
- all sites listed as National Monuments;
- all sites listed in the Register of Historic Monuments;
- all sites subject to a Preservation Order (temporary or full);

- all sites listed in the Record of Protected Structures;
- all Architectural Conservation Areas;
- all sites in the ownership or guardianship of the Local Authority or of the Office of Public Works; and
- all other sites so designated in the report.

Several noise-sensitive receptors have been identified in the vicinity of the existing N2, N12, N54 and other minor roads.

The main agriculture constraints include high quality agricultural land, farm yards and sensitive farm enterprises (dairy and equine).

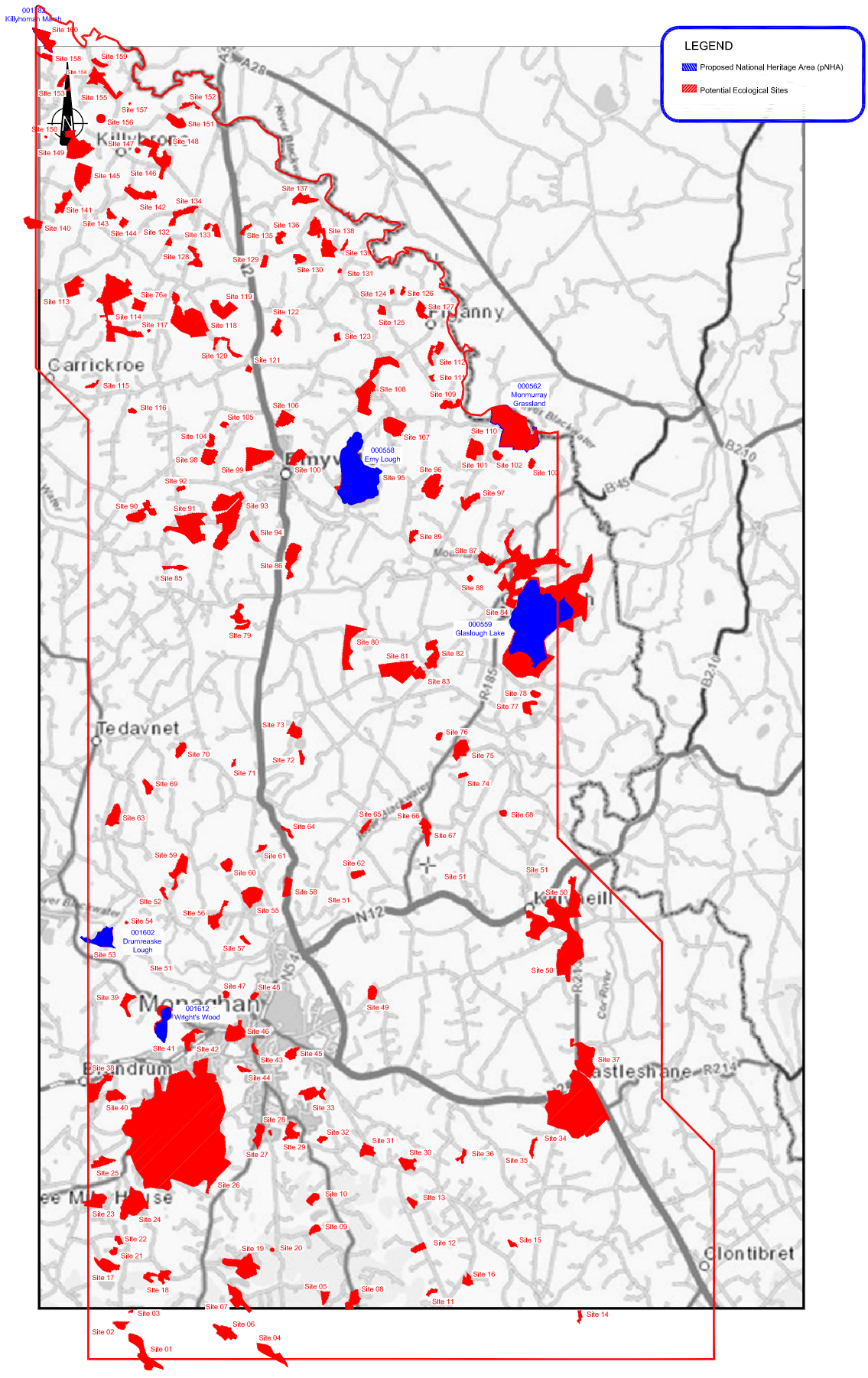
The drumlin terrain has potential to visually conceal a major road scheme, therefore route corridor options should be sensitive to the attractiveness of the landscape, its amenity value and the area's potential for tourism.



Grontmij

Archaeological Sites & Protected Structures

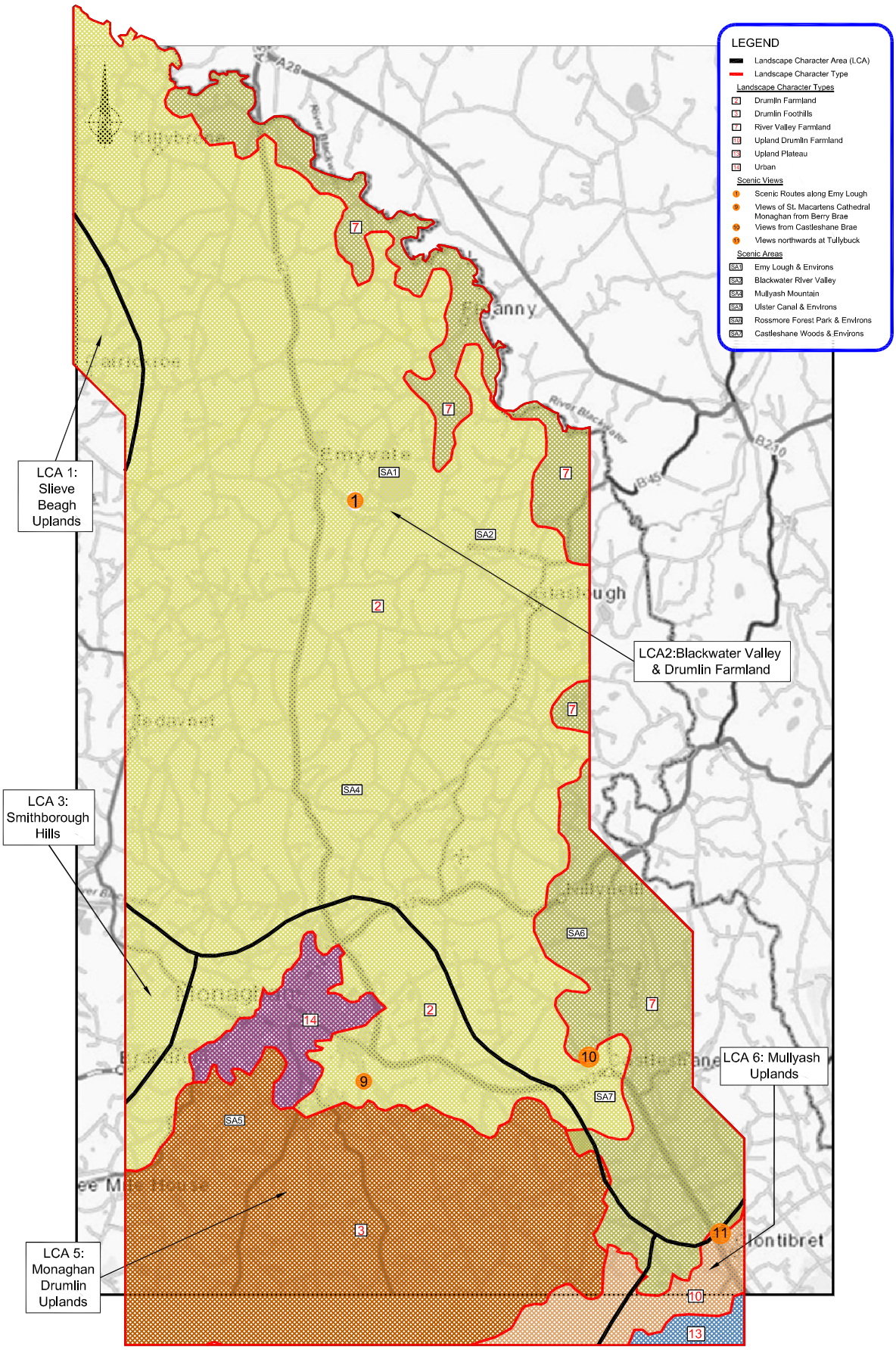
Figure 4.1



Grontmij

Ecology

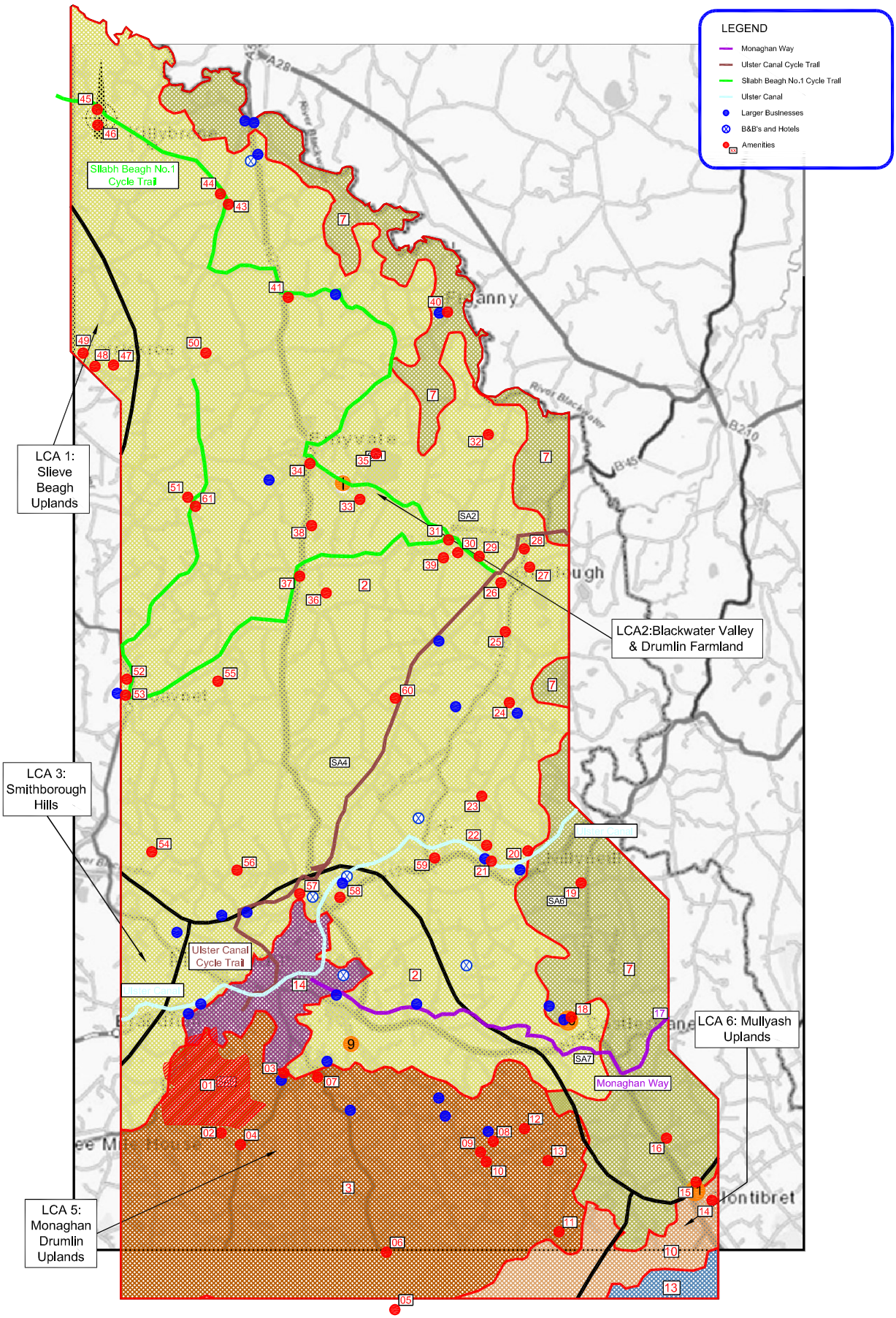
Figure 4.2



Grontmij

Landscape Character

Figure 4.3



Grontmij

Socio-economics

Figure 4.4

5 Consideration of 'Do-Nothing' & 'Do-Minimum' Alternatives

This chapter considers the 'Do-nothing' and 'Do-minimum' scenarios which are defined in the Project Management Guidelines as being:

"The Do-Nothing alternative shall comprise an investigation of the existing road infrastructure and its ability to meet future demands for traffic and safety without any upgrade works"

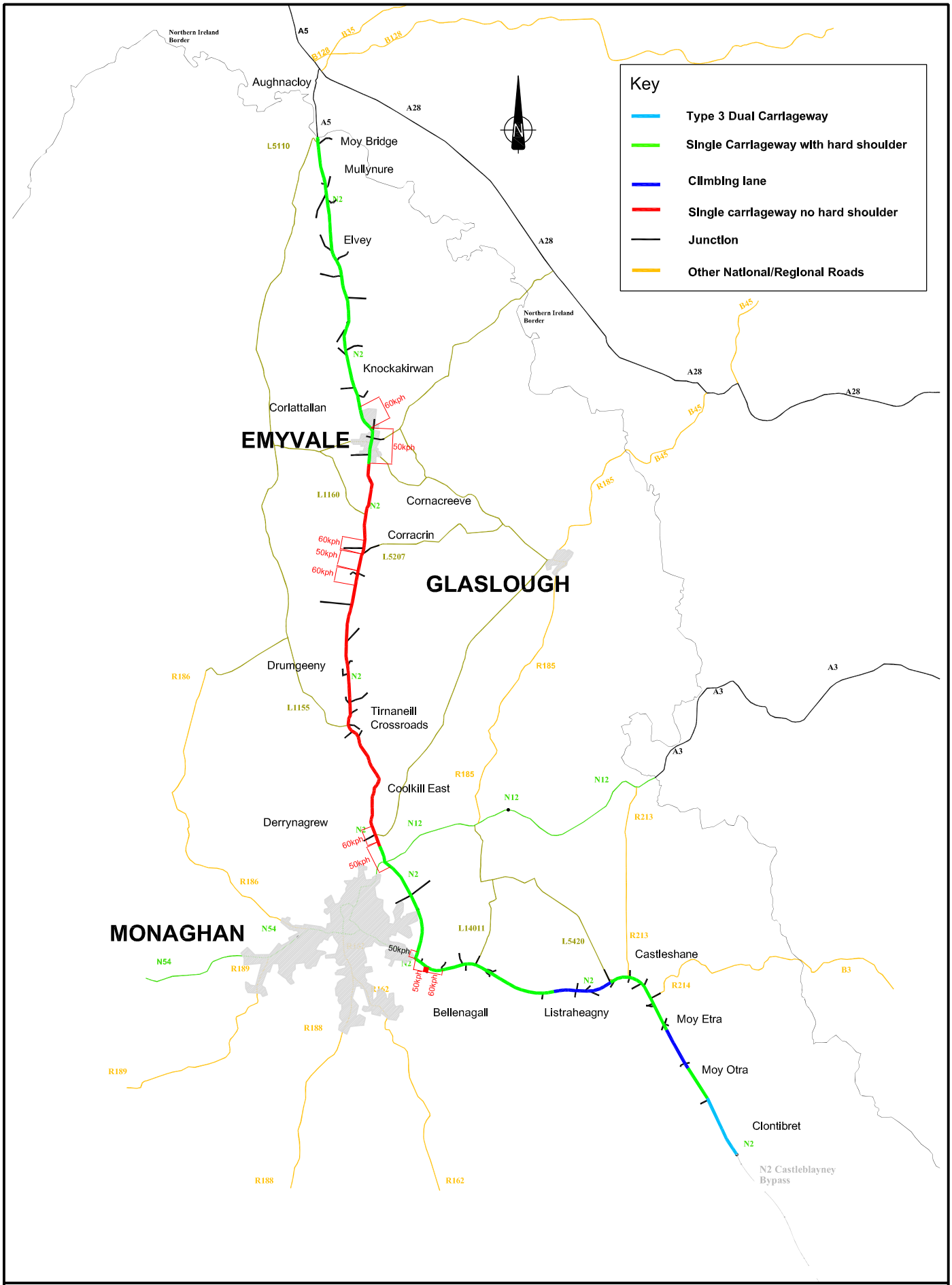
"The Do-Minimum alternative will generally comprise an investigation of the feasibility of an on-line upgrade of the existing route that would be capable of delivering the required levels of service and safety in accordance with the applicable design standards".

5.1 Do-Nothing

Over the 28 km of the existing N2 in the study area there are a range of different layout standards, traffic conditions and historic accident records as described below.

5.1.1 Existing Layout

The existing N2 in the study area generally comprises a single carriageway with hard shoulder provision; however the section from Monaghan to Emyvale has narrow hard strips at the carriageway edge. The initial 2 km section north of Clontibret is a Type 3 dual carriageway with two lanes northbound and one lane southbound. Further north there are extra climbing lanes provided for southbound traffic at Moy Otra and for northbound traffic at Castleshane. Figure 5.1 shows the extents of the varying carriageway types along the route. This figure also highlights where the posted speed limit is not 100kph.



Grontmij

Existing N2 Carrigeway Layout

Figure 5.1

In terms of horizontal alignment the there are a number of bends that fall below the desirable minimum radius that is set out in the Design Manual for Roads and Bridges (DMRB) as being 720 metres, notably the lengthy bend at Castleshane that has a radius of approximately 500 metres radius. Between Monaghan and Emyvale there are sections where the curve radii are well below the DMRB standard as follows:

- Derrynagrew (250m);
- Coolkill East (series of four bends with radii ranging between 110m and 160m);
- Tirnaneill crossroads (reverse curves with 160m and 260m radii); and
- Cornacreeve (reverse curves with 120m and 150m radii).

There is a high frequency of junctions and accesses along the route, laid out mainly as priority junctions with ghost island right turning facilities. The Monaghan Town Bypass also incorporates three roundabout junctions. The high frequency of junctions and accesses is as follows:

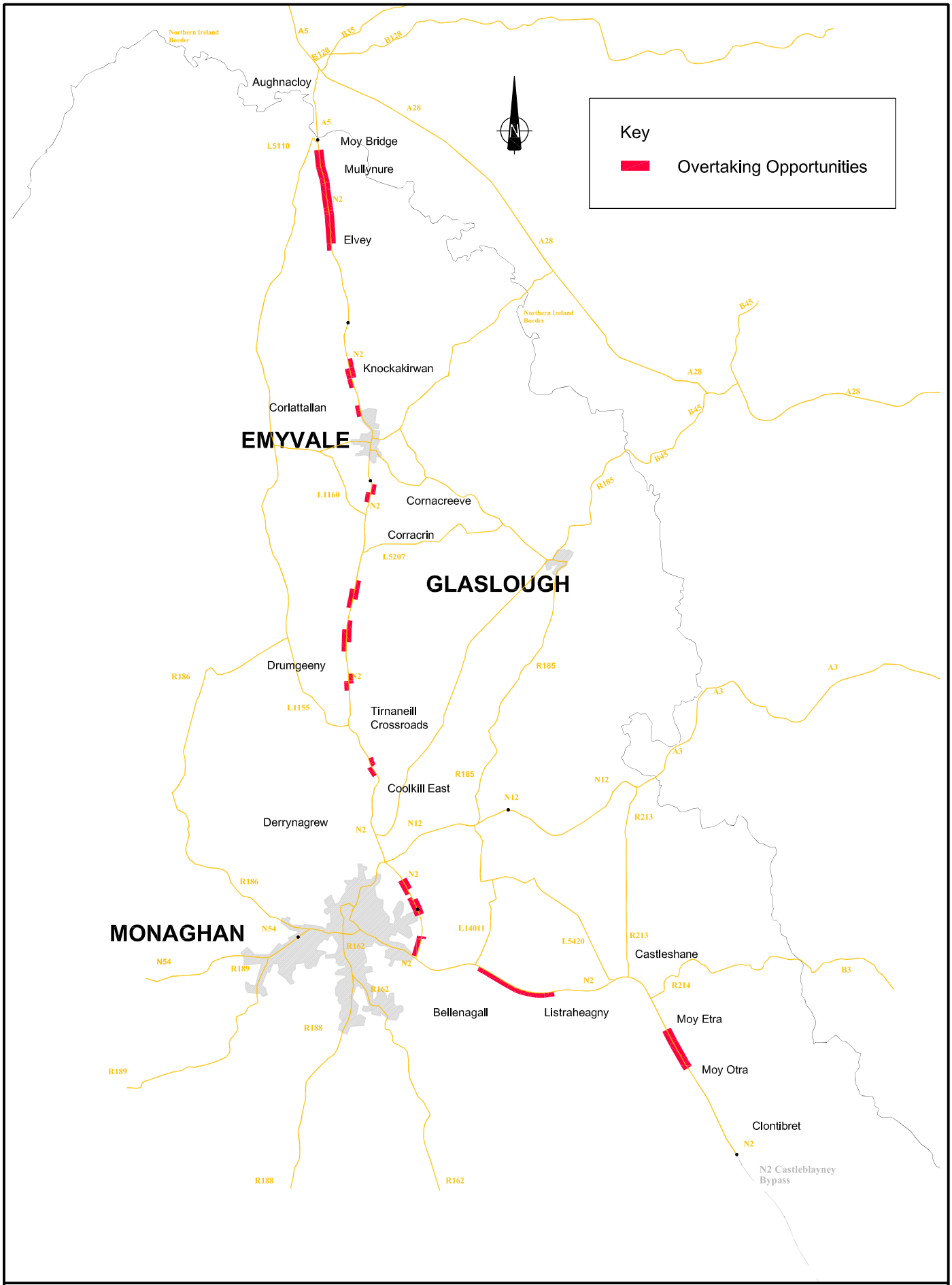
- Clontibret to Monaghan Bypass – 35 in total which is a rate of 4 per kilometre
- Monaghan Bypass - 3 in total which is a rate of 1 per kilometre
- Monaghan Bypass to Emyvale – 73 in total which is a rate of 8 per kilometre
- Emyvale to Moy Bridge – 57 in total which is a rate of 9 per kilometre

Figure 5.1 above also highlights the junctions with local roads along the route. A number of these junctions are sub-standard in terms of their layout and location such as those to the north of Monaghan and those situated on sections where there are climbing lanes.

Overtaking opportunities within the southern section of the route, between Clontibret and Monaghan are limited, as illustrated in Figure 5.2. Overtaking (outwith the Type 3 Dual Carriageway section) is only permitted for approximately 1km between Moy Otra and Moy Utra (provided at the climbing lane section), and for approximately 1.4km between the end of the climbing lane at Listraheagny and Bellanagall. On the Monaghan Town Bypass overtaking is limited to 400m between the southern and middle roundabouts, and to 700m between the middle and northern roundabouts.

Due to the poor geometry overtaking is limited in the section between Monaghan and Emyvale. Between Coolkill East and Corracrin there are four short overtaking sections provided in each direction (non-concurrent) varying between 200m and 600m in length. Between Corracrin and Emyvale, at Cornacreeve, there is a further overtaking section of approximately 400m length.

To the north of Emyvale there are two overtaking sections provided at Corlattallan and Knockakirwin of approximately 250m and 630m length, respectively. Between Elvey and Mullynure, just south of Moy Bridge, a 2.2km overtaking section is provided.



Grontmij

Existing N2 Overtaking Opportunities

Figure 5.2

5.1.2 Traffic

The main source of N2 traffic data for the route is the permanent automatic traffic counter installed at Moy Bridge at the northern extent of the study area. For the year 2009 the annual average daily traffic (AADT) flow was recorded as 5,729 vehicles, of which 12.2% were heavy goods vehicles. A comprehensive set of traffic surveys has been carried out in September 2009 to allow the preparation of a traffic model of the local area for use in the Stage 2 – Project Appraisal. These surveys show higher traffic flows between Emyvale and Monaghan of over 7,000 vehicles per day. At the southern extent of the study area, a temporary automatic traffic counter recorded N2 flows over two weeks that are equivalent to 11,600 vehicles AADT, around 1,400 of which were heavy goods vehicles (12%). At these flow levels the route operates at a poor level of service in that platoons form and passing demand exceeds the opportunities available.

Journey time surveys undertaken between Moy Bridge and Clontibret indicated an average transit time of 24 minutes which equates to an average vehicle speed of 70kph. This partly reflects the lengths of route where the speed limit drops from 100kph to 50 kph through the Emyvale and Corracrin, as well as sections of route with sub-standard visibility, horizontal and vertical geometry.

As part of the 2009 surveys, roadside interviews were carried out on the N2 near Clontibret. Figure 5.3 shows the mixture of origins and destinations for drivers passing through the site in the northbound direction. This information demonstrates that the route carries a mixture of local and longer distance traffic, with 14% of trips destined for Northern Ireland and 13% for County

Donegal. In the Do-nothing scenario this pattern would continue whilst with any off-line improvement the existing road would remain and be available for local users.

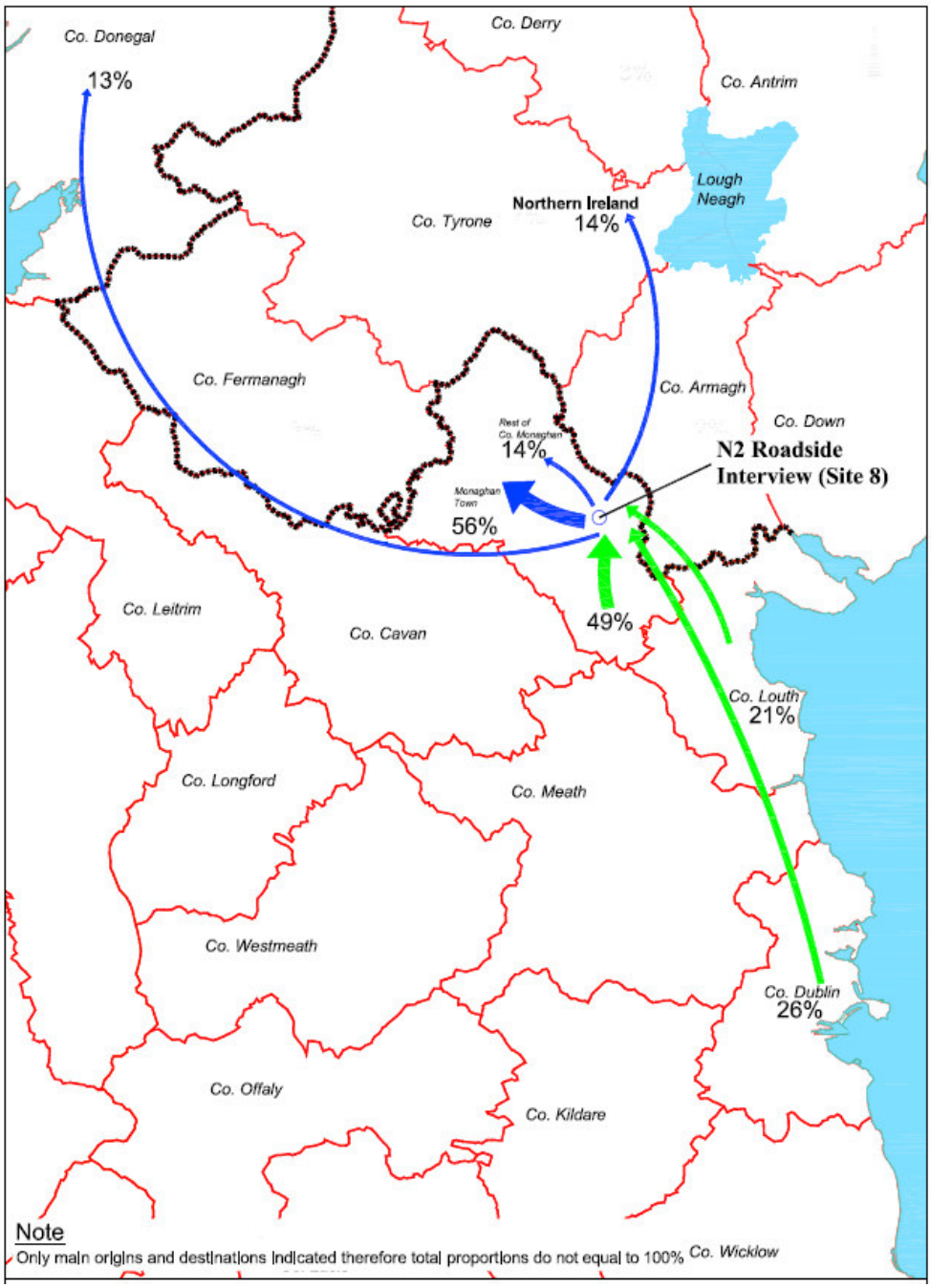


Figure 5.3 N2 Traffic – Origins and Destinations (Northbound near Clontibret)

5.1.3 Analysis of Historic Accidents

Historic accident records for the route have been obtained from An Gardai Siochána and examined in detail. For the period 1996 to 2009 there were a total of 112 personal injury accidents, of which 11 were classified as fatal and 15 resulted in serious injury. To the north of Monaghan the route exhibited an accident rate higher than the national average for a modern single carriageway. In terms of accident severity the relatively high proportion of fatal accidents on the section south of Monaghan is approximately 50% higher than that for a rural single carriageway designed to modern standards. The proportion of accidents occurring at bends is particularly high to the north of Monaghan, where 29% of accidents are bend-related. Even non-injury accidents on the route can cause significant disruption to users, an accident involving two trucks at Corracrin in 2007 resulted in the road being closed for half a day. In such circumstances traffic is subject to significant disruption being diverted onto longer alternative routes such as the R213 / A3 / B210 / A28 route that is significantly longer and of lower standard.

Within the European Road Assessment Programme (EuroRAP) 2005 and 2008 the section of the N2 from Monaghan to the Northern Ireland border was rated as 'medium-high risk'. This rating takes into account the numbers of fatal and serious injury accidents. This risk rating applies to only a small proportion of Ireland's major roads (approximately 10%).

5.1.4 Conclusion

Given the sub-standard layout and the poor level of service in terms of traffic and road safety the Do-nothing scenario is not capable of achieving the scheme objectives either now or in the future, as described in the above sections.

5.2 Do-Minimum

Sections of the existing route have been examined to see if a Do-minimum scenario could be identified that comprises upgraded sections that would be "capable of delivering the required levels of service in accordance with appropriate design standards". However, given the extensive sections of sub-standard geometry, those with limited overtaking opportunity, the urban sections and generally high frequency of junctions, no feasible "low-cost" solution was identified as a do-minimum. It was therefore decided that a full upgrade within the existing corridor should be considered as an option and directly appraised against other off-line scenarios. The on-corridor upgrade, known as the Black option, is further described in Chapter 6.

For assessment purposes, all options are therefore compared against the Do-nothing, with the Do-minimum being equivalent to the Do-nothing.

6 Stage 1 Preliminary Options Assessment

6.1 Feasible Route Corridor Options Identified

Five 400m wide feasible route corridors were initially established, taking into consideration known constraints and maximising the size of the study area investigated. These corridors were created to allow the development of a high standard road whilst minimising the impact on properties and known cultural and environmental constraints. To aid in the comparison of the corridors, each was assigned a colour (Blue, Black, Red, Green and Yellow) with each of the options commencing at the existing N2 roundabout at Clontibret and terminating at the Northern Ireland border where the route ties in with the A5. Figure 6.1 indicates the route corridor options that have been assessed and that are introduced below.

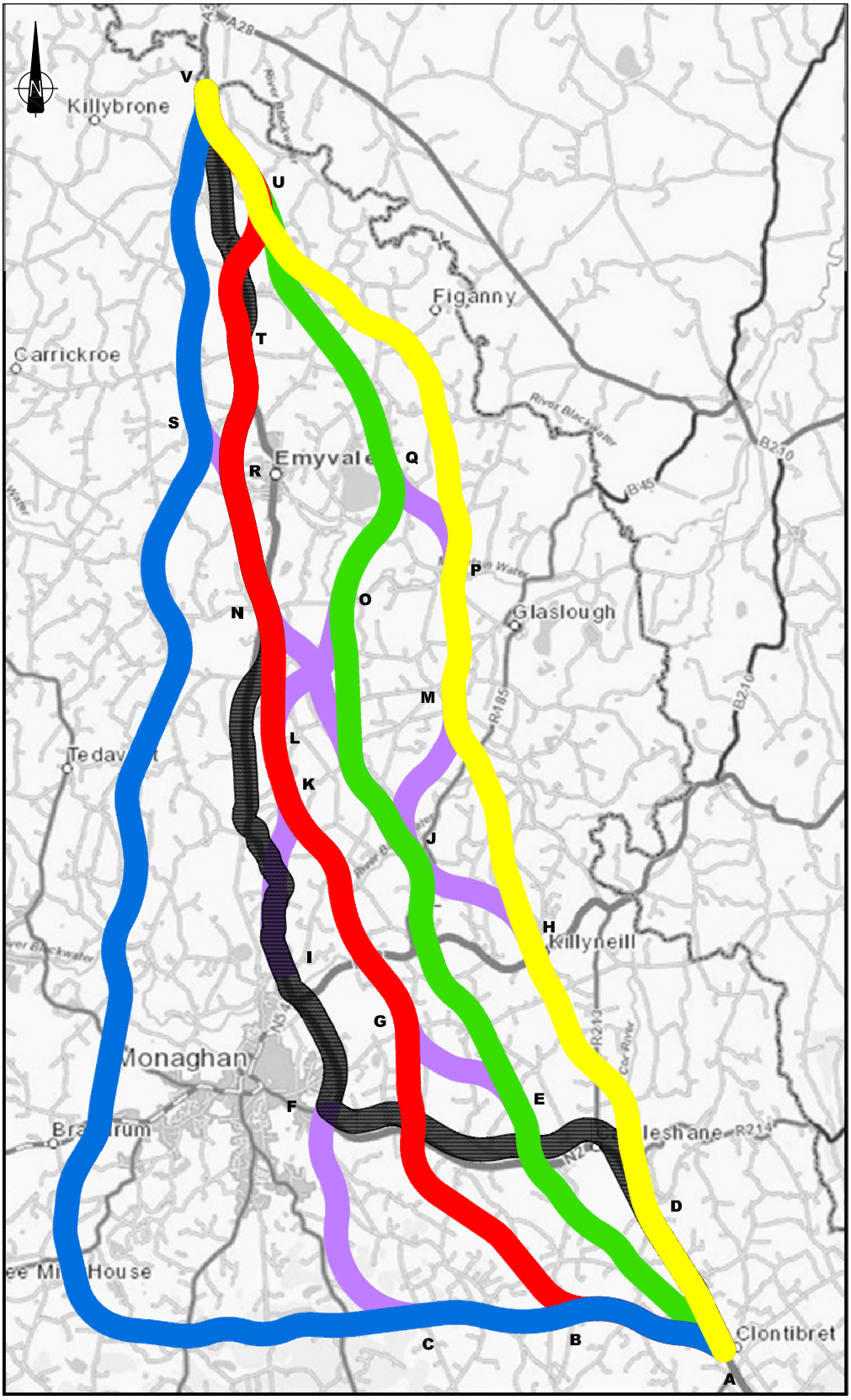
- the **Blue** corridor is the most westerly of the corridors, extending to the south of Monaghan Town and avoiding the area around Kilnamaddy before turning northwards to run parallel to the existing N2. It then crosses the Mountain Water River, west of Emyvale, before tying back into the existing N2 close to the border.

- the **Black** corridor follows the existing N2 corridor, including the corridor followed by the Monaghan Town Bypass opened in 2006. This route considers the investigations carried out on the do-nothing scenario, and that there would be extensive works required to bring the route up to standard, involving widening, realignment to achieve 100 kph design speed and provision of sections of parallel roads to deal with local junctions and accesses. Given the physical constraints and possible substantial impacts on existing communities the Black route includes for bypasses running to the east of Corracrin and west of Emyvale. The routing of the corridor here follows that used by the former Monaghan – Emyvale road realignment scheme previously planned in the 1990s.

- the **Red** corridor runs south west of Castleshane, before crossing the existing N2 east of Monaghan Town where it parallels the town bypass. It crosses the N12, Ulster Canal and Blackwater River north of Monaghan Town and continues running parallel and east of the existing N2, before passing to the west of Emyvale, in the same corridor as the Black route. North of Emyvale there is a short section where the corridor follows the existing N2, before moving offline to the east before joining up again at the border.

- the **Green** corridor initially runs parallel to the N2, passing to the south west of Castleshane, before crossing to east of the Corrawillin settlement. From here, the corridor continues northward, crossing the N12, Ulster canal and then the Blackwater River north of Monaghan Town. Running parallel and east of the existing N2 through the middle of the Study Area, the route crosses the Mountain Water River, before passing to the east of Emyvale and Emy Lough and thereafter tying in at the border.

- the **Yellow** corridor is the most easterly of the corridors, follows the existing N2 from the commencement point towards Castleshane where it heads northwards, crossing the River Cor. The corridor crosses the N12 and the Ulster Canal towards the eastern edge of the study area, before crossing the River Blackwater and passing to the west of Glaslough but east of Emy Lough. North of this the corridor follows the same routing as the green and red corridors.



Grontmij

Feasible Route Corridor Options

Figure 6.1

A number of possible inter-connections between route corridor options have also been identified and are referred to using node points (A, B, C, etc). Taking into account the cross-over links between the five corridors there are a total of 33 possible routes between the scheme extents to be comparatively assessed.

6.2 Management Option

The Common Appraisal Framework (Department of Transport, June, 2009) requires consideration of a "management option" as part of the options appraisal process for transport projects. This is described as follows:

"Investment options will not always represent the most appropriate response to identified needs or objectives. Better management or pricing of existing networks and services may either reduce demand or expand the effective capacity of networks. A management option may also be more environmentally acceptable. Project analysts should give explicit consideration to the management approach when developing options".

In terms of the N2 Clontibret to Northern Ireland Border project no "management option" has been identified arising from the consideration of the existing route, as described in Chapter 5. The Black corridor option offers the only means to achieve the scheme objective through maximising use of the existing road infrastructure. As described above the Black option does incorporate extensive works, similar in scale to other "do-something" options, in order to achieve the design standard appropriate for a strategic national route. Appraisals of the black corridor are contained later in this chapter and also in chapter 7, which reports an incremental analysis for a range of scenarios based on this corridor.

6.3 Assessment of the Route Corridor Options

In accordance with the NRA Project Management Guidelines, each option has been assessed against ***Engineering***, ***Environment*** and ***Economy*** criteria. These criteria have been sub-divided into a number of quantifiable parameters, as described below.

6.4 Engineering

Five key parameters were established to assess the engineering performance for each of the route corridors, as follows:

- **Journey Time Savings** – The time saved for a vehicle travelling from the commencement to termination point of the scheme at an average speed of 95kph when compared to the existing baseline travel time on the existing N2, measured as 24 minutes.
- **Roads and watercourses crossed** – The number of roads bisected by the route corridor options, broken down into National Primary, National Secondary, regional, local and access roads. These figures indicate the number of road structures or diversions required. In developing a score for comparing options the following weightings were applied: 3.0 to National Primary and Secondary roads, 2.0 to regional roads and 1.0 to local and access roads. The number of watercourses bisected by route corridor options, broken down into canals, rivers and streams adjusted using the following weightings: 3.0 for canals and rivers and 1.0 to streams.
- **Service Conflicts** – With the exception of High Voltage ESB transmission lines it is noted that there are no major services within the study area which would influence the selection of a route corridor. The number of High Voltage ESB transmission lines bisected by each route corridor option has been measured to provide a comparison of the impact between the options.
- **Ease of construction** – The length of the existing road network within the route corridor options, broken down into National Primary, National Secondary, regional, local and access roads. In developing a score for comparing options the following weightings were applied: 3.0 to National Primary and Secondary roads, 2.0 to regional roads and 1.0 to local roads. For access roads a weighting of 0.5 was applied. This scoring provides an indication of the level of traffic management that would be required.
- **Drainage** – Area of potential flooding within the route corridor options taken from the OPW 'Damaged Land' surveys. This gives and indication of the potential of difficult ground conditions and abnormal drainage requirements.

The assessment results are contained in Table 6.1 below, with commentary on the relative performances of the options described thereafter.

Route	Length (km)	Time Saving (min)	Roads / watercourses (weighted)	(ESB transmission lines crossed)	Roads in Corridor (weighted, km)	"Damaged Lands" (ha)
Blue	33.5	2.8	110	5	40	89
Black	28.1	6.2	142	4	105	113
Red	26.4	7.3	108	4	40	91
Green	25.3	8.0	83	0	31	105
Yellow	24.7	8.4	87	0	48	186
Blue - Black	28.7	5.9	121	4	74	89
Blue - Black - Red	28.7	5.9	119	4	58	92
Blue - Black - Red - Black	28.4	6.0	116	4	64	88
Blue - Black - Blue	28.8	5.8	112	4	60	84
Blue - Black - Red - Blue	28.6	5.9	107	4	50	84
Blue - Black - Red - Green	29.7	5.2	102	4	48	102
Black - Red	28.2	6.2	140	4	89	116
Black - Red - Black	27.9	6.4	137	4	95	112
Black - Blue	28.3	6.2	133	4	91	108
Black - Red - Blue	28.0	6.3	128	4	81	108
Black - Red - Green	29.1	5.6	123	4	79	126
Red - Blue	26.3	7.4	99	4	32	83
Red - Black	26.1	7.5	108	4	46	87
Red - Green	27.4	6.7	94	4	30	101
Green - Red1	25.7	7.8	111	0	40	81
Green - Red2	25.2	8.1	104	0	42	84
Green - Red1 - Green	26.6	7.2	94	0	30	91
Green - Red1 - Blue	25.5	7.9	99	0	32	73
Green - Red2 - Blue	25.0	8.2	92	0	34	76
Green - Red1 - Black	25.4	8.0	108	0	46	77
Green - Red2 - Black	24.9	8.3	101	0	48	80
Green - Yellow	25.8	7.7	84	0	33	95
Green - Yellow - Green	25.5	7.9	90	0	32	93
Yellow - Green No.1	25.4	8.0	92	0	45	185
Yellow - Green No.2	24.4	8.6	93	0	47	184
Yellow - Red	25.2	8.1	113	0	56	164
Y - R - Black	24.9	8.3	110	0	62	160
Y - R - Blue	29.2	5.6	115	0	53	191

Table 6.1 - Engineering Parameter Values

- **Journey Time Savings** - It can be seen from Table 6.1 that the journey time savings are intrinsically linked to the length of each route corridor option. Therefore the shorter the option the more favourable it is with regard to journey time savings. The top three options with regard to time savings are Yellow-Green2, Yellow, and Green-Red2-Black with savings of between 8.6 and 8.3 minutes. The worst performing option is the Blue option with a time saving of 2.8 minutes.
- **Roads/Watercourses Crossings** - The top three options are Green, Green-Yellow, and Yellow with scores between 83 and 87. The worst performing option is the Black option with a score of 142.
- **Service Conflicts (ESB transmission lines)** - The scores for service conflicts are related to the locations of High Voltage overhead ESB lines (there are no other major services constraints within the study area). These ESB lines are almost exclusively located to the

south of and around Monaghan Town, with the exception of the line extending from Milltown to Killycarran, (passing to the east of Tedavnet). This is reflected in the scoring of the options where approximately half of the options have 4 four conflicts, one option has five, and the other half of the options have no conflicts.

- **Ease of Construction** - The top three options are Red-Green, Green-Red1-Green, and Green, with scores of 30 to 31. There is a large variance between the route options with the worst performing option, the Black option, having a score of 105.
- **Drainage** - The best performing options, those with the least area of damaged land, are Green-Red1-Blue, Green-Red2-Blue, and Green-Red1-Black, with areas of 73 to 77Ha. The worst performing option is the Yellow-Red-Blue with a significantly greater area of 191Ha.

6.5 Environment

11 key parameters were established to assess the potential environmental effects for each of the corridors. These parameters relate to the environmental topics for which extensive information has been collated in the *Constraints Study* report having regard to the *NRA Environmental Assessment & Construction Guidelines*. The parameters are further described below.

- **Cultural Heritage** – the number of individual cultural heritage sites identified within the corridor as defined in the *Constraints Study* report as being key constraints, other constraints, cultural heritage sites, and Areas of Archaeological Potential.
- **Architectural Heritage** – the number of individual architectural heritage sites identified within the corridor as defined in the *Constraints Study* report as being settlements, demesnes and architectural sites.
- **Ecology** – the number of individual ecological sites identified within the corridor as defined in the *Constraints Study* report as being pNHA sites, Sites of National Importance, county important sites, sites of high local importance and other sites. There are no SPAs or SACs within the study zone.
- **Noise** – the number of properties identified within the corridor, weighted depending on the proximity to the centre of the corridor as follows:
    - 0 to 50m from corridor centreline x4 weighting,
    - 50 to 100m from corridor centreline x3 weighting,
    - 100 to 150m from corridor centreline x2 weighting,
    - 150 to 200m from corridor centreline x1 weighting;

- **Air Quality** – the number of properties identified within the corridor;
- **Landscape** – the number of individual landscape constraints identified in the *Constraints Study* report that fall within the corridor. These include demesnes, scenic routes, scenic landscapes, views, settlements, pathway/cycle trails, rivers/lakes and the Ulster Canal;
- **Agronomy** – the number of individual agronomy sites identified within the corridor as defined in the *Constraints Study* report in the categories of dairy, dairy and pigs/poultry, pigs/poultry, beef and sheep, mushrooms, and equine;
- **Socio-Economics** – the number of socio-economic sites identified within the corridor as defined in the *Constraints Study* report as being businesses, B&Bs and hotels, amenities and tourist attractions such as the Monaghan Way, Ulster Canal cycle trail, Sliabh Beath cycle trail, Ulster Canal;
- **Geology** – the area of karst and rock at shallow level to karst within the corridor as defined in the *Constraints Study* report;
- **Hydrogeology** – the area of inner and outer protection zones and aquifer vulnerability within the high and extreme ranges within the corridor as defined in the *Constraints Study* report; and
- **Hydrology** – the number of lake, river, canal and stream crossings within the corridor.

Tables 6.2 and 6.3 show the values identified for each parameter, with commentary on the relative performance of the options described thereafter.

Route	Properties Affected	Cultural Heritage	Architectural Heritage	Ecology	Noise	Air Quality
Blue	490	26	56	73	1,037	490
Black	1,025	28	90	31	2,526	1,025
Red	497	24	50	34	1,074	497
Green	453	18	39	23	976	453
Yellow	427	30	41	21	935	427
Blue - Black	756	26	63	34	1,777	756
Blue - Black - Red	608	28	59	48	1,341	608
Blue - Black - Red - Black	658	28	59	44	1,534	658
Blue - Black - Blue	663	28	57	55	1,474	663
Blue - Black - Red - Blue	565	30	53	65	1,231	565
Blue - Black - Red - Green	513	32	41	41	1,107	513
Black - Red	877	30	86	45	2,090	877
Black - Red - Black	927	30	86	41	2,283	927
Black - Blue	932	30	84	52	2,223	932
Black - Red - Blue	834	32	80	62	1,980	834
Black - Red - Green	782	34	68	38	1,856	782
Red - Blue	454	26	44	51	964	454
Red - Black	547	24	50	30	1,267	547
Red - Green	402	28	32	27	840	402
Green - Red1	472	21	54	32	1,105	472
Green - Red2	491	17	56	30	1,129	491
Green - Red1 - Green	377	25	36	25	871	377
Green - Red1 - Blue	429	23	48	49	995	429
Green - Red2 - Blue	448	19	50	47	1,019	448
Green - Red1 - Black	522	21	54	28	1,298	522
Green - Red2 - Black	541	17	56	26	1,322	541
Green - Yellow	432	23	35	22	952	432
Green - Yellow - Green	460	19	39	22	1,011	460
Yellow - Green No.1	457	27	48	29	962	457
Yellow - Green No.2	455	26	45	21	994	455
Yellow - Red	495	26	65	36	1,115	495
Y - R - Black	545	26	65	32	1,308	545
Y - R - Blue	501	36	67	57	1,120	501

Table 6.2 - Environmental Parameter Values (1)

Route	Properties Affected	Landscape	Agronomy	Socio - Economics	Geology (ha)	Hydrogeology (ha)	Hydrology - River Crossings
Blue	490	61	34	16	0.8	6	37
Black	1,025	93	43	42	0.8	9	26
Red	497	64	22	31	0.6	5	33
Green	453	68	28	26	0.5	5	31
Yellow	427	59	30	25	1.0	7	31
Blue - Black	756	76	36	37	0.6	7	29
Blue - Black - Red	608	75	32	30	0.6	6	31
Blue - Black - Red - Black	658	84	34	35	0.6	6	29
Blue - Black - Blue	663	62	33	22	0.6	6	33
Blue - Black - Red - Blue	565	70	31	20	0.6	5	33
Blue - Black - Red - Green	513	72	32	27	0.7	6	32
Black - Red	877	92	39	35	0.8	8	28
Black - Red - Black	927	101	41	40	0.8	8	26
Black - Blue	932	79	40	27	0.8	8	30
Black - Red - Blue	834	87	38	25	0.8	8	30
Black - Red - Green	782	89	39	32	0.9	8	29
Red - Blue	454	59	21	21	0.6	5	35
Red - Black	547	73	24	36	0.6	5	31
Red - Green	402	61	22	28	0.7	5	34
Green - Red1	472	72	29	29	0.4	5	31
Green - Red2	491	64	30	27	0.5	4	25
Green - Red1 - Green	377	69	29	26	0.4	5	32
Green - Red1 - Blue	429	67	28	19	0.4	4	33
Green - Red2 - Blue	448	59	29	17	0.4	4	27
Green - Red1 - Black	522	81	31	34	0.4	5	29
Green - Red2 - Black	541	73	32	32	0.4	4	23
Green - Yellow	432	53	34	25	0.6	6	32
Green - Yellow - Green	460	56	33	28	0.5	6	29
Yellow - Green No.1	457	74	26	24	0.8	6	29
Yellow - Green No.2	455	62	29	29	0.7	7	28
Yellow - Red	495	70	28	25	0.7	5	23
Y - R - Black	545	79	30	30	0.7	6	21
Y - R - Blue	501	73	30	20	0.8	7	30

Table 6.3 – Environmental Parameter Values (2)

- **Cultural Heritage** - The most favourable options with regard to cultural heritage will be that with the least number of relevant sites. The three top-performing options are Green-Red2, Green-Red2-Black, and Green, containing between 17 and 18 sites. The worst performing option is the Yellow-Red-Blue corridor with 36 sites.
- **Architectural Heritage** - The most favourable options with regard to architectural heritage will be these with the least number of relevant sites. The three top-performing options are Red-Green, Green-Yellow, and Green-Red1-Green, with between 32 and 36 sites. The worst performing option is the Black option with 90 sites.

- **Ecology** - The most favourable options with regard to ecology will be these with the least number of ecological sites within the corridor. The three top-performing options are Yellow, Yellow-Green2, and Green-Yellow (and Green-Yellow-Green), with 21, 21, and 22 sites each. The worst performing option is the Blue option with 73 sites.
- **Noise** - The most favourable options with regard to noise are those with the lowest score based on the weighted number of properties in the corridor. In this case, the three top-performing options are Red-Green, Green-Red1-Green, and Yellow, having scores between 840 and 935. There is a large variance across the results, with the worst performing option, the Black, having a score of 2526.
- **Air Quality** - Similar to noise, air quality is assessed by the number of properties within the corridor (although there are no weightings applied). The three top-performing options are Green-Red1-Green, Red-Green, and Green-Red1-Blue with between 377 and 429 properties. The option with the greatest number of properties is the Black option, with 1025 properties within the corridor.
- **Landscape** - The most favourable options with regard to landscape are those with the fewest individual landscape constraints. The three top-performing options are Green-Yellow, Green-Yellow-Green, and, jointly, Yellow, Red-Blue, and Green-Red2-Blue, with between 53 and 59 constraints. The worst performing option is the Black-Red-Black option with 101 constraints.
- **Agronomy** - The most favourable option with respect to agronomy will be that with the least number of identified agricultural properties. The three top-performing options are Red-Blue, Red, and Red-Green with 21, 22 and 22 properties within the corridor. The option with the greatest number of properties is the Black option with 43.
- **Socio-Economics** - The most favourable option with respect to socio-economics would be that with the least number of identified socio-economic sites. The three top-performing options are Blue, Green-Red2-Blue, and Green-Red1-Blue (16, 17 and 19 sites respectively). The least favourable option is the Black option with 42 identified sites.
- **Geology** - The most favourable option with respect to geology would be that with the smallest area of identified geological sites. The only identified potential karst feature within the study area is a spring situated at Mullanacross to the north of Emyvale. An area of the limestone aquifer spanning the width of the study area to the north of Monaghan Town is also considered to be controlled by karst features and is considered an area of potential unstable ground. The scores reflect the geological conditions and on that basis the top-performing options are Green-Red1, Green-Red1- Green, Green-Red1-Blue, Green-Red2-

Blue, Green-Red1-Black, and Green-Red2-Black, all with an area of 0.4Ha. The worst performing option is the Yellow route corridor with an area of 1Ha.

- **Hydrogeology** - The most favourable options with respect to hydrogeology will be those with the smaller areas of hydrogeological sensitivity. Within the source protection areas, nine inner protection zones have been identified relating to Monaghan Town Water supply scheme. There are also a number group water schemes in the area surrounding Monaghan Town and Glaslough. In relation to aquifer vulnerability the area to the south of Monaghan has the higher concentration of high and extreme ratings with the low rating becoming more prevalent moving north through the study area. On that basis the top-performing options are Green-Red2, Green-Red1-Blue, Green-Red2-Blue, and Green-Red2-Black, all with an area of 4Ha. The worst performing option is the Black route corridor with an area of 9Ha.
- **Hydrology** - The most favourable option would be that with the fewest number of lake, river, canal and stream crossings. The three top-performing options are, therefore, Yellow-Red-Black (21), Green-Red2-Black (23), and Green-Red2 (25). The worst performing option is the Blue route corridor, which has 37 crossings.

6.6 Economy

The economy assessment of the preliminary options is based on a comparison of cost estimates between the corridor options. Given that only broad concepts are identified it has been decided to use a cost per kilometre for this purpose, based on recent NRA schemes. Assuming the highest level of provision would be a dual carriageway[2] then the appropriate total scheme cost[3] is €7.8M per kilometre. In addition, for those sections that would lie in the existing corridor, that is the black sections, an additional €1.0m per kilometre has been assumed. This is an allowance for the extra infrastructure that would be required to provide for continued or alternative access to existing properties, by providing local access roads since the frequency of access to the national primary would be significantly reduced. Table 6.4 shows the results of the assessment.

[2] Carriageway type is decided during the Phase 3 Design process that follows Phase 2 Route Selection, in accordance with NRA Project Management Guidelines.
[3] Total scheme cost includes for planning, land and construction

Route	Length (km)	Cost Estimate
Blue	33.5	262
Black	28.1	247
Red	26.4	206
Green	25.3	198
Yellow	24.7	193
Blue - Black	28.7	242
Blue - Black - Red	28.7	227
Blue - Black - Red - Black	28.4	231
Blue - Black - Blue	28.8	237
Blue - Black - Red - Blue	28.6	225
Blue - Black - Red - Green	29.7	234
Black - Red	28.2	232
Black - Red - Black	27.9	236
Black - Blue	28.3	242
Black - Red - Blue	28.0	230
Black - Red - Green	29.1	239
Red - Blue	26.3	205
Red - Black	26.1	208
Red - Green	27.4	214
Green - Red1	25.7	200
Green - Red2	25.2	196
Green - Red1 - Green	26.6	208
Green - Red1 - Blue	25.5	199
Green - Red2 - Blue	25.0	195
Green - Red1 - Black	25.4	203
Green - Red2 - Black	24.9	199
Green - Yellow	25.8	202
Green - Yellow - Green	25.5	199
Yellow - Green No.1	25.4	198
Yellow - Green No.2	24.4	190
Yellow - Red	25.2	197
Y - R - Black	24.9	199
Y - R - Blue	29.2	228

Table 6.4 – Economic Parameter Values

The top three top-performing options are Yellow-Green2 (€190m), Yellow (€193m), and Green-Red2-Blue (€195m). The worst performing option is the Black option (€247m).

6.7 Comparison using Framework Matrix

The parameter values, as shown above in Tables 6.1, 6.2, 6.3 and 6.4, were inserted into an assessment matrix, whereby the overall performance of each option could be established. Once all the engineering values were collated it was decided, based on professional judgement, to

apply the following weightings in order to determine an overall engineering score for a particular option:

- 0.35 weighting for time savings;
- 0.2 weighting for structures;
- 0.1 weighting for service conflicts;
- 0.25 weighting for ease of construction; and
- 0.1 weighting for drainage.

This matrix assessment process determined a ranking score for each option in terms of the engineering, environment and economy criteria, as shown in Table 6.5.

Route Options	Engineering	Environment	Economy
Blue	4.3	5.4	1
Black	3.4	2.7	2
Red	7.0	6.5	8
Green	9.1	7.4	9
Yellow	7.8	6.1	9
Blue - Black	4.6	4.5	3
Blue - Black - Red	5.1	5.2	5
Blue - Black - Red - Black	5.4	4.8	4
Blue - Black - Blue	5.4	5.5	4
Blue - Black - Red - Blue	5.8	5.4	5
Blue - Black - Red - Green	5.5	5.5	4
Black - Red	3.6	2.9	4
Black - Red - Black	3.9	2.5	4
Black - Blue	3.9	3.1	3
Black - Red - Blue	4.4	3.1	4
Black - Red - Green	4.1	3.3	3
Red - Blue	7.8	6.9	8
Red - Black	7.0	6.3	7
Red - Green	7.2	6.9	7
Green - Red1	7.9	6.8	8
Green - Red2	8.5	7.5	9
Green - Red1 - Green	8.4	7.3	7
Green - Red1 - Blue	8.7	7.3	8
Green - Red2 - Blue	9.1	7.8	9
Green - Red1 - Black	8.3	6.4	8
Green - Red2 - Black	8.2	6.5	8
Green - Yellow	8.7	7	8
Green - Yellow - Green	8.5	7.4	8
Yellow - Green No.1	7.9	6.4	9
Yellow - Green No.2	8.0	6.5	10
Yellow - Red	7.0	6.5	9
Y - R - Black	7.2	5.5	8
Y - R - Blue	5.6	5	5

Table 6.5 - Ranking Scores for 33 Corridor Options

The PMG guidance suggests the performance of options is presented as being grouped into high preference, medium preference and low preference. The ranking scores shown in Table 6.1 were therefore translated in preference ratings using the thresholds itemised in Table 6.6 below.

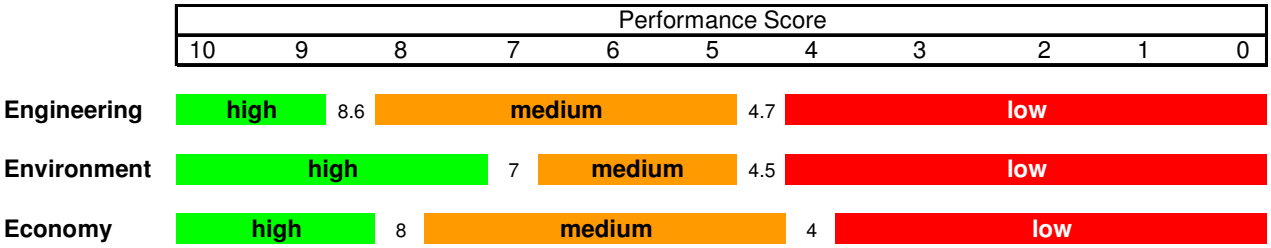


Table 6.6 - Performance Score to Preference Rating Conversion

The resulting framework matrix is shown in Table 6.7. This also indicates which options are recommended for further appraisal as part of Stage 2. The shortlist contains those options that had a 'High Preference' in any of the three criteria of engineering, environment and economy.

Route Options	Engineering	Environment	Economy	Progress to Stage 2?
Blue	Low Preference	Medium Preference	Low Preference	NO
Black	Low Preference	Low Preference	Low Preference	NO
Red	Medium Preference	Medium Preference	Medium Preference	NO
Green	High Preference	High Preference	High Preference	YES
Yellow	Medium Preference	Medium Preference	High Preference	YES
Blue - Black	Low Preference	Medium Preference	Low Preference	NO
Blue - Black - Red	Medium Preference	Medium Preference	Medium Preference	NO
Blue - Black - Red - Black	Medium Preference	Medium Preference	Medium Preference	NO
Blue - Black - Blue	Medium Preference	Medium Preference	Medium Preference	NO
Blue - Black - Red - Blue	Medium Preference	Medium Preference	Medium Preference	NO
Blue - Black - Red - Green	Medium Preference	Medium Preference	Medium Preference	NO
Black - Red	Low Preference	Low Preference	Medium Preference	NO
Black - Red - Black	Low Preference	Low Preference	Medium Preference	NO
Black - Blue	Low Preference	Low Preference	Low Preference	NO
Black - Red - Blue	Low Preference	Low Preference	Medium Preference	NO
Black - Red - Green	Low Preference	Low Preference	Low Preference	NO
Red - Blue	Medium Preference	Medium Preference	Medium Preference	NO
Red - Black	Medium Preference	Medium Preference	Medium Preference	NO
Red - Green	Medium Preference	Medium Preference	Medium Preference	NO
Green - Red1	Medium Preference	Medium Preference	Medium Preference	NO
Green - Red2	Medium Preference	High Preference	High Preference	YES
Green - Red1 - Green	Medium Preference	High Preference	Medium Preference	YES
Green - Red1 - Blue	High Preference	High Preference	Medium Preference	YES
Green - Red2 - Blue	High Preference	High Preference	High Preference	YES
Green - Red1 - Black	Medium Preference	Medium Preference	Medium Preference	NO
Green - Red2 - Black	Medium Preference	Medium Preference	Medium Preference	NO
Green - Yellow	High Preference	High Preference	Medium Preference	YES
Green - Yellow - Green	Medium Preference	High Preference	Medium Preference	YES
Yellow - Green No.1	Medium Preference	Medium Preference	High Preference	YES
Yellow - Green No.2	Medium Preference	Medium Preference	High Preference	YES
Yellow - Red	Medium Preference	Medium Preference	High Preference	YES
Y - R - Black	Medium Preference	Medium Preference	Medium Preference	NO
Y - R - Blue	Medium Preference	Medium Preference	Medium Preference	NO

Table 6.7 - Framework Matrix

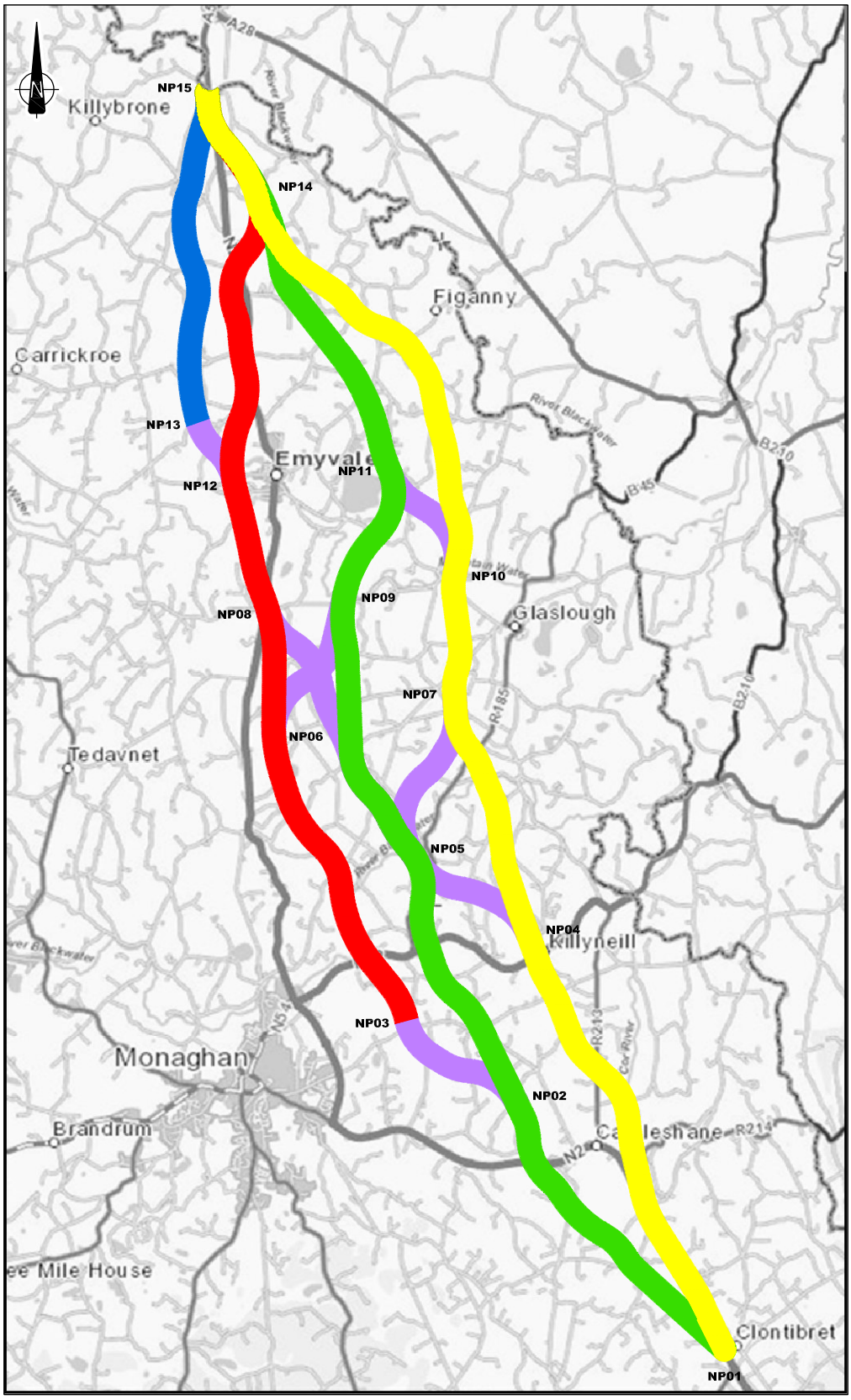
6.8 Initial Conclusion, June 2010

The preliminary options assessment examined the relative performance of feasible corridors using engineering, environmental and economic criteria. A framework matrix was produced whereby several options were recommended to be taken forward to public consultation and Stage 2 – Project Appraisal. This resulted in 11 out of the 33 corridors being recommended for further consideration as shown in Table 6.8 below and on Figure 6.2, with node points being used to identify the various cross-over locations.

Route Corridor Option	Node Description
Green	NP01-15
Yellow	NP01-15
Green - Red2	NP01-05, 05-08, 08-15
Green - Red1 - Green	NP01-02, 02-03, 03-06, 06-09, 09-15
Green - Red1 - Blue	NP01-02, 02-03, 03-12, 12-13, 13-15
Green - Red2 - Blue	NP01-05, 05-08, 08-12, 12-13, 13-15
Green - Yellow	NP01-05, 05-07, 07-15
Green – Yellow - Green	NP01-05, 05-07, 07-10, 10-11, 11-15
Yellow - Green No.1	NP01-04, 04-05, 05-15
Yellow - Green No.2	NP01-10, 10-11, 11-15
Yellow - Red	NP01-04, 04-08, 08-15

Table 6.8 - Route Corridor Options Initially Selected

In overall terms this process resulted in the Black and Blue corridors not scoring as well as other options appraised. The Black (which is based on the existing route corridor) was the poorest scoring in terms of engineering and environment, reflecting the difficulties in designing and constructing a route in an established transport corridor. The Blue route had the highest potential cost whilst offering the least travel time savings to long distance traffic movement. The options taken forward were based around three corridors (Green, Red and Yellow) and intermediate cross-overs between them. A short section of Blue route to the north of Emyvale remained in two of the shortlisted options.



Grontmij

Feasible Route Corridor Options taken to Public Consultation (July 2010)

Figure 6.2

6.9 Public Consultation Feedback on Corridors

A public consultation exhibition was held on 7th and 8th July 2010 at the Four Seasons Hotel in Monaghan Town. Over 300 people attended the event over the two days to view the displays showing the 11 shortlisted options. Comments were sought via the return of a short questionnaire. Over 1,600 responses were received some of which identified the need to further examine some of the corridors in greater detail.

Further to the consultation, a number of developments were made to the previously proposed corridors which took into account comments / submissions received. This development work is which refers to the below maps contained in Figures 6.3 to 6.7.

Map A - Corridor development near Castleshane: The ***Green*** corridor was amended to pass Castleshane, further to the west through the townlands of Creeve, Aghnaglogh, Rackwallace, Aghnagap and Cormurphy.

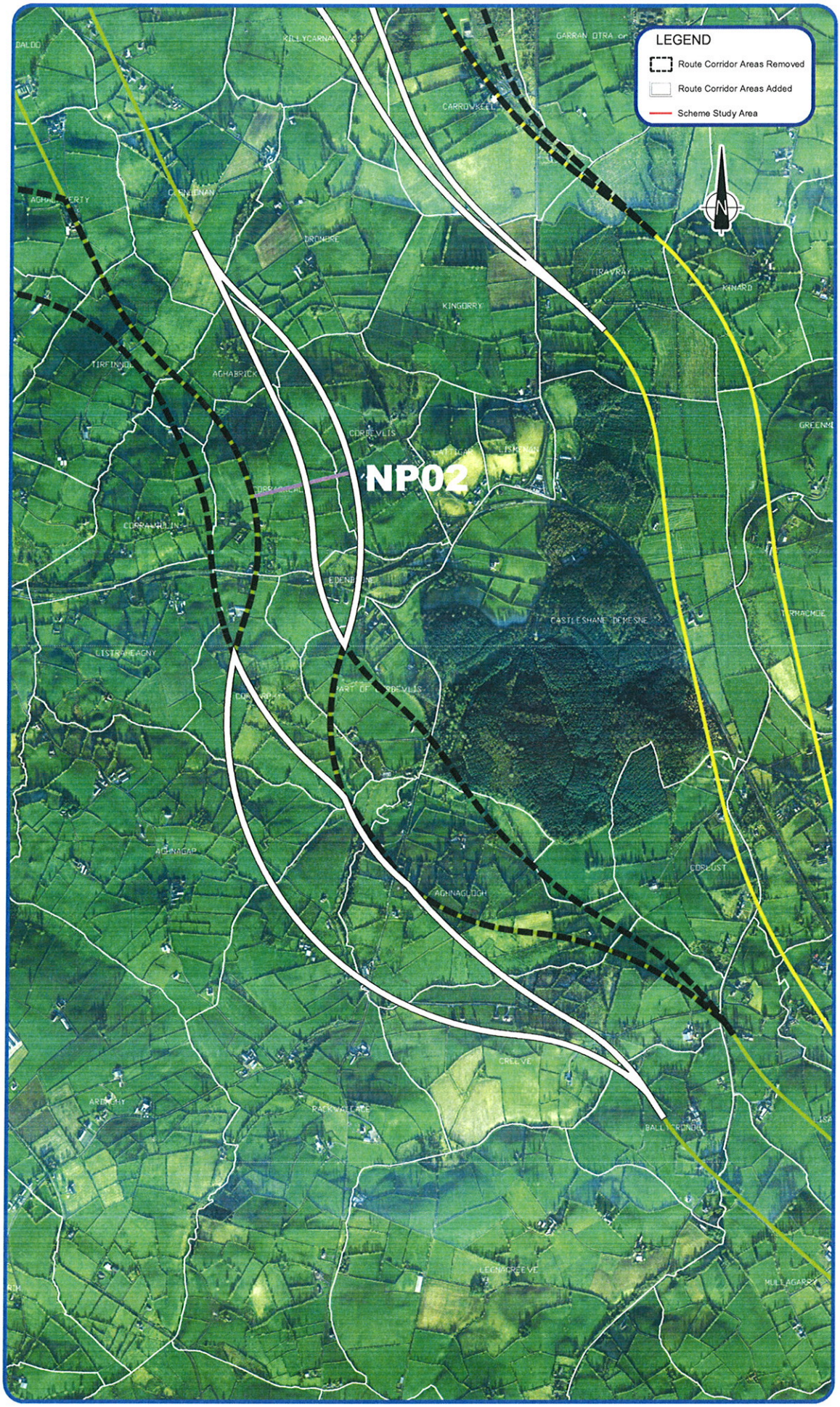
Map B - Corridor development near Tyholland: The ***Yellow*** corridor has been amended to pass Tyholland further to the west commencing near the townland of Tiravray and then returning back to the original ***Yellow*** corridor at Terrycaffe. As a result the ***Yellow*** corridor passes through the Townlands of Kildoagh, Tuckmilltate and Tullygony.

Map C - Corridor development near Liscarney: A section of the ***Red*** corridor was removed between the townlands of Aghalaverty and Mullabrack with a new link added to the ***Green*** corridor at Crowey to join the ***Red*** route at Mullabrack.

Map D - Corridor development near Glaslough: The ***Yellow*** corridor was also amended between Lisgoagh and Tonyshandeny to pass further west of Glaslough through the townland of Aghnagap.

Map E - Corridor development north of Emyvale: The ***Red*** corridor was further amended north of Emyvale to cross the existing N2 road at Knockakirwan and Lenagh and continue in a north easterly direction up to the townland of Killeanly where it joins the ***Green*** corridor at Drumcondra and the ***Yellow*** route corridor at Killydonagh.

N2 CLONTIBRET TO NORTHERN IRELAND BORDER ROAD SCHEME



transport21
progress in motion

NDP
National Development Plan
Transforming Ireland

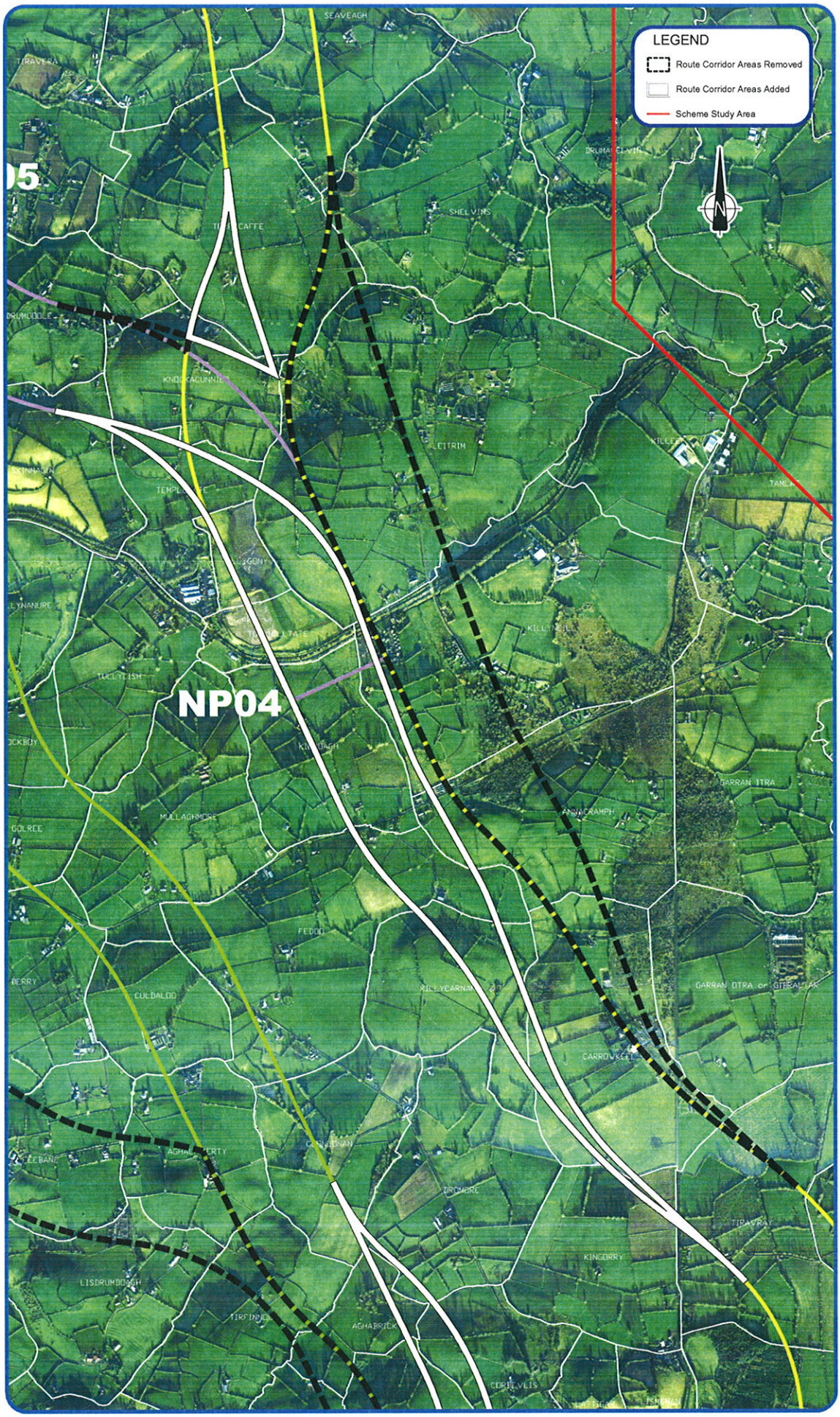
Department of Transport
An Roinn Iompair

NRA
An tÚdarás um Bóithre Náisiúnta
National Roads Authority

Grontmij

MAP A - CORRIDOR DEVELOPMENT NEAR CASTLESHANE

N2 CLONTIBRET TO NORTHERN IRELAND BORDER ROAD SCHEME



transport21
progress in motion

NDP
National Development Plan
Transforming Ireland

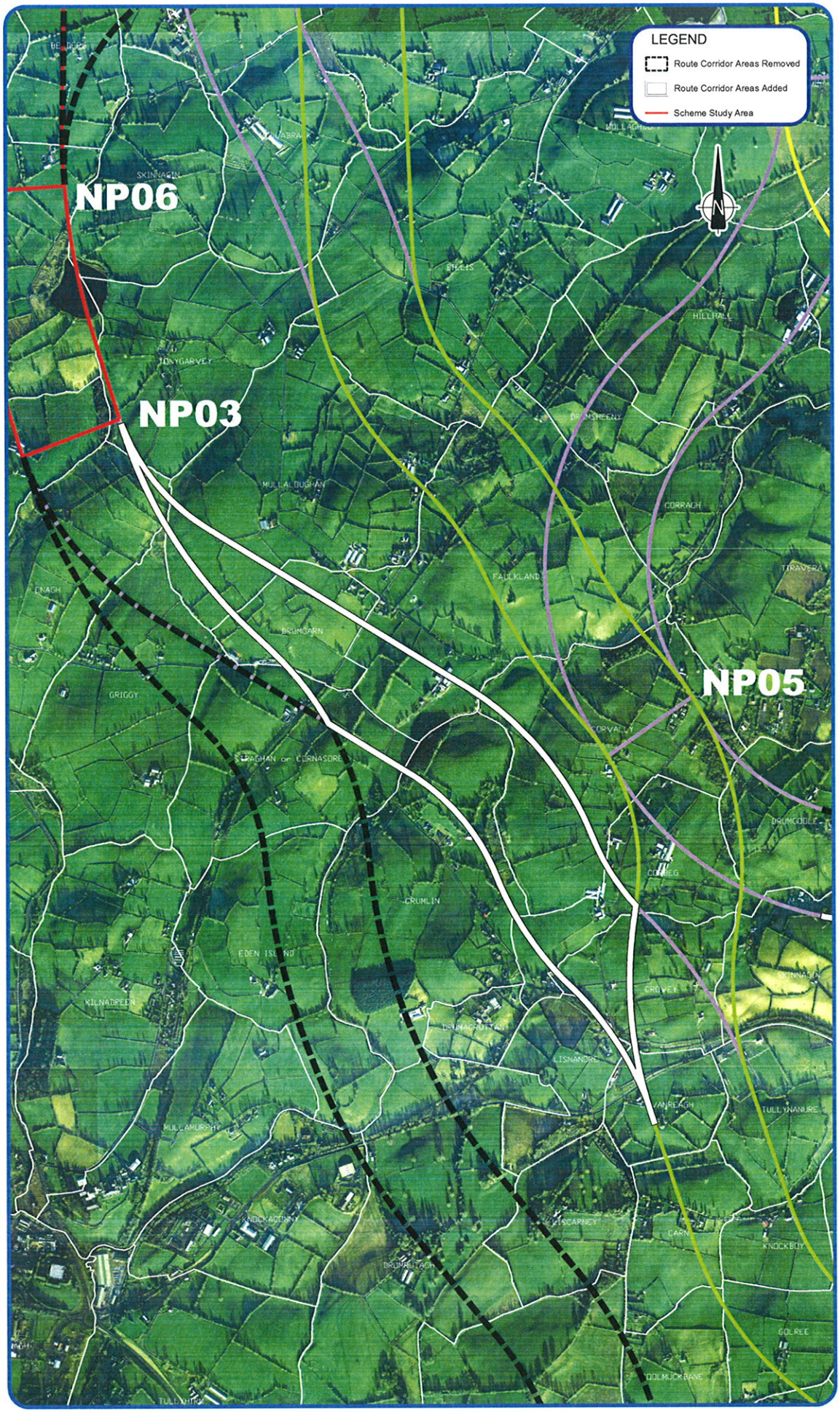
Department of Transport
An Roinn Iompair

NRA
An tÚdarás um Bóithre Náisiúnta
National Roads Authority

Grontmij

MAP B - CORRIDOR DEVELOPMENT NEAR TYHOLLAND

N2 CLONTIBRET TO NORTHERN IRELAND BORDER ROAD SCHEME



transport21
progress in motion

NDP
National Development Plan
Transforming Ireland

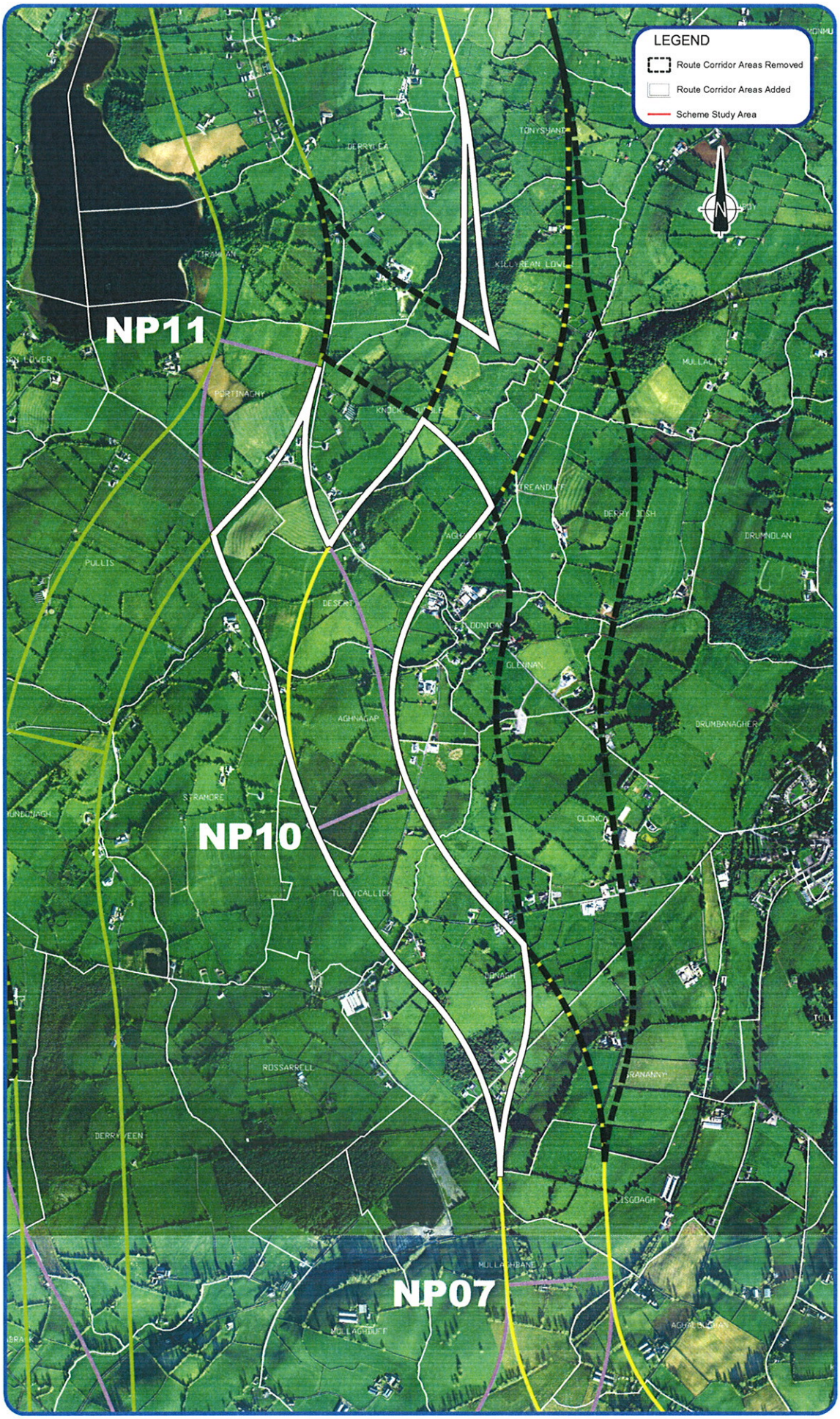
Department of Transport
An Roinn Iompair

NRA
An tÚdarás um Bóithre Náisiúnta
National Roads Authority

Grontmij

MAP C - CORRIDOR DEVELOPMENT NEAR LISCARNEY

N2 CLONTIBRET TO NORTHERN IRELAND BORDER ROAD SCHEME



transport21
progress in motion

NDP
National Development Plan
Transforming Ireland

Department of Transport
An Roinn Iompair

NRA
An tÚdarás um Bóthre Náisiúnta
National Roads Authority

Grontmij

MAP D - CORRIDOR DEVELOPMENT NEAR GLASLOUGH

N2 CLONTIBRET TO NORTHERN IRELAND BORDER ROAD SCHEME

transport21
progress in motion

NDP
National Development Plan
Transforming Ireland

Department of Transport
An Roinn Iompair

NRA
An tÚdarás um Bóithre Náisiúnta
National Roads Authority

Grontmij

MAP E - CORRIDOR DEVELOPMENT NORTH OF EMYVALE

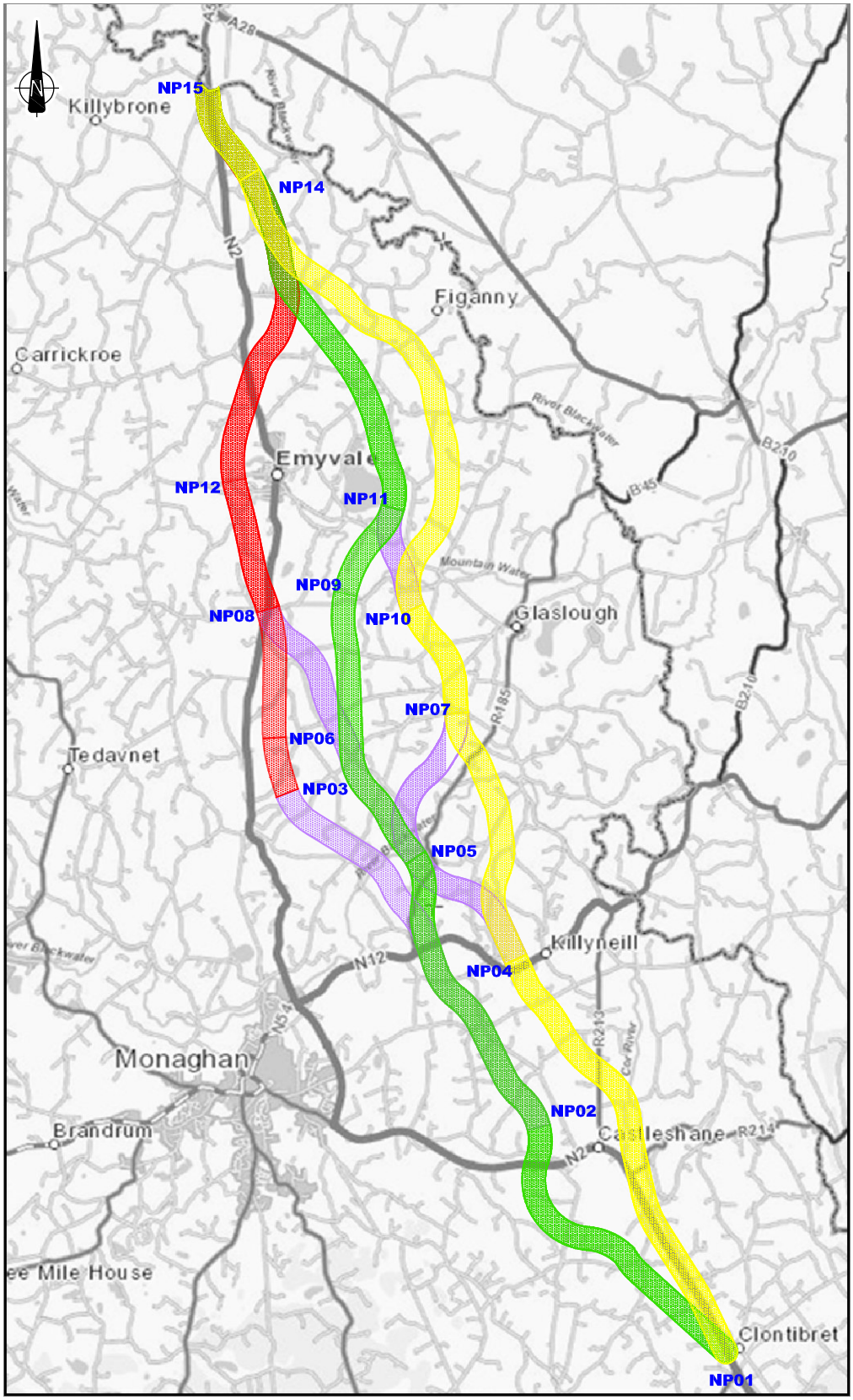
The ***Blue*** corridor was removed from further consideration within the assessment. This was due to the fact that the northern section of the ***Blue*** corridor impacted on four demesnes: Dungillick House (an unregistered/undetermined site); Mount Anketell (an unregistered/undetermined site); Glebe House (an unregistered/undetermined site); and Fort Singleton (a site of regional importance). This has removed a number of townlands from the route corridor study. These include: Dunmadigan; Killybressal; Lisavargy; Lisgrew; Curkin; Aghaliskeevan; Attiduff; Mullabryan; Glasmullagh; Dernamuck; Mount Anketell; Gorticleave; Mullaghcor; Glebe; Mullanacross; and Girfin.

A consequence of the removal of the Blue corridor was the retention of those two corridors shortlisted at Stage 1, ***Green – Red1 – Blue*** and ***Green – Red2 – Blue***. The ***Green – Red1 – Blue*** corridor, where the ***Blue*** section was removed, reverted to the ***Red*** corridor that had been amended as discussed above. This resulted in the ***Green – Red*** corridor. The removal of the ***Blue*** section from the ***Green – Red2 – Blue*** corridor theoretically removes a corridor from the appraisal process as the resultant corridor is the same as the ***Green – Red2*** corridor.

Developed route corridors were therefore taken to further public consultation in February 2011 at which comments were sought on the new areas through which the amended route corridors pass. The three amended corridors (including some amended crossovers) displayed at the February 2011 consultations are shown in Figure 6.8. In terms of possible options using the inter-connections between the ***Red***, ***Green*** and ***Yellow*** corridors there are 9 practical combinations as listed in Table 6.9 below. These are the corridor options that were progressed to Stage 2.

Option No.	Route Corridor Option	Node Description
1	Yellow	NP01-15
2	Green	NP01-15
3	Yellow - Green No.1	NP01-04, 04-05, 05-15
4	Yellow - Green No.2	NP01-10, 10-11, 11-15
5	Yellow - Red	NP01-04, 04-08, 08-15
6	Green - Yellow	NP01-05, 05-07, 07-15
7	Green - Yellow - Green	NP01-05, 05-07, 07-10, 10-11, 11-15
8	Green – Red	NP01-02, 02-03, 03-15
9	Green - Red2	NP01-05, 05-08, 08-15

Table 6.9 - Developed Route Corridor Options



Grontmij

Route Corridors Progressing to Stage 2
(February 2011)

Figure 6.8

6.10 Public Consultation Feedback on Using the Existing Route Corridor

A large number of respondents also sought that an on-line improvement should be further considered. Although a cost benefit analysis of an on-line improvement would be prepared as part of the Stage 2 – Project Appraisal, a preliminary economic assessment was carried out to get an initial indication of the difference in travel time benefits between the Black and other shortlisted options. The assessment takes into account the element of long distance traffic observed at Clontibret (of the 11,600 vehicles, 14% to Donegal and 13% to Northern Ireland which is 3,100 vehicles per day). The Black option (the 'on-line' corridor) has an estimated time saving of 6.2 minutes, whilst the shortlisted options have time savings averaging 8.0 minutes (taken from Table 6.1). Assuming there is no traffic growth over a standard 30 year evaluation period and using a value of time of €22.20/hour[4] it is possible to calculate the travel time savings for the shortlisted options and the black option, as shown in Table 6.10.

Non- shortlisted Option	Travel Time Benefit (€m)	Shortlisted Option	Travel Time Benefit (€m)	Difference (€m)
Black	79	**Yellow**	107	-28
		Green	101	-22
		Yellow - Green No.1	101	-22
		Yellow - Green No.2	109	-30
		Yellow - Red	103	-24
		Green - Yellow	98	-19
		Green - Yellow - Green	100	-21
		Green - Red	99	-20
		Green - Red2	103	-24

Table 6.10 - Comparison of Travel Time Benefits

When the black option's travel time savings are compared with the shortlisted options then the average loss in benefits is approximately €23m. This differential is likely to be higher when the main cost-benefit analysis is undertaken as it will take in more traffic patterns, as well as traffic growth over the evaluation period. Therefore, based on this significant reduction in benefits, it was decided it would not be necessary to include the black route in the further public consultation. However, as stated in chapter 7, the Black corridor has been included in the further appraisal to provide comparison with the shortlisted options.

[4] Taken from NRA Project Appraisal Guidelines 2008, Appendix 6

6.11 Public Consultation Feedback on Current Traffic Flow Levels

Public feedback questioned the need for the scheme given the economic downturn which is reflected in a drop in traffic levels recorded on the existing road. In this regard the annual average daily traffic flow registered at the Northern Ireland border fell by 5% between 2007 and 2009. However, as the Stage 2 process would use the latest available NRA traffic growth assumptions that allow for the downturn, it was considered appropriate to proceed with the further evaluation of the shortlisted options.

7 Stage 2 Project Appraisal

7.1 Description of Corridor Options

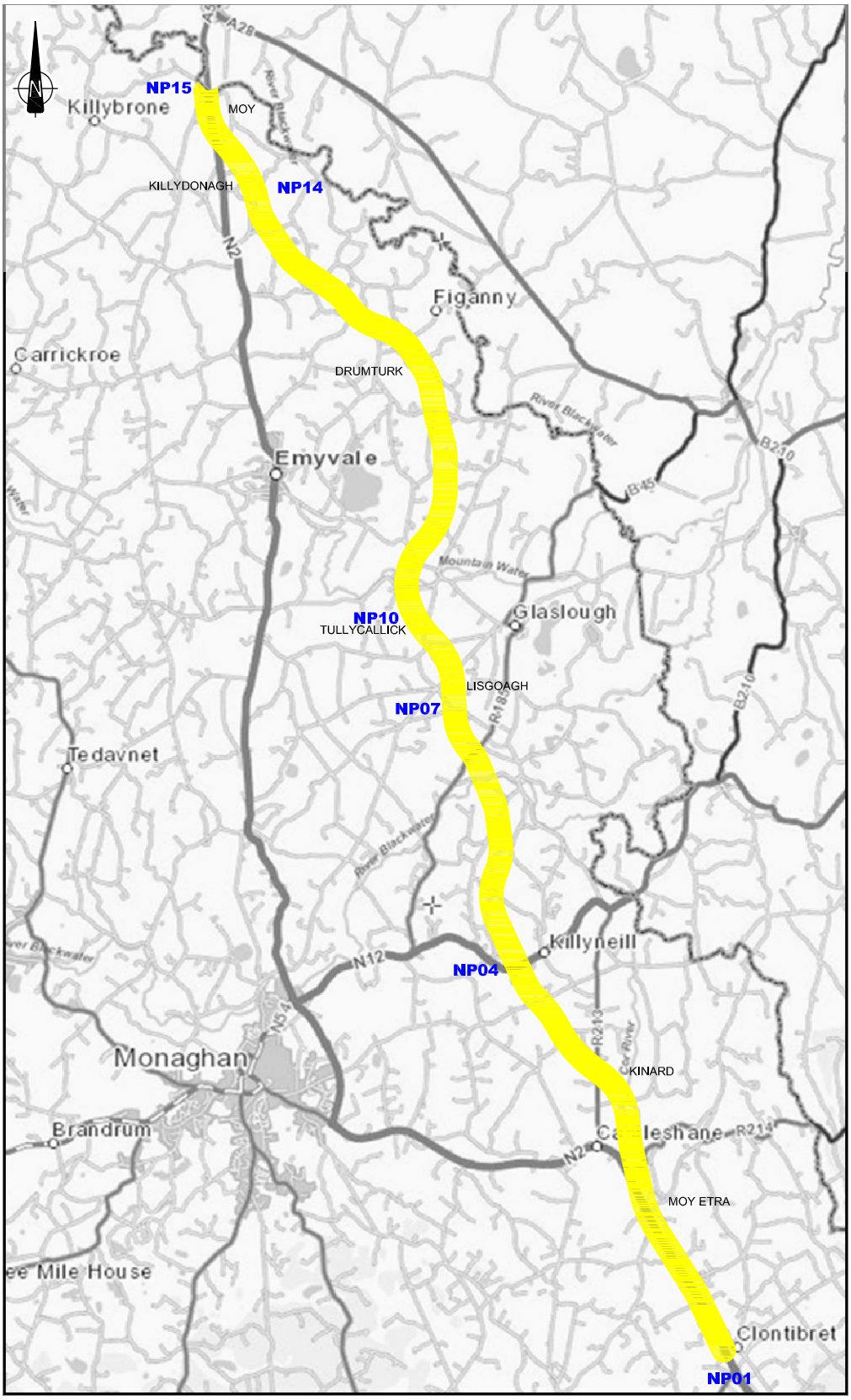
Following the completion of the Stage 1 Preliminary Options Assessment nine corridor options were identified to progress to Stage 2 Project Appraisal as indicated in Chapter 6 and summarised in Table 7.1.

Option	Corridor	Node Description
1	Yellow	NP01-15
2	Green	NP01-15
3	Yellow - Green No.1	NP01-04, 04-05, 05-15
4	Yellow - Green No.2	NP01-10, 10-11, 11-15
5	Yellow - Red	NP01-04, 04-08, 08-15
6	Green - Yellow	NP01-05, 05-07, 07-15
7	Green - Yellow - Green	NP01-05, 05-07, 07-10, 10-11, 11-15
8	Green - Red	NP01-02, 02-03, 03-15
9	Green - Red2	NP01-05, 05-08, 08-15

Table 7.1 - Corridor Options for Stage 2 Project Appraisal

In addition to the nine, the Black corridor, which is an upgrade mainly along the existing route, has been included in all the appraisals. Although not shortlisted at Stage 1 the Black corridor is the nearest to a "management option", as defined in the CAF Guidelines, and it is therefore useful to benchmark performance against this case as a reference. The nine corridor options plus the black corridor scenarios are described below and shown on Figures 7.1-7.10.

For comparative purposes all options are appraised assuming options have a single carriageway cross-section. This decision has been based on the traffic modelling undertaken during the Stage 2 process in which traffic flows predicted lie within a range where a single carriageway would be suitable. It should be noted that decisions relating to carriageway standard (and also junction strategy) are not formally made until the future Phase 3 design process.



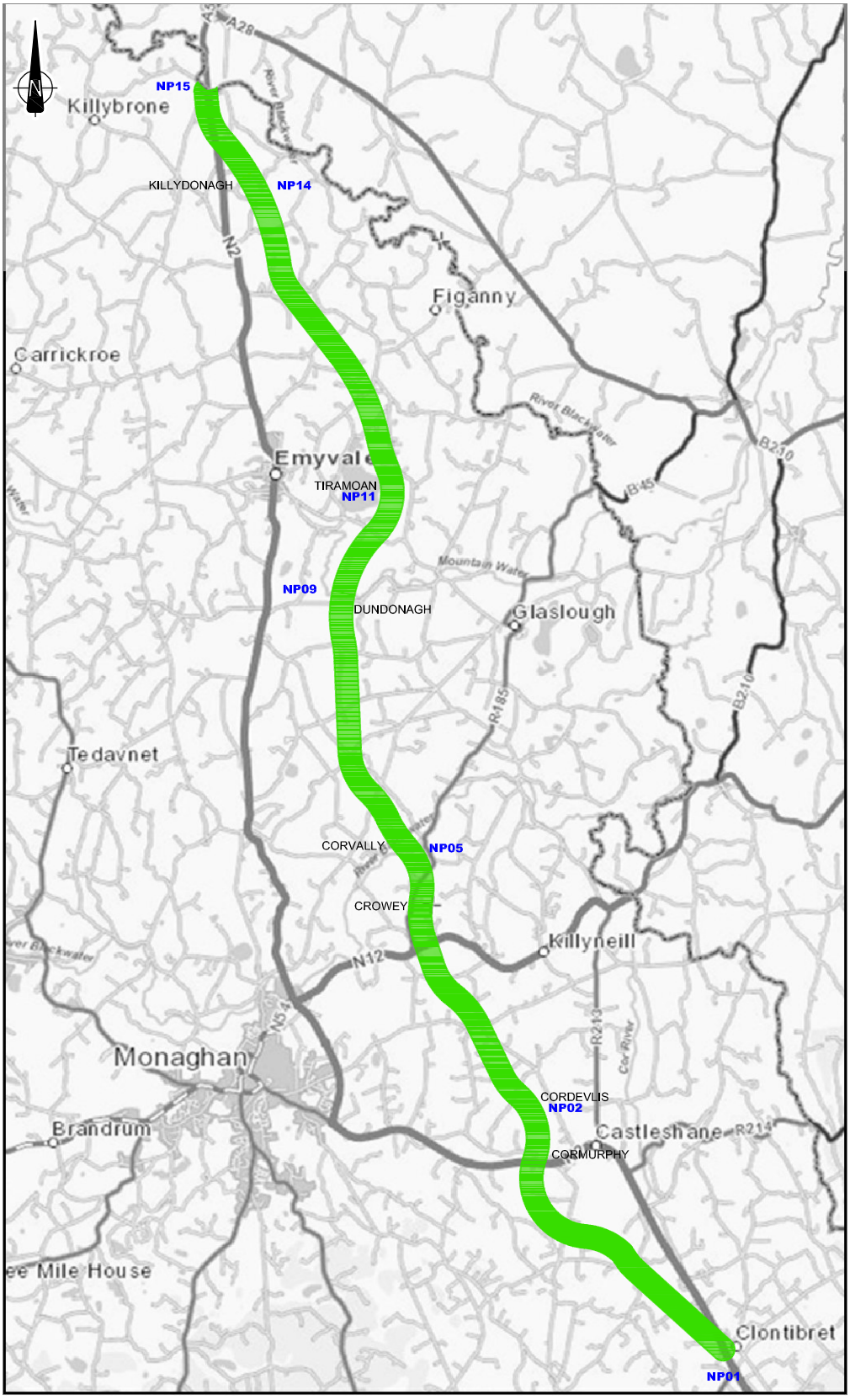
Yellow Corridor
(NP01-04-07-10-14-15)

The Yellow corridor is the most easterly of the corridors and follows the existing N2 from the commencement point, **Node NP01**, adjacent to Clontibret heading north-westerly towards Castleshane where it veers offline in a northerly direction at the townland of Moy Etra. It then runs parallel to the River Cor to Kinard where it heads in a north-westerly direction to **Node NP04** near the townland of Killyneill. Continuing in a north-westerly direction the corridor crosses the N12 and the Ulster Canal and then passes through **Node NP07** at Lisgoagh. Travelling in a northerly direction from here it passes west of Glaslough and crosses the River Blackwater near **Node NP10** in the townland of Tullycallick. It continues north, passing to the east of Emy Lough, changing direction at Drumturk, running in a north-westerly direction to **Node NP14** in the townland of Killydonagh before continuing to the termination point, **Node NP15,** at Moy on the Northern Ireland border.

Grontmij

Yellow Corridor

Figure 7.1



Green Corridor
(NP 01-02-05-09-11-14-15)

Starting at the commencement point, **Node NP01**, the Green corridor initially runs in a north-westerly direction passing to the southwest of Castleshane, before crossing the existing N2 near the townland of Cormurphy. From here the corridor continues northwest passing **Node NP02** at Cordevlis before crossing the N12 and Ulster Canal near the townland of Crowey, to the northeast of Monaghan Town. Further north it passes through **Node NP05** at Corvally whereafter it crosses the River Blackwater. Running parallel to the east of the existing N2 the route crosses the Mountain Water River near **Node NP09** at Dundonagh where it veers in a north-easterly direction and passes through **Node NP11** at Tiramoan, directly east of Emy Lough. Passing Emy Lough it heads in a north-westerly direction to **Node NP14** in the townland of Killydonagh where it runs along the Yellow corridor to the termination point, **Node NP15**.

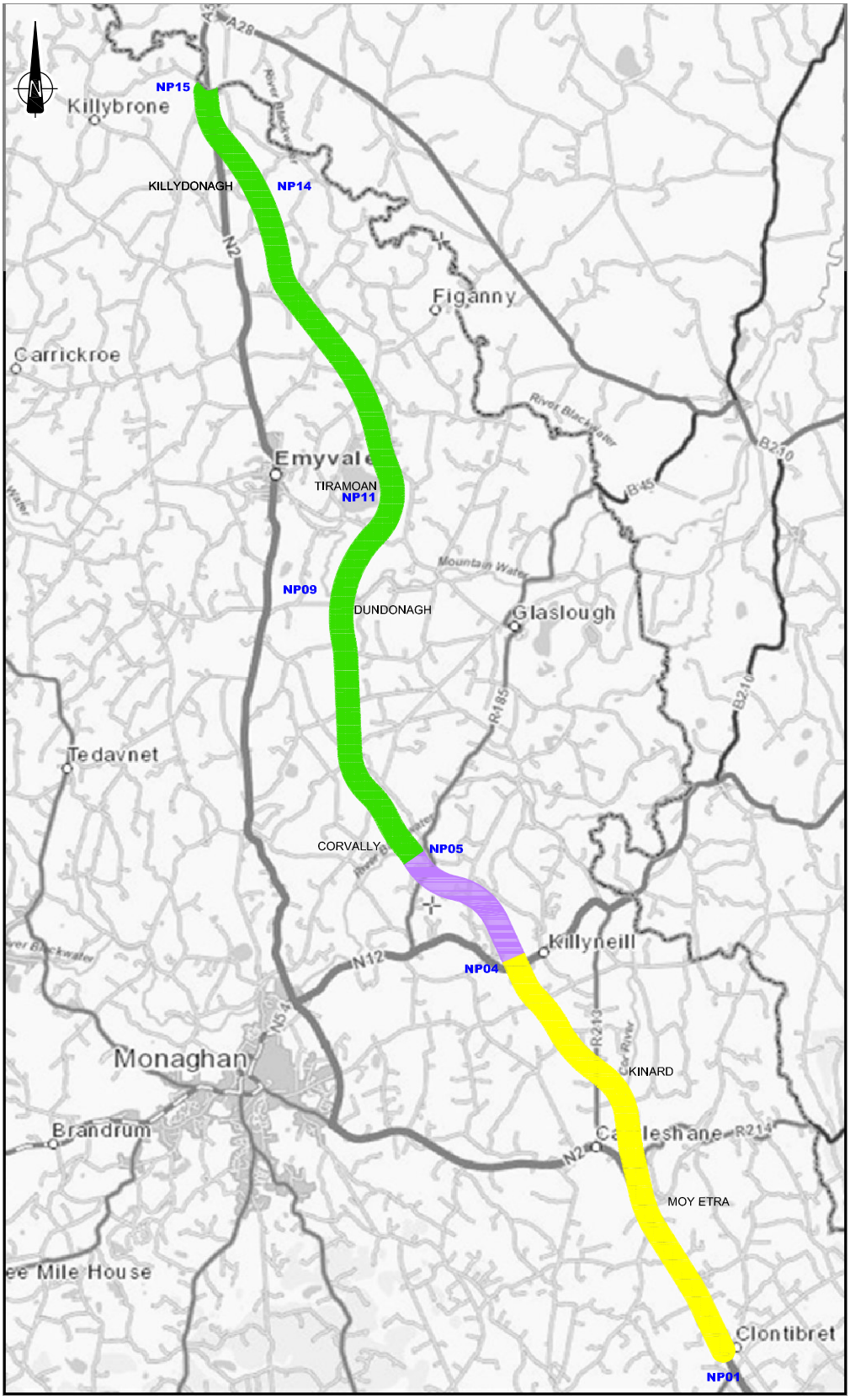
Grontmij

Green Corridor

Figure 7.2

Yellow - Green No.1 Corridor (NP 01-04-05-09-11-14-15)

This corridor follows the Yellow corridor from the commencement point, **Node NP01**, as far as **Node NP04** near the townland of Killyneill. It then runs in a north-westerly direction to the Green corridor at **Node NP05** by Corvally. It then exists as the Green corridor to the termination point, **Node NP15**.



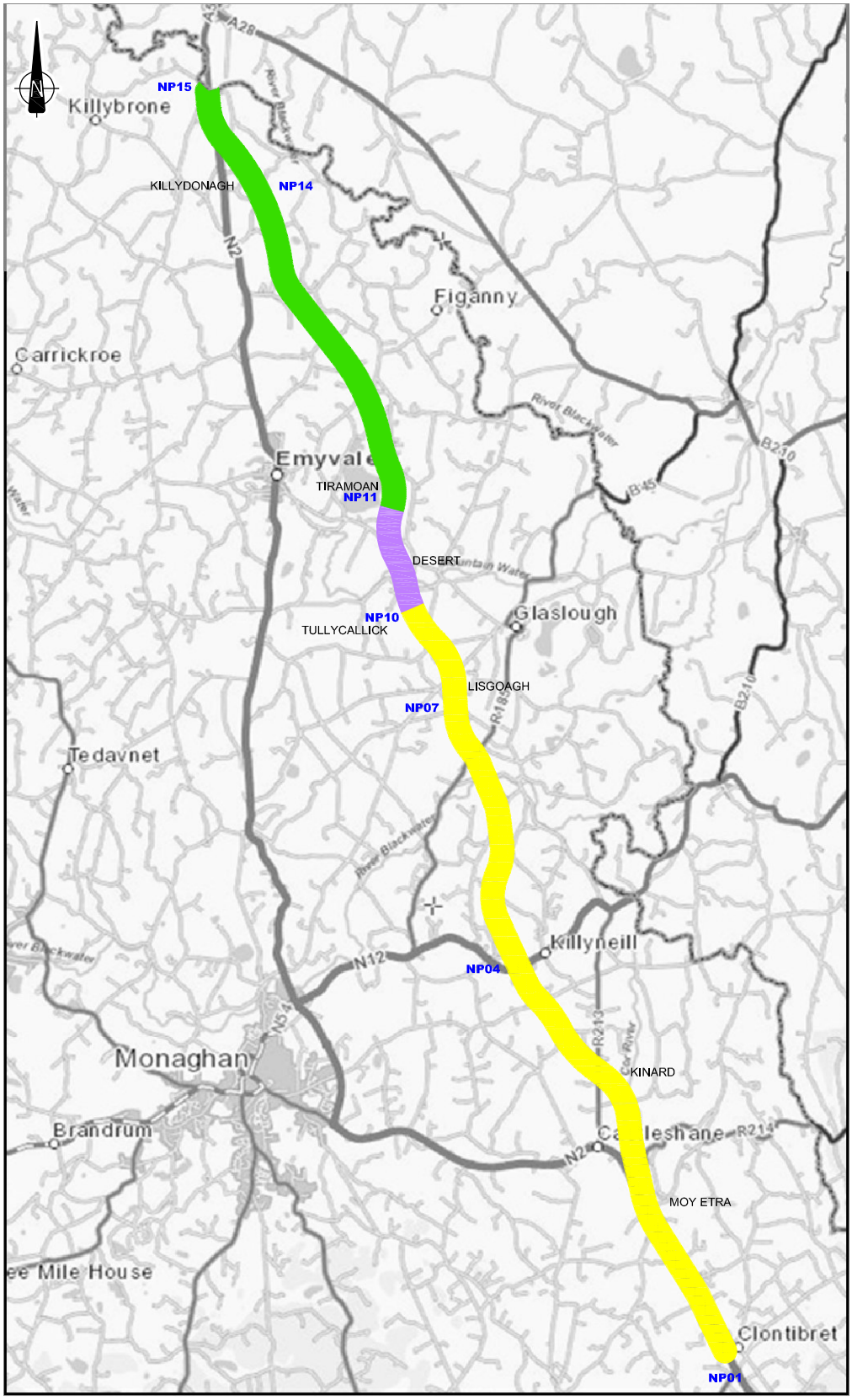
Grontmij

Yellow - Green No. 1 Corridor

Figure 7.3

Yellow - Green No.2 Corridor (NP 01-04-07-10-11-14-15)

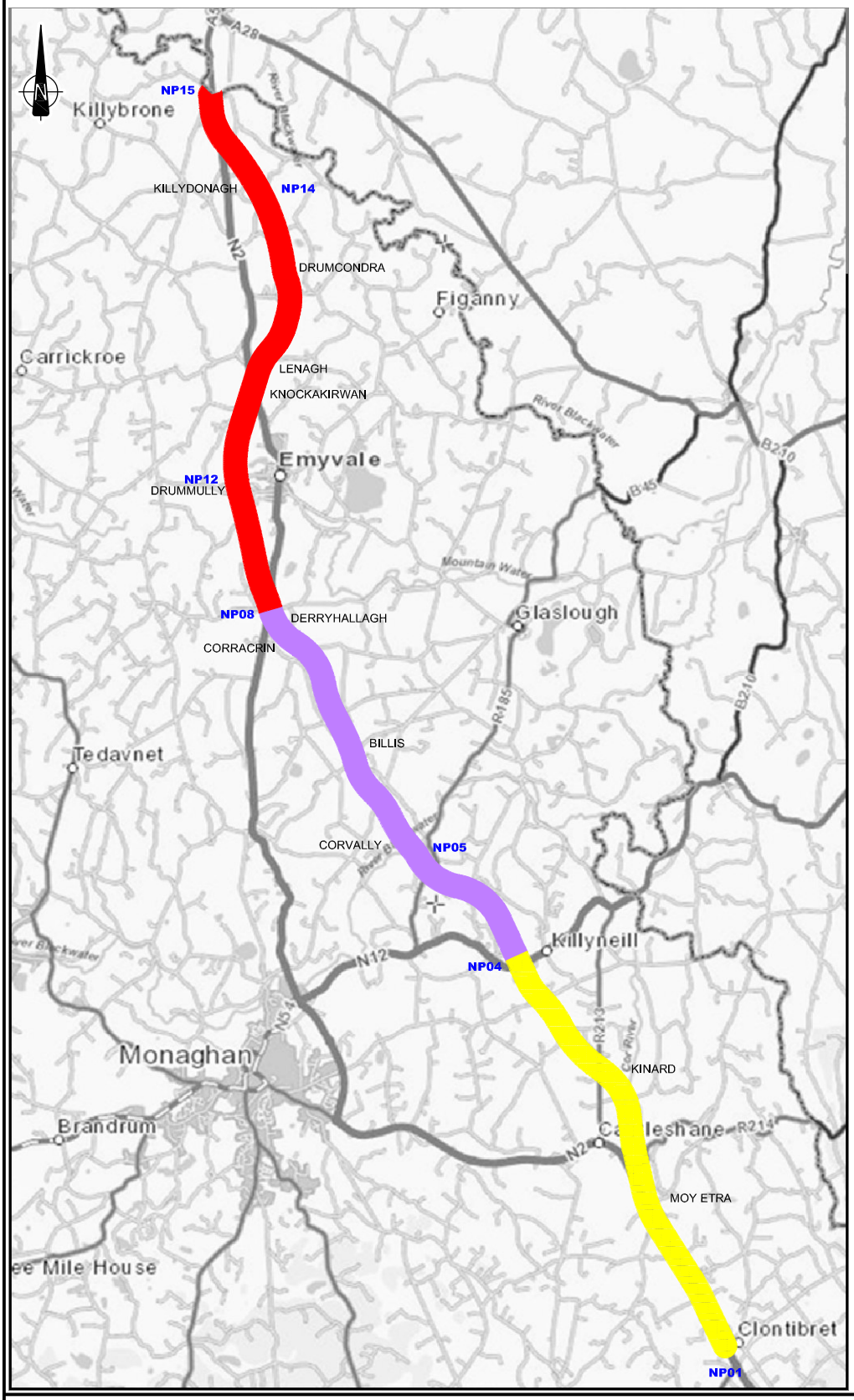
This corridor follows the Yellow corridor from the commencement point, **Node NP01**, as far as **Node NP10** near the townland of Tullycallick. It then runs in a north-westerly direction, crossing the Mountain Water at Desert, to **Node NP11** and the Green Corridor at Tiramoan. It then exists as the Green corridor to the termination point, **Node NP15**.



Grontmij

Yellow - Green No. 2 Corridor

Figure 7.4



Yellow - Red Corridor
(NP 01-04-05-08-12-14-15)

This corridor follows the Yellow corridor from the commencement point, **Node NP01**, as far as **Node NP04** near the townland of Killyneill. It then runs in a north-westerly direction from the Yellow Corridor at **Node NP04** by Killyneill to the Green Corridor at **Node NP05** by Corvally. It continues in a north-westerly direction from **Node NP05** at Corvally following the path of the Green Corridor and crossing the R185 and Blackwater River until the townland of Billis. It then continues in a north-westerly direction to **Node NP08** at Derryhallagh where it crosses the existing N2 directly north of Corracrin. Crossing the Mountain Water River and bypassing Emyvale to the west of the village near **Node NP12** at Drummully the corridor then veers in a north-easterly direction and crosses the existing N2 between the townlands of Lenagh and Knockakirwan. It continues to the townland of Drumcondra whereafter it heads in a north-westerly direction to **Node NP14** in the townland of Killydonagh where it runs along the Yellow corridor to the termination point, **Node NP15**.

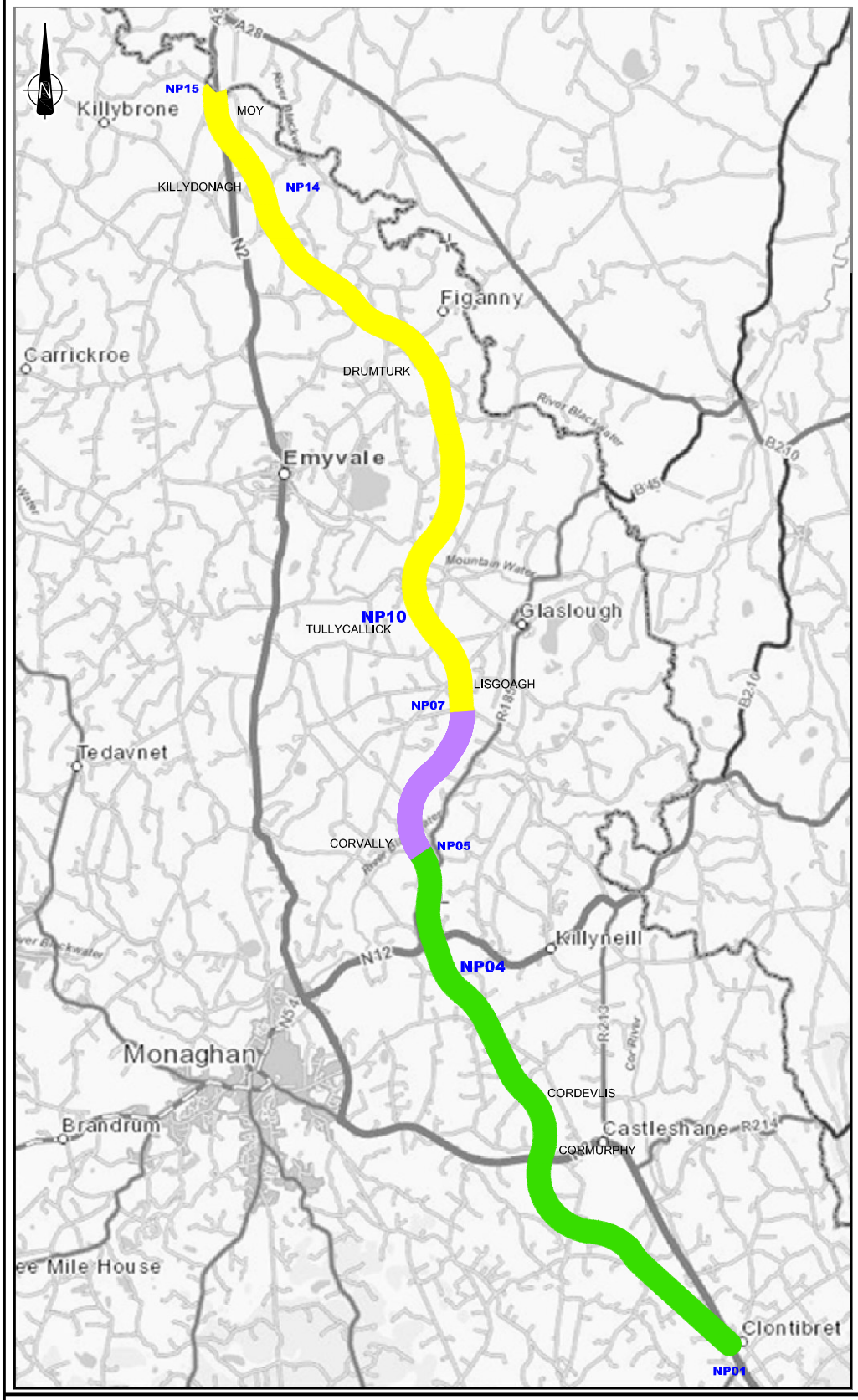
Grontmij

Yellow - Red Corridor

Figure 7.5

Green - Yellow Corridor
(NP 01-04-05-07-10-14-15)

This corridor follows the Green corridor from the commencement point, **Node NP01**, as far as **Node NP04** near the townland of Killyneill. It then runs in a north-westerly direction to the **Node NP05** by Corvally. It then runs parallel, in a north-easterly direction, to the R185 and a length of the Blackwater River to the Yellow Corridor at **Node NP07** by Lisgoagh. It then follows the Yellow corridor to the termination point, **Node NP15**.



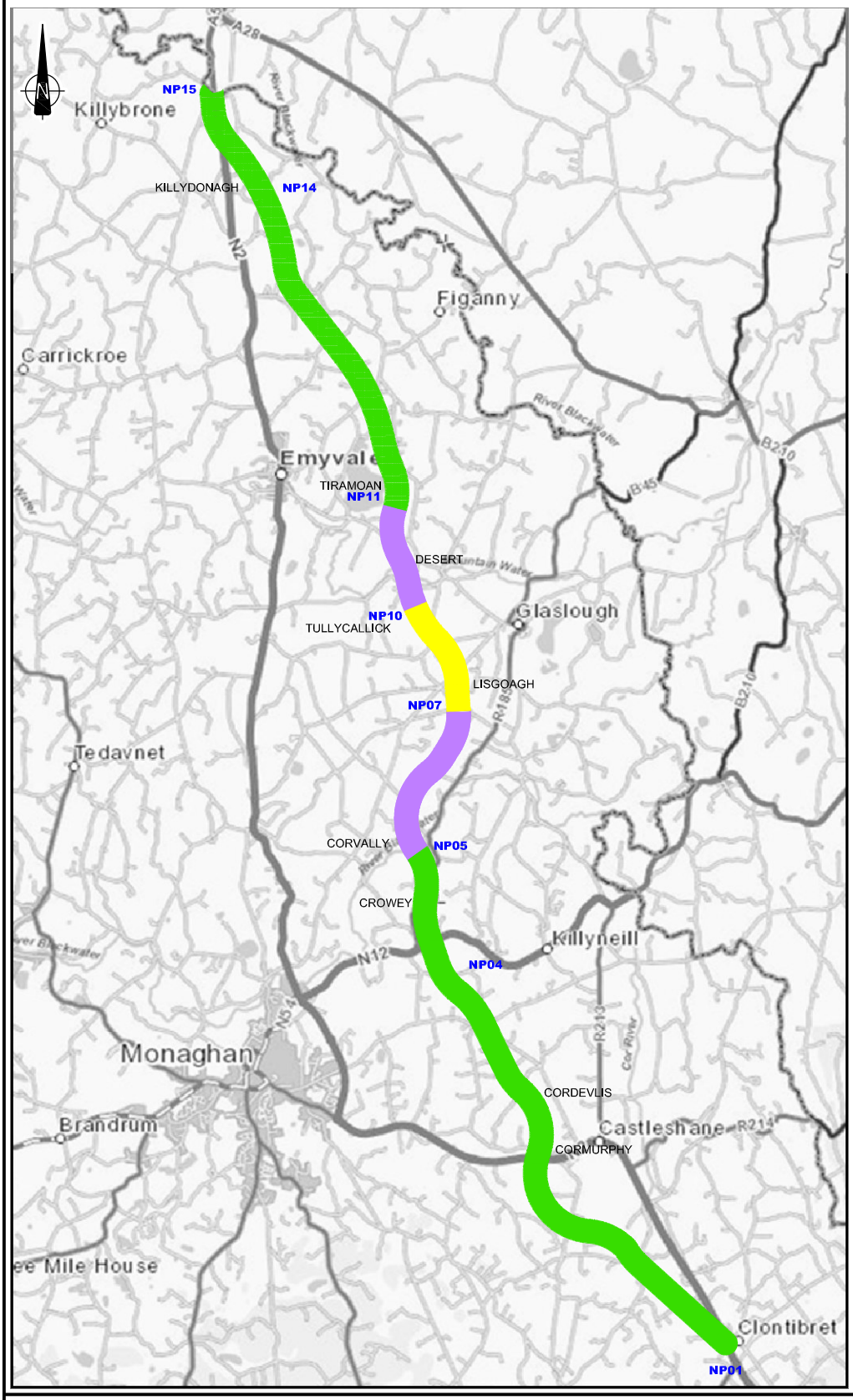
Grontmij

Green - Yellow Corridor

Figure 7.6

Green - Yellow - Green Corridor (NP 01-04-05-07-10-11-14-15)

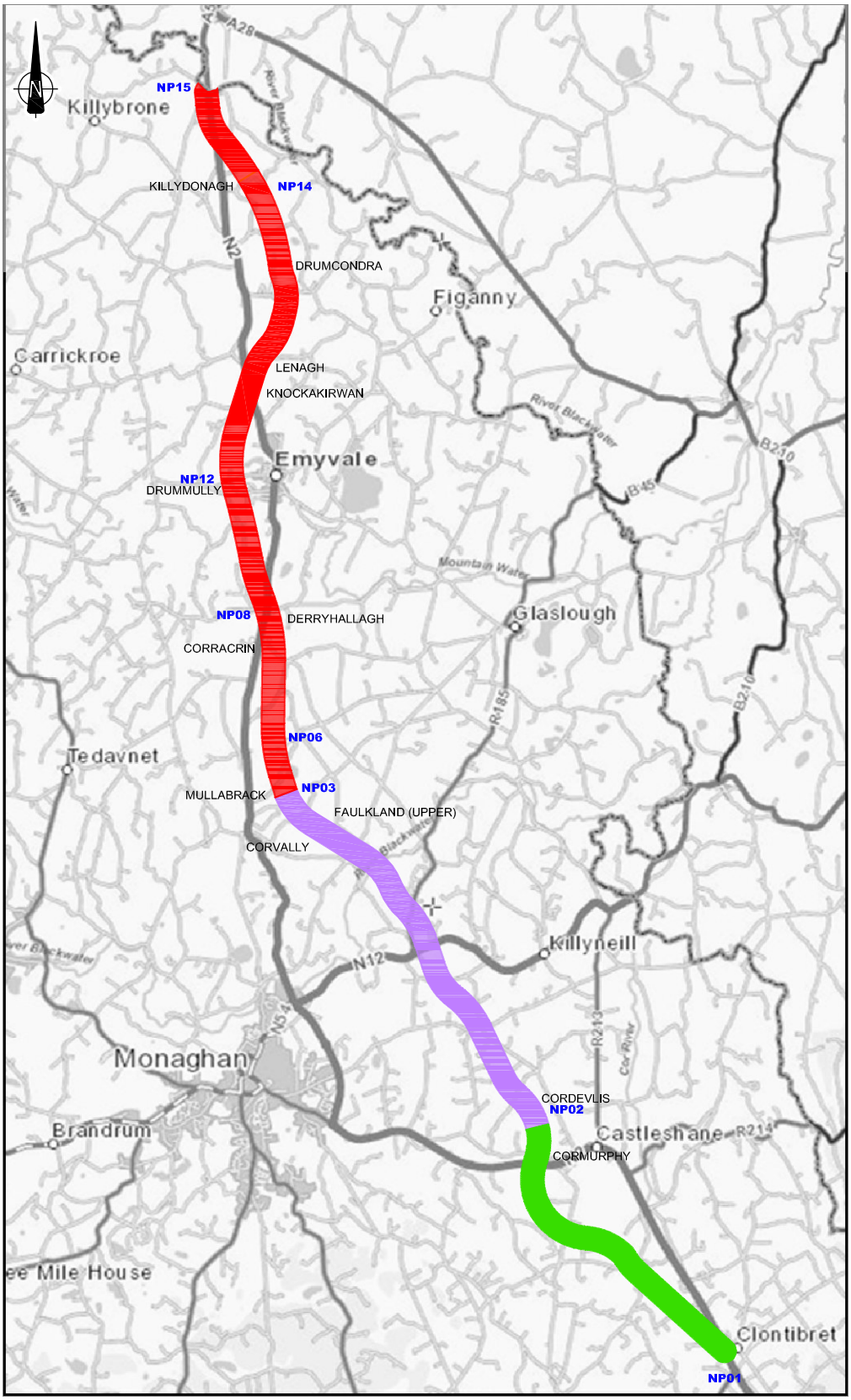
This corridor follows the Green corridor from the commencement point, **Node NP01**, as far as **Node NP04** near the townland of Killyneill. It then runs in a north-westerly direction to the **Node NP05** by Corvally. It then runs parallel, in a north-easterly direction, to the R185 and a length of the Blackwater River to the Yellow Corridor at **Node NP07** by Lisgoagh. It then follows the Yellow corridor to **Node NP10** in the townland of Tullycallick where it veers in a north-westerly direction, crossing the Mountain Water at Desert, to **Node NP11** at Tiramoan. It then follows the Green corridor to the termination point, **Node NP15**.



Grontmij

Green - Yellow - Green Corridor

Figure 7.7



Green - Red Corridor
(NP 01-02-03-06-08-12-14-15)

This corridor follows the Green corridor from the commencement point, **Node NP01**, as far as **Node NP02** at Cordevlis. The corridor then runs in a north-westerly direction following the route of the Green Corridor until the crossing of the N12 and Ulster Canal where it continues in a north-westerly direction, crossing the Blackwater River at Faulkland (Upper) to **Node NP03** at Mullabrack. From here it runs in a northerly direction towards **Node NP06** at Drumcaw where it runs along the western edge of Drumcaw Lough and then passes **Node NP08** at Derryhallagh where it crosses the existing N2 directly north of Corracrin. Crossing the Mountain Water River and bypassing Emyvale to the west of the village near **Node NP12** at Drummully the corridor then veers in a north-easterly direction and crosses the existing N2 between the townlands of Lenagh and Knockakirwan. It continues to the townland of Drumcondra whereafter it veers in a north-westerly direction to **Node NP14** in the townland of Killydonagh where it runs along the Yellow corridor to the termination point, **Node NP15**.

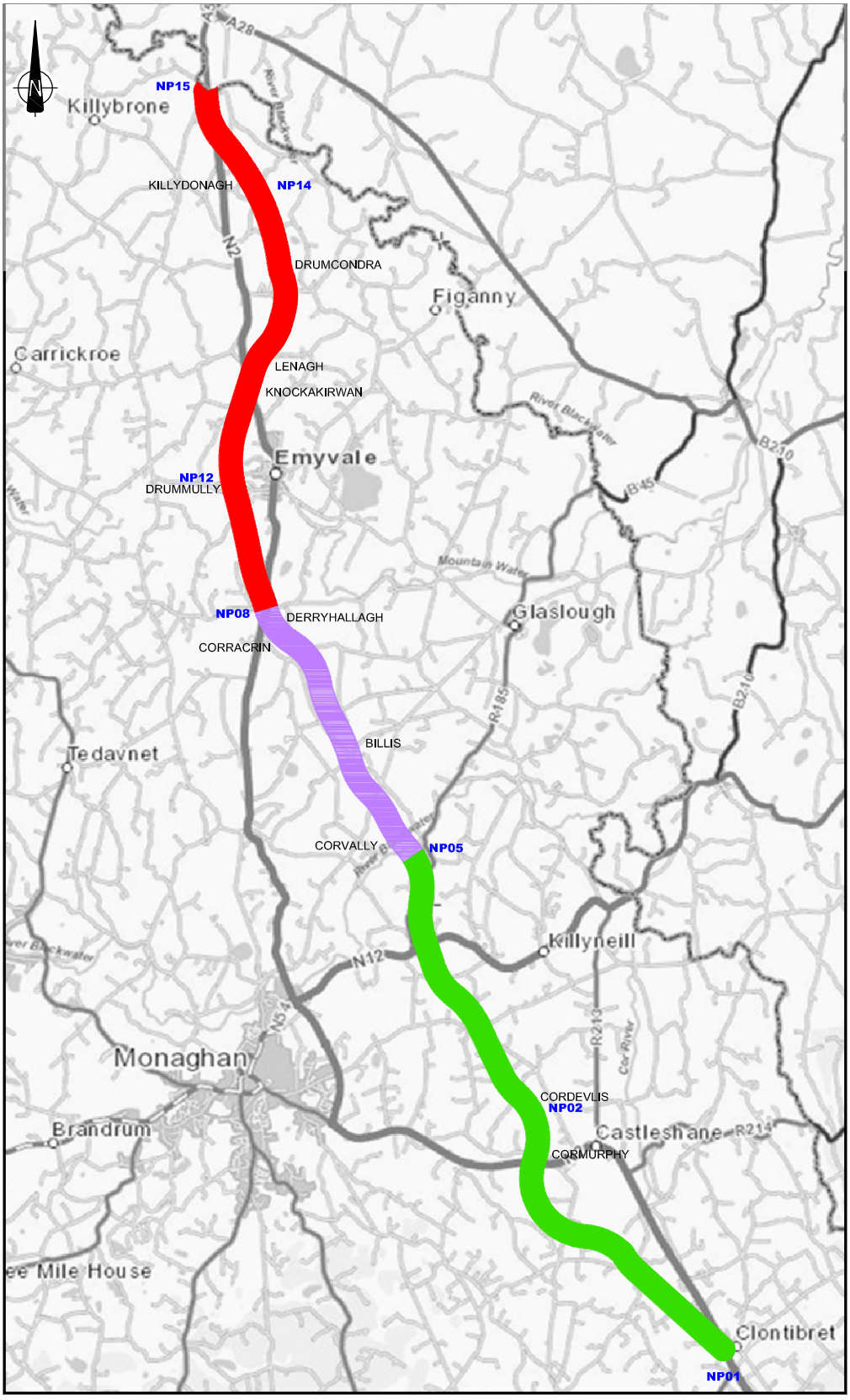
Grontmij

Green - Red Corridor

Figure 7.8

Green - Red 2 Corridor
(NP 01-02-05-08-12-14-15)

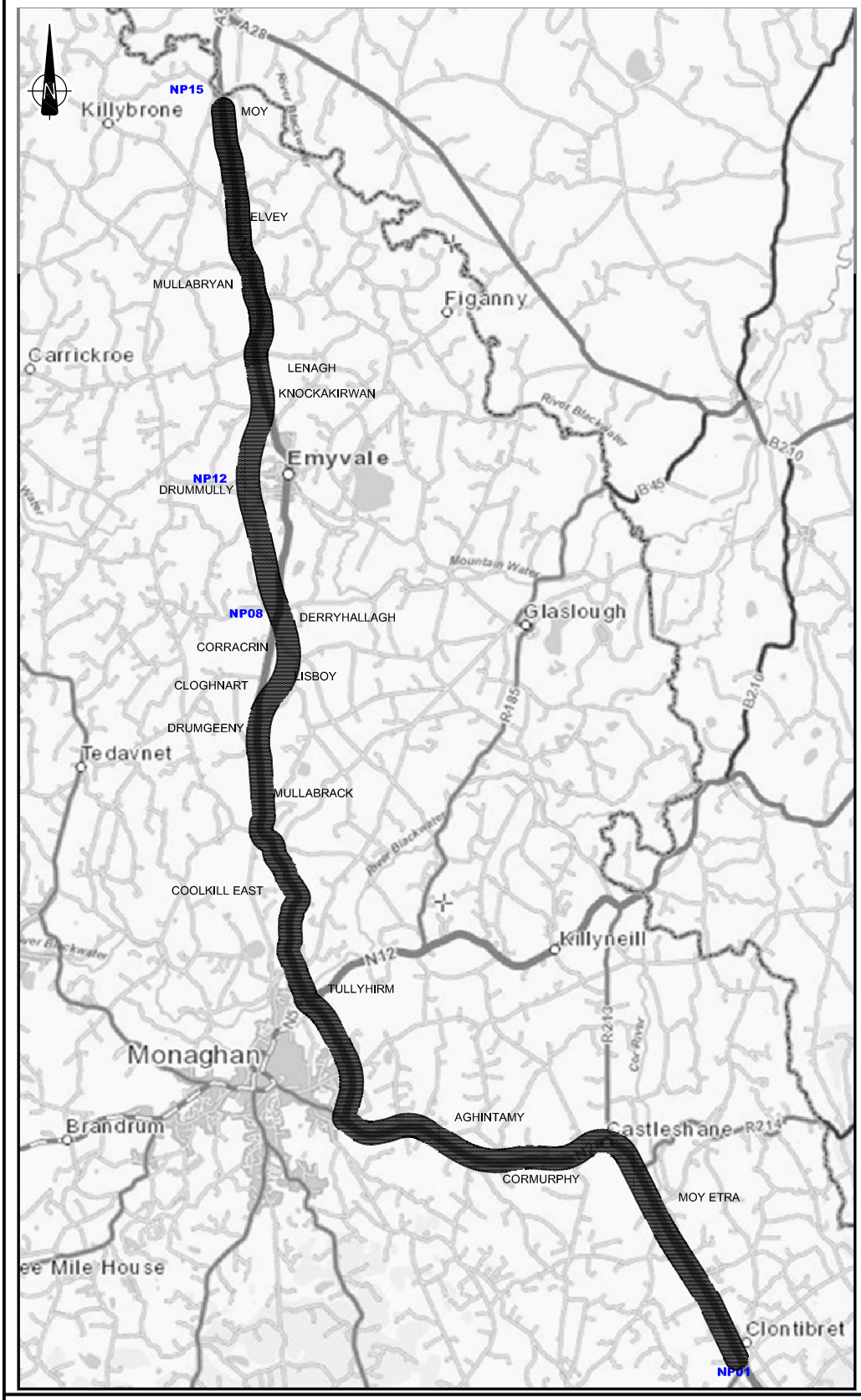
This corridor follows the Green corridor from the commencement point, **Node NP01**, as far as **Node NP05** at Corvally. It then follows the path of the Green Corridor crossing the R185 and Blackwater River until the townland of Billis where it continues in a north-westerly direction to the **Node NP08** at Derryhallagh where it crosses the existing N2 directly north of Corracrin. Crossing the Mountain Water River and bypassing Emyvale to the west of the village near **Node NP12** at Drummully the corridor then veers in a north-easterly direction and crosses the existing N2 between the townlands of Lenagh and Knockakirwan. It continues to the townland of Drumcondra whereafter it veers in a north-westerly direction to **Node NP14** in the townland of Killydonagh where it runs along the Yellow corridor to the termination point, **Node NP15**.



Grontmij

Green - Red No. 2 Corridor

Figure 7.9



Black Corridor (NP 01-08-12-15)

Starting at the commencement point, **Node NP01**, the Black corridor initially runs in a northerly direction as far as Castleshane, before veering west and passing the townlands of Cormurphy and Aghintarny until it reaches the southern roundabout of the Monaghan Bypass. From here the corridor continues northwards utilising the corridor of the existing Bypass to the east of Monaghan Town. It continues in a northerly direction crossing the Ulster Canal and Blackwater River, and passes the N12 just north of Tullyhirm. Further north it passes the townlands of Coolkill East, Mullabrack and Drumgeeny before heading offline in a north-easterly direction between Cloghnart and Lisboy. It then veers in a north-westerly direction to the east of Corracrin to the **Node NP08** at Derryhallagh where it crosses the existing N2 directly north of Corracrin. Crossing the Mountain Water River and bypassing Emyvale to the west of the village near **Node NP12** at Drummully the corridor then veers in a north-easterly direction and rejoins the corridor of the existing N2 between the townlands of Lenagh and Knockakirwan. The corridor continues northwards passing Mullabryan and Elvey before continuing to the termination point, **Node NP15,** at Moy on the Northern Ireland border.

Grontmij

Black Corridor

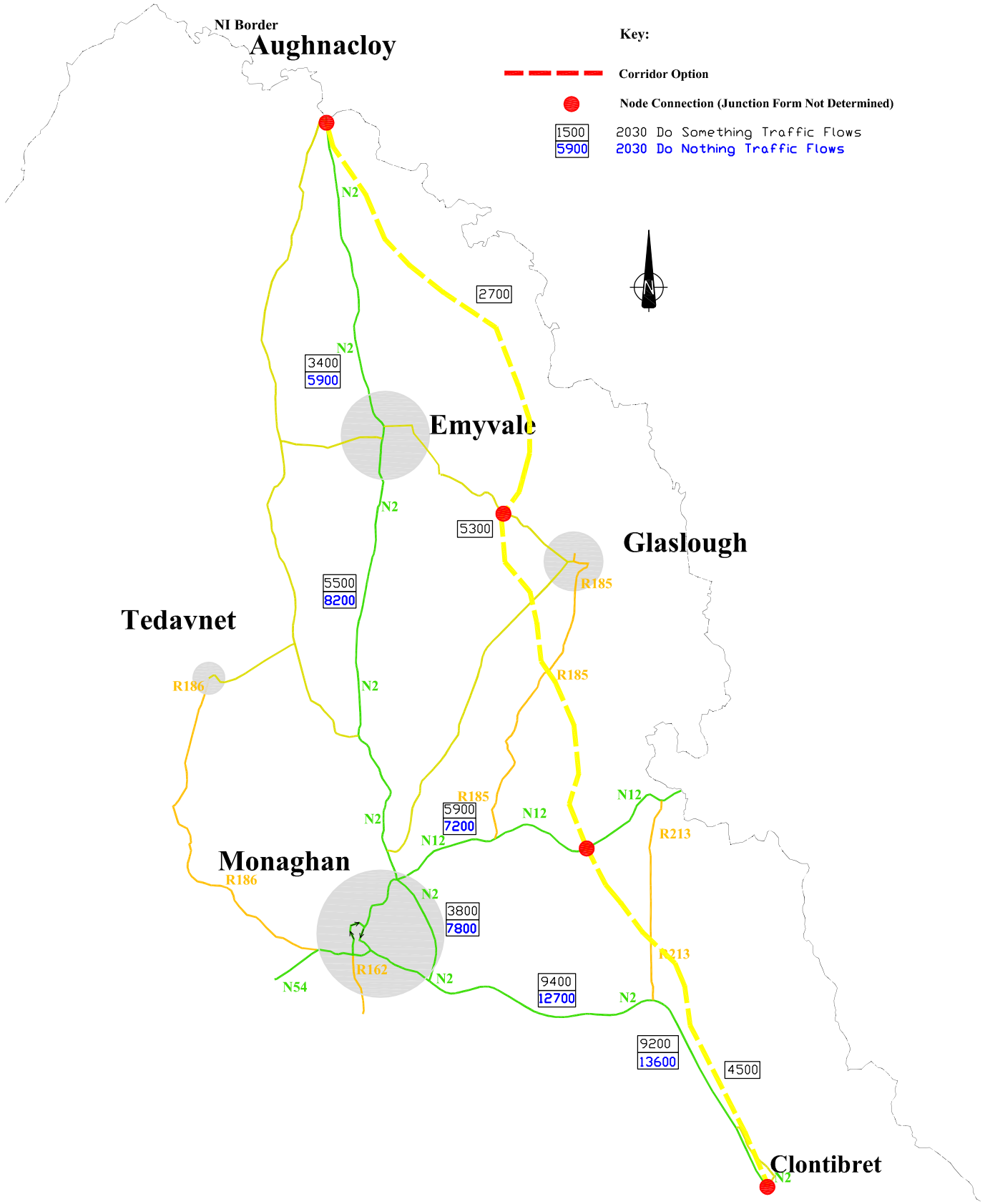
Figure 7.10

7.2 Traffic Model Outputs for the Corridors Tested

The 2030 (medium growth[5]) daily traffic flows for the corridors under consideration are shown on Figures 7.11 to 7.19. These have been produced by the local area model as described in Chapter 3. The main traffic effects are summarised as follows:

- In relation to bypassing Emyvale those options to the west are more effective in reducing traffic flows in the community;
- Route options at Castleshane to the west of the existing route carry more traffic than those to the east; and
- All shortlisted options demonstrate a reduction in traffic on the existing Monaghan Town Bypass which would allow this route to carry local traffic more efficiently.

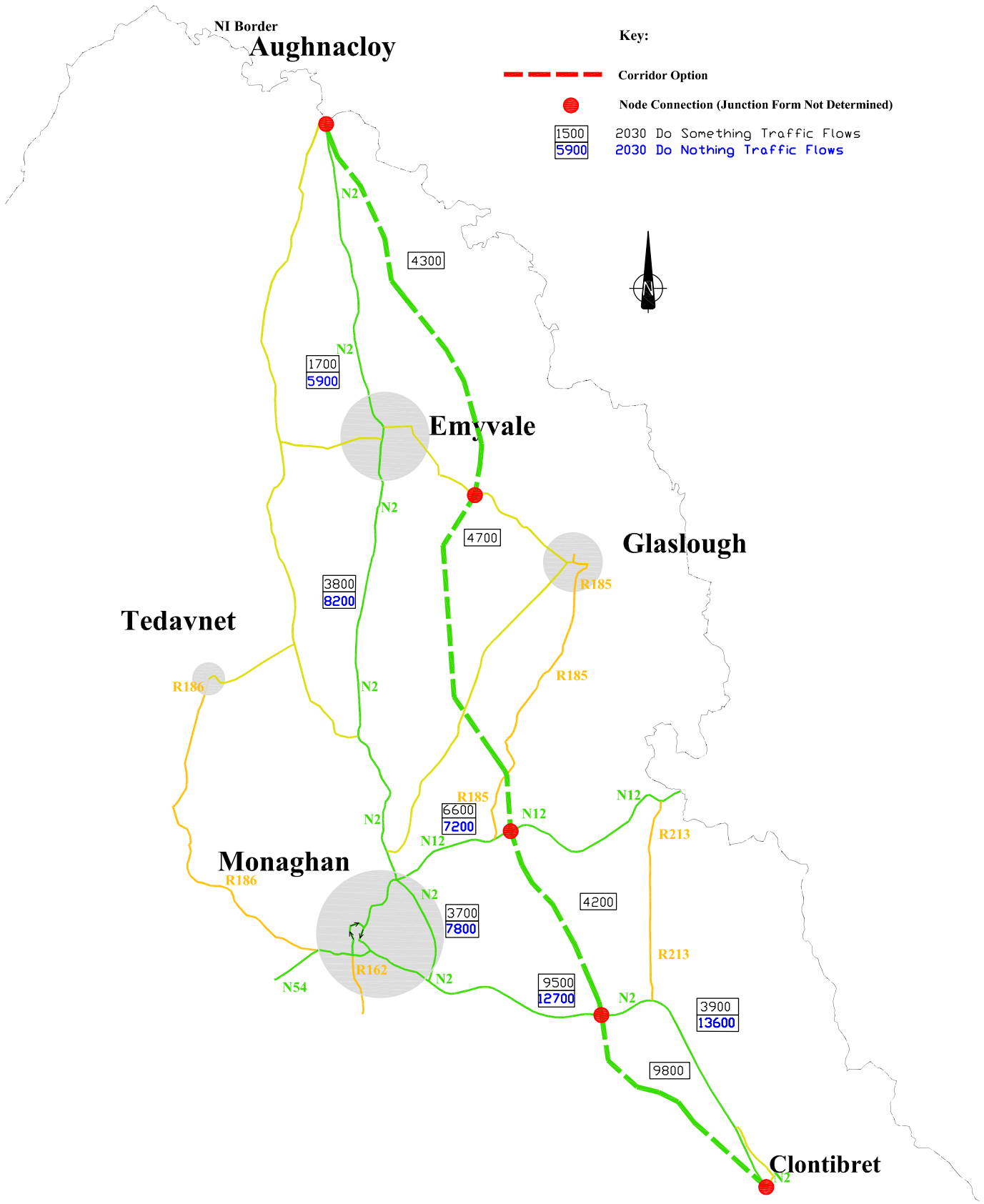
[5] As stated in Chapter 3 an appraisal year of 2030 has been used to compare the operational performance of options and scenarios, this being a requirement for assessing NRA road schemes where the appraisal year is 15 years after the assumed opening year. Also, the traffic forecasting used in the route selection process has been based on a "medium growth" projection to allow comparison between the performance of the options (the model is also capable of producing both high and low forecasts if required).



Grontmij

Option 1 (Yellow)

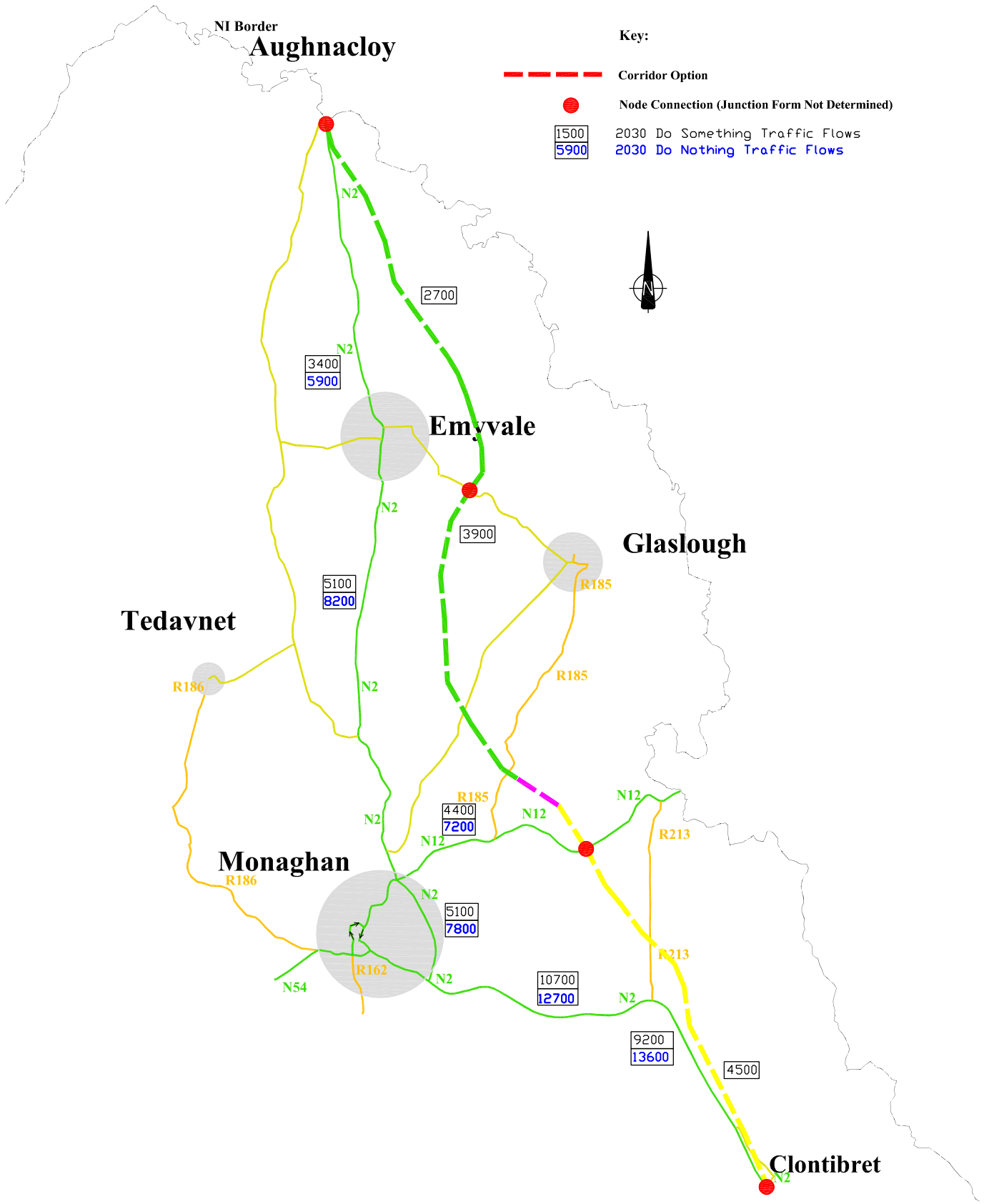
Figure 7.11



Grontmij

Option 2 (Green)

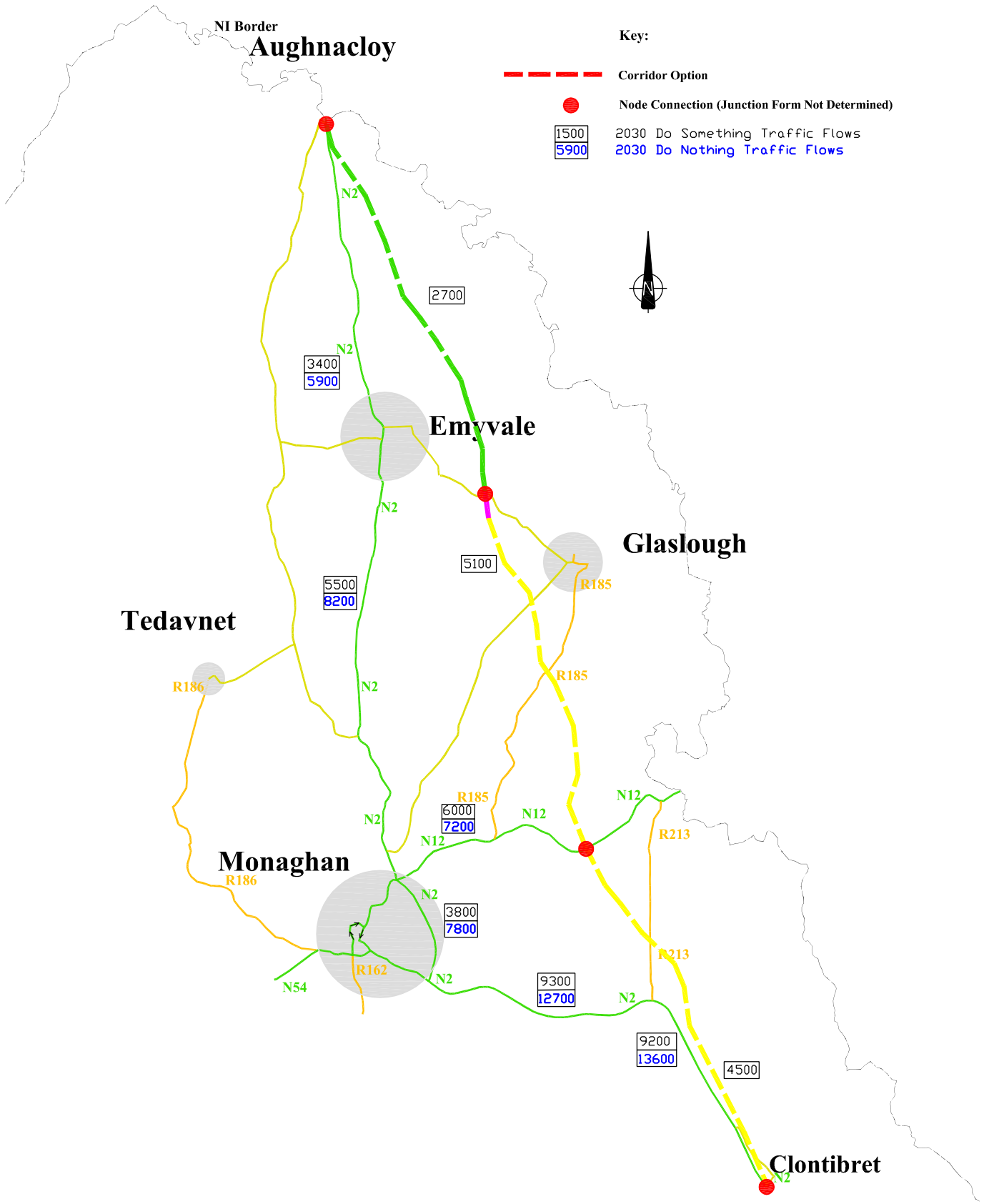
Figure 7.12



Grontmij

Option 3 (Yellow-Green No.1)

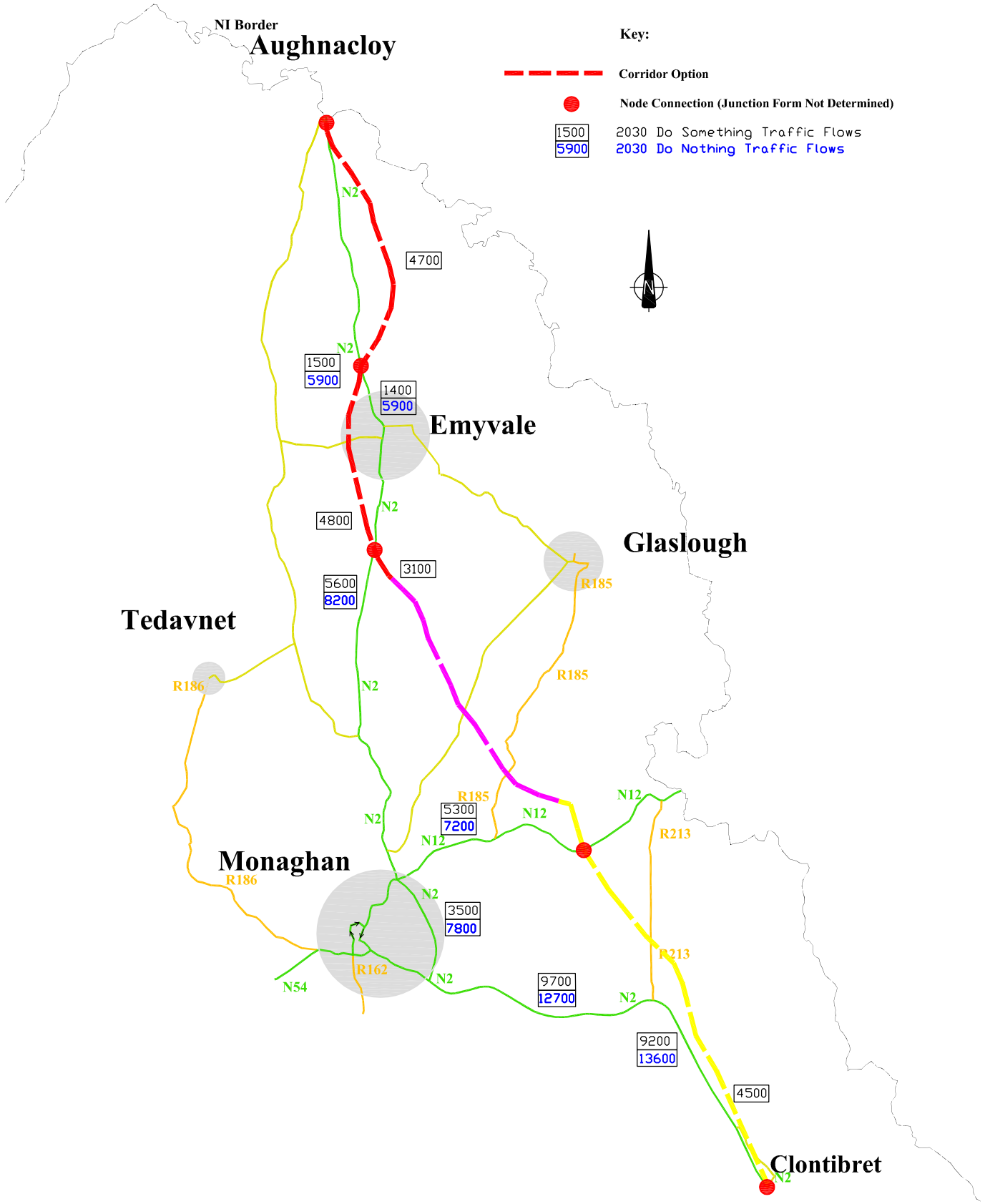
Figure 7.13



Grontmij

Option 4 (Yellow-Green No.2)

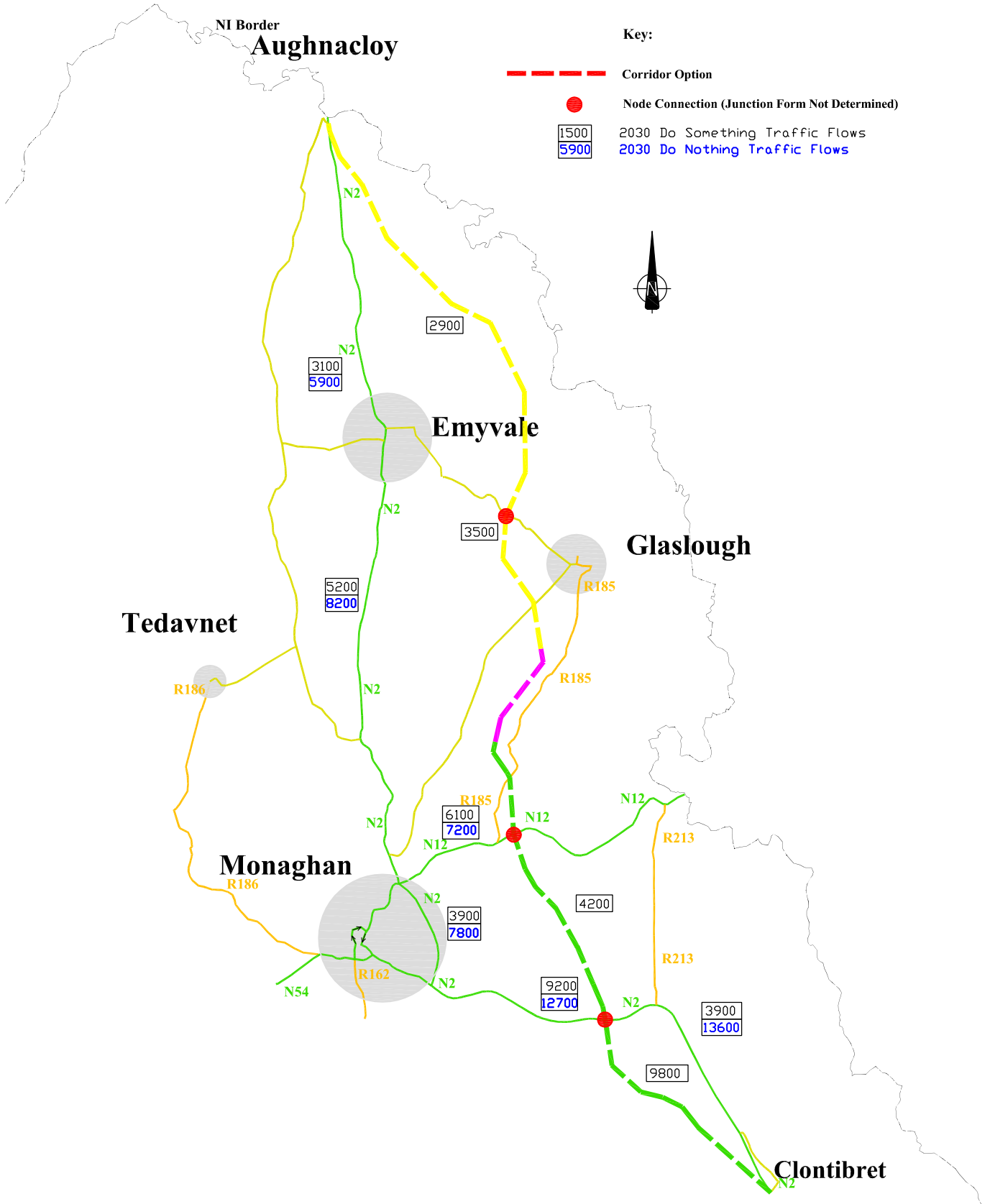
Figure 7.14



Grontmij

Option 5 (Yellow-Red)

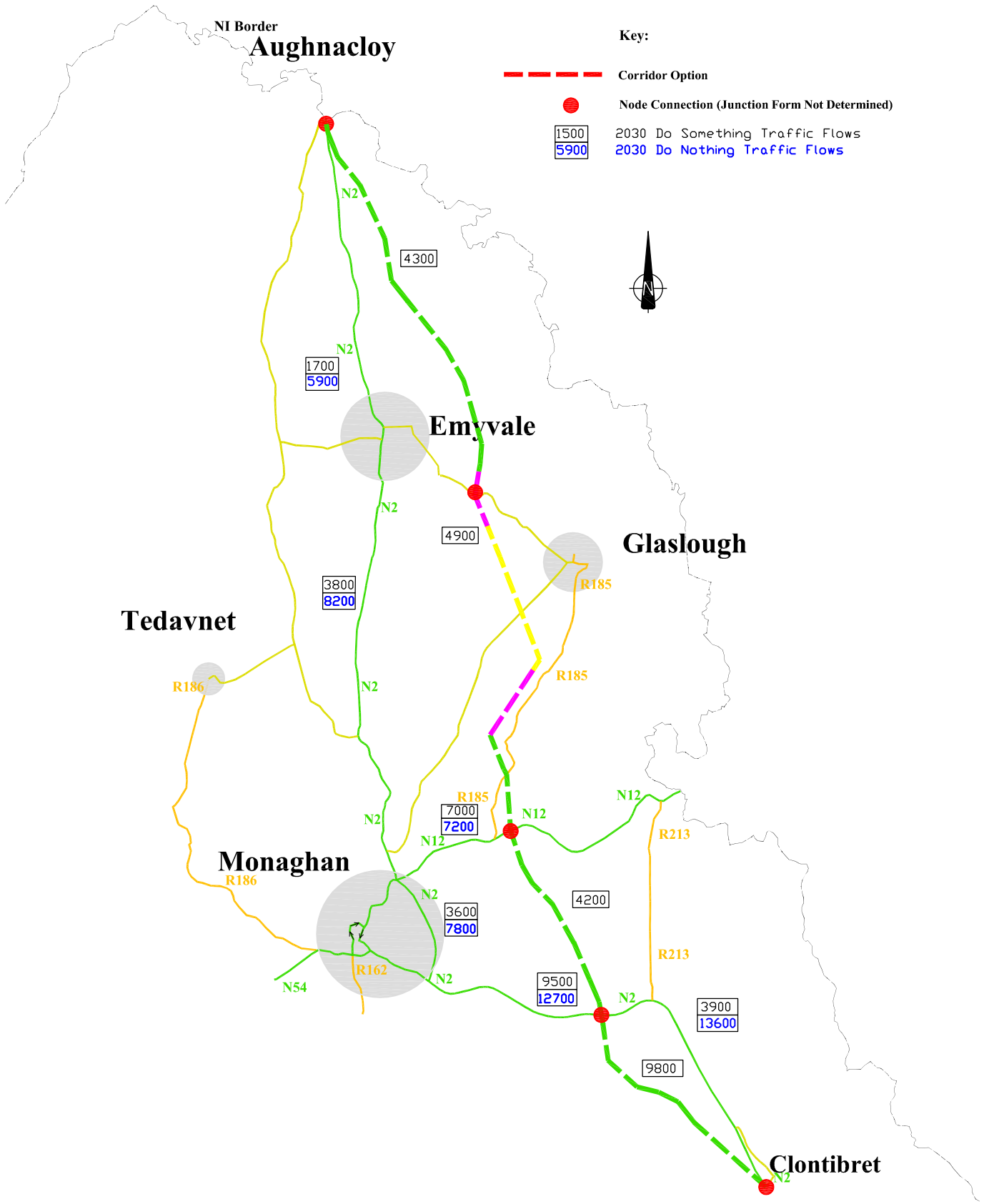
Figure 7.15



Grontmij

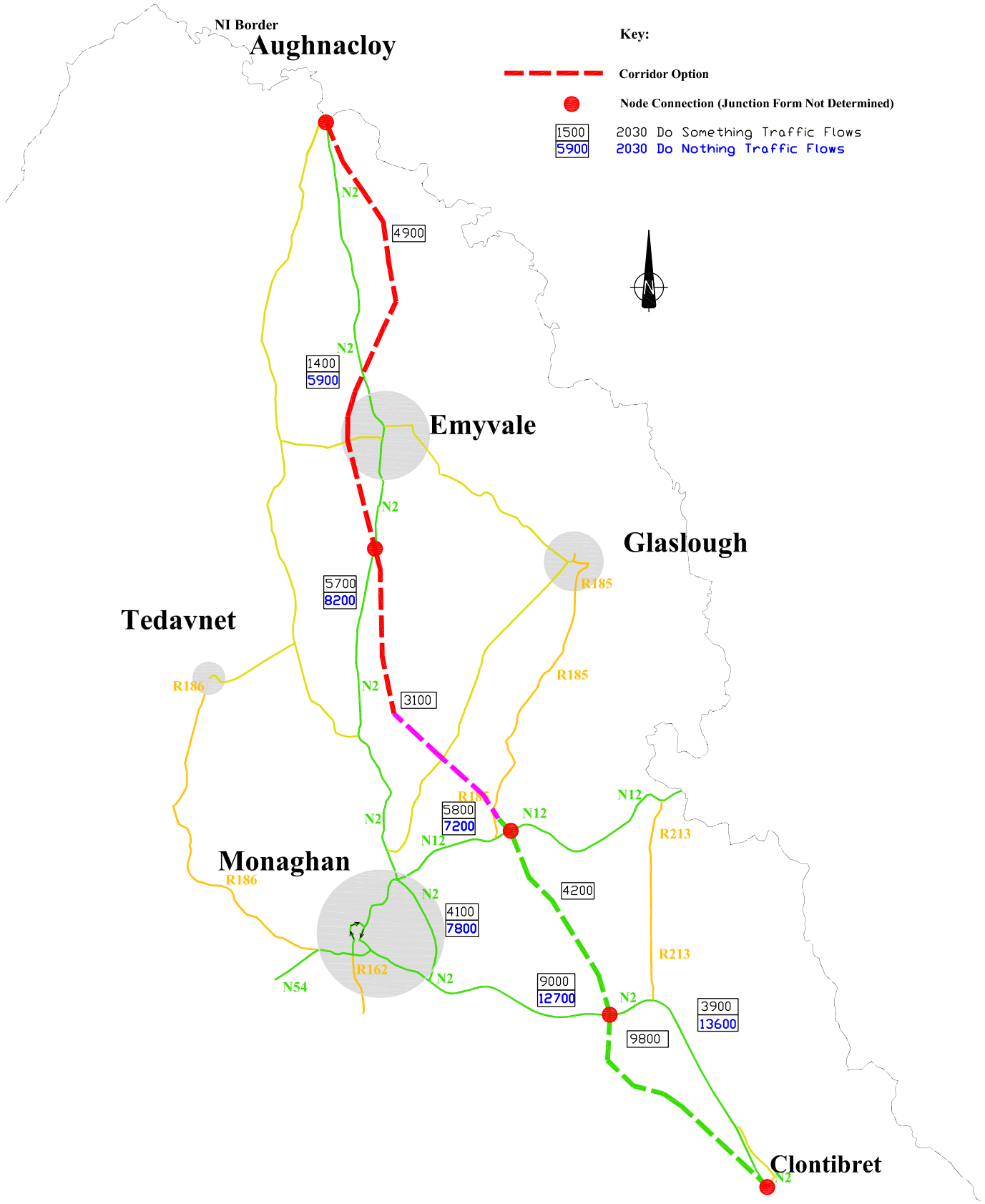
Option 6 (Green-Yellow)

Figure 7.16



Grontmij

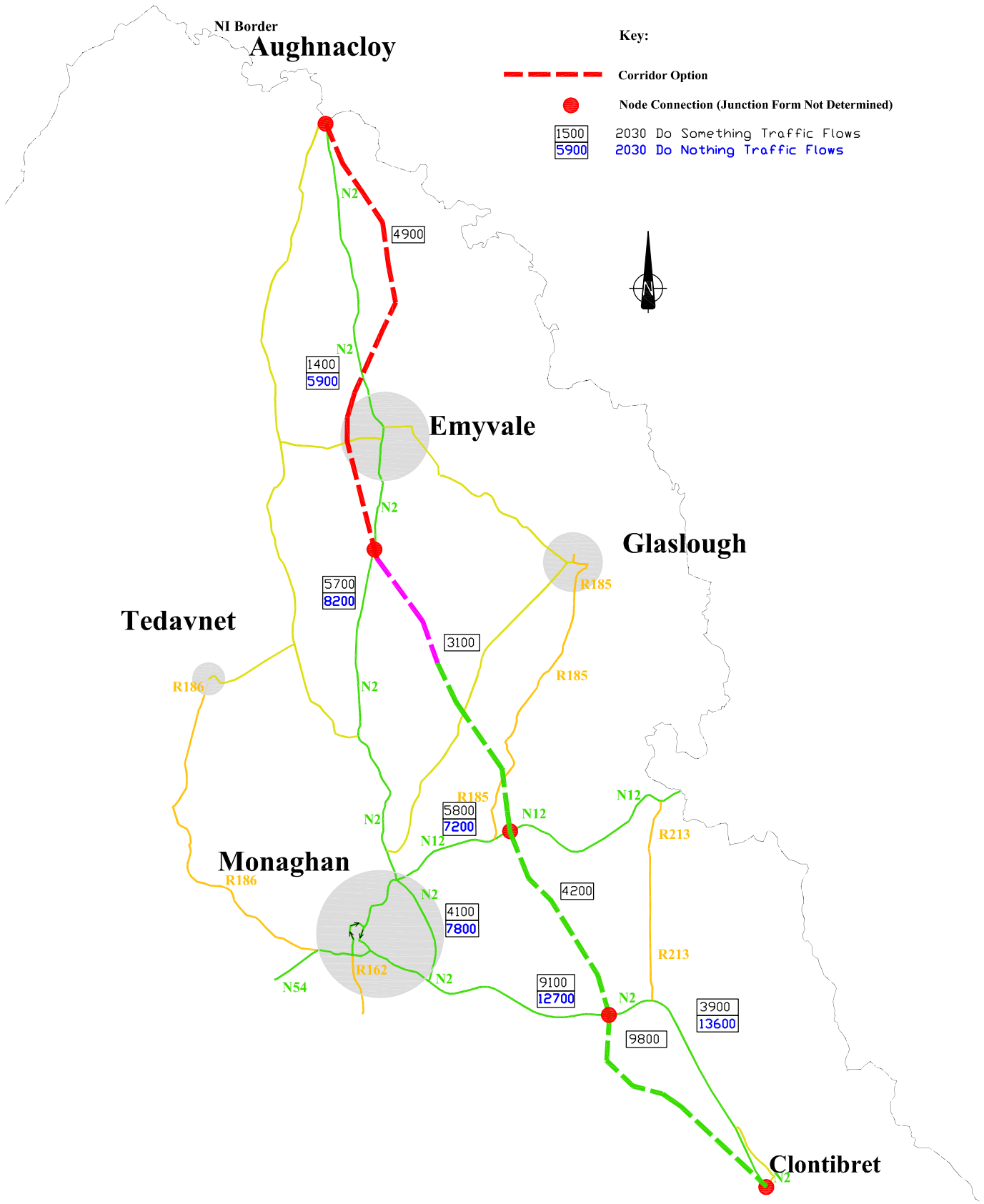
Option 7 (Green-Yellow-Green) Figure 7.17



Grontmij

Option 8 (Green-Red)

Figure 7.18



Grontmij

Option 9 (Green-Red2)

Figure 7.19

7.3 Assessment Methodology

In accordance with the NRA's Project Management Guidelines the performance of the shortlisted options have been appraised against five criteria: ***Economy***, ***Safety, Environment, Accessibility*** and ***Integration***. For each criterion the ten scenarios (nine corridor options plus the black corridor) have been ranked and then given a preference rating on the following basis:

- The three (or if closely matched four) top performing scenarios are deemed to be "**Preferred**",
- The bottom three (or if closely matched four) performing scenarios are deemed to be "**Least Preferred**",
- The middle placed scenarios are deemed to be "**Intermediate**" and
- If all the scenarios perform equally they were deemed to be "**Similar**".

The results for each individual criterion have then been collated into a framework matrix for direct comparison (see section 7.9). The following sections summarise the individual appraisals, rankings and preference ratings.

7.4 Economy Appraisal

The economy appraisal takes into account both the costs and benefits estimated for a particular scenario. Costs for each of the corridors appraised have been estimated as Options Comparison Estimates in accordance with the NRA's Cost Management Manual 2010. These "Level 2" estimates quantify those items that typically capture the majority of the cost such as drainage, earthworks, pavement and structures. For example initial estimates of suitable cut, unsuitable cut and embankment fill have been made that have been converted into costs using rates from an NRA's Schedule of Unit Rates (lower range, May 2011). Around 20% of the costs were allowed for by using elemental cost rates, for example landscaping works being assumed to be 4% of overall construction costs. Table 7.2 shows the estimates (that include VAT) used in comparing the corridors. These estimates show that for the shortlisted options the OCEs range from €121M to €141M, with the main differences being related to the number of structures required to cross side roads and watercourses. Although an additional €10M allowance has been made for parallel access roads on the Black corridor, this scenario is the least expensive, primarily since there are fewer structures required.

Option	Corridor	Options Comparison Estimate	Length (km)
1	Yellow	€121,737,000	25.3
2	Green	€137,247,000	25.8
3	Yellow - Green No.1	€129,534,000	25.4
4	Yellow - Green No.2	€121,840,000	24.5
5	Yellow - Red	€127,754,000	25.2
6	Green - Yellow	€136,540,000	26.6
7	Green - Yellow - Green	€132,324,000	25.8
8	Green - Red	€139,939,000	26.0
9	Green - Red2	€141,050,000	25.7
-	Black	€96,077,000	28.1

Table 7.2 Stage 2 Project Appraisal - Corridor Cost Estimates (including VAT)

The above costs have been used in a Cost Benefit Analysis (CBA) which provides the means of assessing value for money of the monetised costs and benefits of the different corridors. Cost benefit analysis achieves this by comparing the Do-Nothing (i.e. the existing transport network) with Do-Something scenarios (i.e. the various options). The analysis determines whether the monetised travel time and road safety benefits outweigh the costs of construction and future maintenance. The CBA has been undertaken in accordance with the NRA Project Appraisal Guidelines 2011 and uses the CoBA 11 (Release13) software program. This program discounts all costs and benefits to a present value year of 2009 at a discount rate of 4%. The results of the CBA for the corridors being appraised are shown in Table 7.3.

Option	Corridor	Present Value Benefits (PVB)	Present Value Costs (PVC)	Net Present Value (NPV = PVB-PVC)	Benefit Cost Ratio (BCR = PVB/PVC)
1	Yellow	205,500	113,339	92,339	1.81
2	Green	232,167	126,419	105,749	1.84
3	Yellow - Green No.1	121,474	121,717	-243	1.0
4	Yellow - Green No.2	196,365	113,103	83,262	1.74
5	Yellow - Red	248,952	117,633	131,319	2.12
6	Green - Yellow	176,751	127,348	49,403	1.39
7	Green - Yellow - Green	207,429	122,607	84,822	1.69
8	Green - Red	238,685	128,765	109,920	1.85
9	Green - Red2	250,253	129,361	120,892	1.94
-	Black	68,097	87,554	-19,456	0.78

Table 7.3 - Cost Benefit Analysis Results
Note : all costs and values are represented in units of €'000 in 2009 prices discounted to 2009

The parameter used in ranking the performance of the ten scenarios is Benefit Cost Ratio (BCR). For a scheme to have a positive economic case, i.e. the benefits exceed the costs, a BCR of greater than 1.0 is needed. Table 7.4 indicates the results of the economy appraisal, including rankings and preference ratings. Given that the Green corridor has a BCR less than 1% different to the Green Red corridor, four corridors have been given a "Preferred" preference rating for the economy appraisal.

Option	Corridor	BCR	Ranking	Preference Rating
1	Yellow	1.81	5	Intermediate
2	Green	1.84	4	Preferred
3	Yellow - Green No.1	1.00	9	Least Preferred
4	Yellow - Green No.2	1.74	6	Intermediate
5	Yellow - Red	2.12	1	Preferred
6	Green - Yellow	1.39	8	Least Preferred
7	Green - Yellow - Green	1.69	7	Intermediate
8	Green - Red	1.85	3	Preferred
9	Green - Red2	1.94	2	Preferred
-	Black	0.78	10	Least Preferred

Table 7.4 - Economy Appraisal Preference Ratings

7.5 Safety Appraisal

The cost benefit analysis software estimates changes in the number and severity of accidents on the road network following the implementation of the scheme. These are based on national average accident rates for different road types in relation to fatal, serious injury and slight injury accidents. The estimated reductions in accidents are monetised and reported as "Present Value Benefit (PVB) accidents". This value has been adopted as the parameter to compare the safety

performance of the options and scenarios. Table 7.5 indicates the results of the safety appraisal, including rankings and preference ratings.

Option	Corridor	PVB Accidents*	Ranking	Preference Rating
1	Yellow	2.9	4	Intermediate
2	Green	2.8	5	Intermediate
3	Yellow - Green No.1	0.3	10	Least Preferred
4	Yellow - Green No.2	2.6	6	Intermediate
5	Yellow - Red	3.8	1=	Preferred
6	Green - Yellow	1.7	8	Least Preferred
7	Green - Yellow - Green	1.9	7	Intermediate
8	Green - Red	3.4	3	Preferred
9	Green - Red2	3.8	1=	Preferred
-	Black	0.4	9	Least Preferred

*values are €m in 2009 prices discounted to 2009

Table 7.5 - Safety Appraisal Preference Ratings

A road safety appraisal has been undertaken in accordance with the NRA guidelines, as shown in Appendix B. This however does not identify any significant differences between the corridors and therefore has not been used in the comparative assessment.

7.6 Environment Appraisal

In terms of environment eleven topics have been appraised by specialists in that subject to establish the relative performance of an option. For each topic the specialist has ranked the options and thereafter a preference rating has been given to be consistent with other Stage 2 appraisals. An overall set of environment preference ratings is shown in Section 7.6.12. The

appraisals for individual topics are detailed in the following sections. The assessments were carried out under the headings of:

- Ecology
- Geology and Hydrogeology
- Hydrology and Drainage – Water Quality and Fisheries
- Landscape and Visual
- Archaeology Cultural Heritage
- Architectural Heritage
- Air Quality and Climate
- Noise and Vibration
- Socio–Economics
- Agronomy

The NRA guidance for each specific environmental topic was followed in all relevant instances. For some of the appraisals it was necessary to assume route alignment was along the centreline of the corridor.

7.6.1 Ecology

The ecological assessment for the corridor options was carried out by assessing both the number and severity of impacts on ecological sites in accordance with the NRA document entitled *Guidelines for Assessment of Ecological Impacts of National Road Schemes.* Ecological sites in the study area were identified during a desk study which examined aerial photographs of the study area and subsequent site visits. This was supplemented through consultation with various statutory consultees and a review of the data they provided. Sites that have been identified as being within the corridors being assessed are described in Table A1 in Appendix A.

The total number of ecological sites potentially impacted by the corridors being assessed is 18. These sites are typically either wetland sites associated with lakes/naturally infilling lakes and areas of deciduous and/or coniferous woodland. Due to the habitats present all of the sites are potentially important for mammals.

Signs of badger activity including setts, tracks and evidence of foraging were found in a number of sites. Any of the sites containing areas of dry woodland have potential for badger setts. Badgers are known to forage in wet areas but it is unlikely that setts would be found in wet ground.

Individual hedgerows and treelines were not assessed as part of this survey but are considered to be important habitats for many mammal species especially badgers.

Main watercourses crossed by the corridors and smaller watercourses within sites were assessed for otter and bat potential. No evidence of otters such as spraints and footprint was found during the site surveys. High water levels during the survey period are likely to have washed away signs of otter activity on some of the affected watercourses. However, it is likely that otter utilise all of the smaller streams and drains in the study area, along with the larger watercourses (including the Ulster Canal), for foraging/commuting, particularly those which connect areas of wet low-lying habitats. No otter holts were identified at any of the watercourse crossing points along the proposed corridor.

Signs of fallow deer were recorded in one of the woodland sites and it is likely that this species occurs elsewhere in the study area especially where there are substantial areas of woodland. Signs of foraging squirrel were recorded in two of the sites, however it is difficult to determine whether this was red or grey squirrel. No signs of pine marten were recorded but it is possible that this species is present within the study area.

Due to the rich soils and drumlin landscape in the general area the corridors run mainly through improved agricultural grasslands that are generally ecologically poor for wildlife and bats, in particular, and most of the agricultural areas may be considered as of low or negligible interest from a bat perspective. However, the agricultural field boundaries are diverse with good quality hedgerows and tall treelines and these are therefore of local value being used for commuting and foraging by bats.

In order to compare the corridors the ecology appraisal has taken into account:

- The number of ecological sites affected; and
- Their cumulative area.

A mammal preference rating, with this being based on avoidance and/or reduction of impacts on mammals by avoiding suitable mammal habitat, with “high” being the most preferred and “low” being the least preferred.

For each site an “impact level” ranging from severe to not significant has been determined. The results of this appraisal are shown in Table 7.6. The impact level for each individual site is shown in Table A2 in Appendix A.

Option	Corridor	No. of Ecological Sites Impacted	Area Ecological Sites Impacted (Ha)	Mammal Preference Rating	Impact Level				
					Severe	Major Negative	Moderate Negative	Minor Negative	Not significant
1	Yellow	4	2.06	High			1	2	1
2	Green	6	7.8	Low			3	2	1
3	Yellow - Green No.1	6	8.1	Low		1	3	1	1
4	Yellow - Green No.2	3	4.6	Low/Medium		1	1		1
5	Yellow – Red	6	4.02	Medium/Low			4	1	1
6	Green – Yellow	6	3.56	Medium			2	3	1
7	Green - Yellow - Green	5	6.1	Low		1	2	1	1
8	Green – Red	7	3.68	Medium			4	2	1
9	Green - Red2	6	3.32	High			2	3	1
-	Black	9	9.24	Low		1	4	3	1

Table 7.6 Ecology Appraisal

The sites potentially affected on a corridor-by-corridor basis are summarised below:

The ***Yellow*** corridor potentially impacts on four ecological sites (Site Nos. 51, 89, 96 and 136). Two of these sites are rated as sites of high local importance (C sites) and two are rated as sites of moderate local importance (D sites).

The ***Green*** corridor potentially impacts on six ecological sites (Site Nos. 35, 51, the boundary of 66, 80, 108 and the boundary of 136). Four of these sites are rated as sites of high local importance (C sites) and two are rated as sites of moderate local importance (D sites).

The ***Yellow – Green No. 1*** corridor potentially impacts on six ecological sites (Site Nos. 51, 67, the boundary of 66, 80, 108 and the boundary of 136). Five of these sites are rated as sites of high local importance (C sites) and one is rated as a site of moderate local importance (D site).

The ***Yellow – Green No. 2*** corridor potentially impacts on three ecological sites (Site Nos. 51, 108 and the boundary of 136). All of these sites are rated as sites of high local importance (C sites).

The ***Yellow – Red*** corridor potentially impacts on six ecological sites (Site Nos. 51, 67, 66, the boundary of 94 and 99 and the boundary of 136). One of these sites is rated as a site of county importance (C+), three of these sites are rated as sites of high local importance (C sites) and one is rated as a site of moderate local importance (D site).

The ***Green - Yellow*** corridor potentially impacts on six ecological sites (Site Nos. 35, 51, 66, the boundary of 89, the boundary of 96 and the boundary of 136). Two of these sites are rated as sites of high local importance (C sites) and four are rated as sites of moderate local importance (D sites).

The ***Green - Yellow – Green*** corridor potentially impacts on five ecological sites (Site Nos. 35, 51, 66, 108 and the boundary of 136). Three of these sites are rated as sites of high local importance (C sites) and two are rated as sites of moderate local importance (D sites).

The ***Green – Red*** corridor potentially impacts on seven ecological sites (Site Nos. 35, 51, 65, the boundary of 73, the boundary of 94, 99 and 136). Two of these sites are rated as sites of county importance (C+ sites), four of these sites are rated as sites of high local importance (C sites) and one is rated as a site of moderate local importance (D site).

The ***Green – Red 2*** corridor potentially impacts on six ecological sites (Site Nos. 35, 51, 66, the boundary of 94 and 99 and the boundary of 136). One of these sites is rated as a site of county importance (C+ sites), three of these sites are rated as sites of high local importance (C sites) and two are rated as sites of moderate local importance (D sites).

The ***Black*** corridor potentially impacts on nine ecological sites (the boundary of 34 and 37, 51, the boundary of 58, 64, and the boundary of 94, 99, 121 and 136). Two of these sites are rated as sites of county importance (C+ sites), five of these sites are rated as sites of high local importance (C sites) and two are rated as sites of moderate local importance (D sites).

The results of the ecology appraisal have been used to provide preference ratings as indicated in Table 7.7.

Option	Corridor	Ranking	Preference Rating
1	Yellow	1	Preferred
2	Green	9	Least Preferred
3	Yellow - Green No.1	8	Least Preferred
4	Yellow - Green No.2	6	Intermediate
5	Yellow - Red	5	Intermediate
6	Green - Yellow	4	Intermediate
7	Green - Yellow - Green	7	Intermediate
8	Green - Red	3	Preferred
9	Green - Red2	2	Preferred
-	Black	10	Least Preferred

Table 7.7 Ecology Preference Ratings

In terms of potential ecological impacts ***Yellow*** is the most preferred corridor. The least favoured corridor is the Black Corridor, which potentially impacts on 9 sites of ecological interest.

7.6.2 Geology

An assessment of the impact on the geological constraints was undertaken in accordance with the NRA *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.* The assessment established the extents of geological outcrops, subsoils, and karst potential within each of the 400m wide corridors.

Table 7.8 below shows the results and rankings of the individual geological assessments of the corridors.

Option	Corridor	Geology - Outcrops		Geology - Subsoils		Geology - Karst Potential	
		Total (m)	Rank	Total (m)	Rank	Total (m)	Rank
1	Yellow	9100	9	14200	6	12200	1
2	Green	5800	5	15000	7	13300	3
3	Yellow - Green No.1	8900	8	19800	10	21100	9
4	Yellow - Green No.2	8700	7	15800	8	12200	1
5	Yellow - Red	8400	6	18400	9	34300	10
6	Green - Yellow	4800	3	9600	1	18500	6
7	Green - Yellow - Green	4400	2	11200	2	18500	6
8	Green - Red	4000	1	11800	3	16400	5
9	Green - Red2	5100	4	13300	5	13300	3
-	Black	11200	10	11900	4	19000	8

Table 7.8 Geology Appraisal

The ***Black*** Corridor is estimated to have the greatest extent of mapped outcrop area (11,200m), whereas the ***Green - Red*** corridor (4,000m) is estimated to have the least extent. The greatest extent of peat deposits were mapped within the ***Yellow-Green No.1*** corridor whilst the smallest extent was mapped within the ***Green – Yellow*** Corridor. The greatest extent of karstified bedrock

has been mapped along the ***Yellow-Red*** corridor, whilst both the ***Yellow*** and ***Yellow-Green No.2*** corridors have the least (12,200m).

The corridor preferences with respect to geology are presented in Table 7.9 below. These take into account the three topics examined on an equal basis.

Option	Corridor	Ranking	Preference
1	Yellow	8	Least Preferred
2	Green	7	Intermediate
3	Yellow - Green No.1	9	Least Preferred
4	Yellow - Green No.2	6	Intermediate
5	Yellow - Red	10	Least Preferred
6	Green - Yellow	2	Preferred
7	Green - Yellow - Green	5	Intermediate
8	Green - Red	1	Preferred
9	Green - Red2	4	Intermediate
-	Black	3	Preferred

Table 7.9 Geology Preference Ratings

In terms of geology ***Green Red*** is the preferred corridor as it crosses through the least extents of potentially sensitive geological features.

7.6.3 Hydrogeology

An assessment of the impact on the hydrogeological constraints was undertaken in accordance with the NRA *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.* The assessment established the extents of hydrogeological areas of vulnerability, wells, inner and outer source protection areas for groundwater supplies within each of the 400m wide corridors.

Table 7.10 below shows the results and rankings of the individual hydrogeological assessments of the corridors.

		Extreme and high Vulnerability		Wells		Inner Source Protection Area		Outer Source Protection Area	
		Total (m)	Rank	Total (no.)	Rank	Total (m)	Rank	Total (m)	Rank
Option	Corridor	*F=0.125*		*F=0.175*		*F=0.375*		*F=0.325*	
1	Yellow	76600	10	24	9	0	1	0	1
2	Green	58300	4	14	3	540	6	2900	5
3	Yellow - Green No.1	64400	6	14	3	0	1	0	1
4	Yellow - Green No.2	68400	7	18	6	0	1	0	1
5	Yellow - Red	70700	8	12	1	0	1	0	1
6	Green - Yellow	62000	5	21	8	540	6	2900	5
7	Green - Yellow - Green	53900	3	15	5	540	6	2900	5
8	Green - Red	43100	1	18	6	535	5	5600	9
9	Green - Red2	53800	2	12	1	540	6	2900	5
-	Black	73100	9	38	10	900	10	34600	10

Table 7.10 Hydrogeology Appraisal

The greatest extent of Extreme (E) and High (H) vulnerability areas were mapped along the ***Yellow*** corridor, within the lowest extent mapped along the ***Green - Red*** and ***Green – Red2*** corridors. The southern section of the ***Black*** corridor is estimated to contain the greatest extent of

extreme and high vulnerability areas. The ***Black*** corridor is estimated to have the highest number of mapped third party wells within the 400m buffer corridor compared with the other corridors. The ***Green – Red2*** and ***Yellow-Red*** corridor encountered the least number of third party wells. The Inner Source Protection Areas (SI) of public water supplies are traversed by the ***Green, Green – Yellow, Green – Yellow – Green, Green – Red***, ***Green – Red2*** and ***Black*** corridors. The Outer Source Protection Areas (SO) of public water supplies are traversed by the ***Green, Green – Yellow, Green – Yellow – Green, Green – Red***, ***Green – Red2*** and ***Black*** corridors.

The corridor preferences with respect to hydrogeology are presented in Table 7.11 below. These take into account the three topics examined in Table 7.10 above, with the weighting arrived at based on the perceived relative sensitivity of each aspect.

Option	Corridor	Ranking	Preference
1	Yellow	4	Intermediate
2	Green	6	Intermediate
3	Yellow - Green No.1	2	Preferred
4	Yellow - Green No.2	3	Preferred
5	Yellow - Red	1	Preferred
6	Green - Yellow	9	Least Preferred
7	Green - Yellow - Green	7	Intermediate
8	Green - Red	8	Least Preferred
9	Green - Red2	5	Intermediate
-	Black	10	Least Preferred

Table 7.11 Hydrogeology Preference Ratings

7.6.4 Hydrology – Water Quality and Fisheries

The Water Quality and Fisheries assessment for the corridors was carried out by identifying all the potentially affected watercourses and features through the examination of mapping, publications, aerial photography and consultation with both statutory and non statutory bodies. Consultees ranged from the Inland Fisheries Ireland (IFI), the EPA and the National Parks and Wildlife Service to local angling groups.

For this assessment 45 representative watercourses were visited at or as close as possible to their proposed crossing points and their habitats evaluated. Rather than simply count the number of watercourses potentially affected, each crossing stretch was scored (1-5) depending on its instream and bankside habitats relevant to their suitability for salmonids fish (salmon and trout). In addition, each watercourse crossing was given a risk score (1-5) depending on the perceived difficulty that might attach to engineering a crossing point. In this case the slope of adjoining ground and, to a lesser extent, the complexity of the bankside habitats were taken into account in this score. This scoring approach was only used as a general guide; the final ranking of corridors was based on a combination of these findings combined with particular sensitivities identified along certain corridors. Table 7.12 presents the results of the watercourse habitat and risk assessments for each corridor.

Option	Corridor	Habitat Score	Risk Score	Ranking	Preference Rating
1	Yellow	52	40	1	Preferred
2	Green	58	50	6	Intermediate
3	Yellow - Green No.1	53	44	3	Preferred
4	Yellow - Green No.2	53	41	2	Preferred
5	Yellow - Red	53	36	7	Intermediate
6	Green - Yellow	57	47	4	Intermediate
7	Green - Yellow - Green	58	48	5	Intermediate
8	Green - Red	60	42	8	Least Preferred
9	Green - Red2	58	42	9	Least Preferred
-	Black	67	57	10	Least Preferred

Table 7.12 Hydrology Appraisal and Preference Ratings

The preferred corridors emerging from an aquatic ecological perspective are those to the east and centre east of the study area, i.e. the ***Yellow*** and ***Yellow-Green*** corridor combinations as these corridors have the least potential impact upon fisheries and water quality.

7.6.5 Landscape and Visual

The Landscaping and Visual assessment focuses on the potential impacts on both the physical and visual environment and seeks to differentiate between the two. The assessment is based on the methodology provided by the Environmental Protection Agency (EPA) in their document *Guidelines for Environmental Impact Assessment*, supplemented by the document produced by the Landscape Institute and Institute of Environmental Assessment, *Guidelines for Landscape and Visual Impact Assessment* and the NRA Environmental Assessment and Construction Guidelines.

For the purposes of this assessment certain informed assumptions relating to vertical alignment were made to allow for an assessment to be made of potential cuttings and embankments associated with each of the corridors.

From a landscape and visual perspective, the selection of a preferred corridor centres on the balance between the potential visual impact on residential properties along the existing N2 corridor or the adverse physical effects should the corridor enter the more sensitive environments away from the existing route corridor. These sensitive landscapes exist either as isolated areas based on natural or cultural components, for example, Emy Lough, Glaslough or the Castleshane demesne, or as linear landscapes, for example the Blackwater Valley to the northeast of the study area. The area around Glaslough and Emy Lough contains a number of areas and routes recognised for their landscape and cultural importance, contiguous with the Blackwater Valley and in effect, create a wider area of landscape sensitivity.

The nature of the existing landscape consisting of well vegetated hedgerows and rolling drumlin landforms, both restricts long distance views and offers the potential to screen a new road alignment. Furthermore, earthworks or new planting to cuttings and embankments would be quickly absorbed within the existing environment.

The physical and landscape effects are summarised below on a corridor-by-corridor and nodal basis. The fold out figure at the end of Appendix A shows the locations of the various node points for the shortlisted options.

Yellow Corridor (NP01-04-07-10-14-15)

Node Point 01 – 04:

The Yellow corridor follows the existing N2 route from the roundabout at Kilcrow to immediately southeast of the wooded Castleshane demesne. Following the same route, the corridor would require little embankment with cuttings required to accommodate the increased width of the road corridor. It departs the existing alignment to swing more northerly along the line of the Cor River, in the centre of the broad, flat river valley. In closely following the river, the corridor also aligns with the field pattern, but would require to be on embankment and therefore increasingly visible on the valley floor. The corridor or its influence on the field pattern may be visible in this section from the protected view northwards from Tullybuck. Immediately east of Tiravray on the R213, the corridor turns north-westward through some flatter reaches of the Blackwater Valley and Drumlin Farmland LCA to cross the Ulster Canal west of Tyholland. Throughout, the corridor is heavily influenced by the adjacent rivers and is described as River Valley farmland Landscape Type and as such is of high sensitivity. In this section, the corridor is primarily on embankment with the crossing of the minor road east of Annacramph potential intrusive to the adjacent properties along the road. Otherwise the corridor is sparsely populated in this section.

Physical Effects - Slight adverse.

Visual Effects - Moderate to slight adverse.

Node Point 04 - 07

North of the Ulster Canal there is a low range of drumlins that the corridor would cut into the side of, before continuing through attractive farmland with well wooded hedgerows, mainly on embankment to enable the crossing of the frequent minor roads. The corridor would cross the Blackwater River where the river is more pronounced and enter into the shallow valley to the south of Glaslough.

Physical Effects - Moderate adverse.

Visual Effects - Moderate adverse.

Node Point 07 - 14

Both cuttings and embankments would be required in this sensitive area. The settlement of Glaslough is of high conservation interest and is mainly contained within the nationally important Castle Leslie Demesne. The corridor alignment describes a marked loop to the west to avoid encroaching too closely to the village. However, the entire area is of landscape and conservation interest with a consistency and attractiveness to the landscape and settlements along the Glaslough Road corridor from Emyvale. Protected views over Emy Lough are afforded from the road to the west of the corridor and the attractive villages of Aghaboy and Letloonigan along the road would be closely bypassed by the Yellow corridor to the west. The Glaslough Road and the roads through Aghaboy and Letloonigan are also part of the Sliabh Beagh No 1 Cycle Trail through this area of Monaghan. Getting through the drumlin landscape in this area requires significant and repeated cuttings and embankments, which would have an adverse impact on a sensitive landscape in the medium term, but would rapidly integrate into the rolling landform as the mitigation planting matures. Rounding Emy Lough at a distance to the east, the landscape becomes more even as the influence of the Blackwater River Valley increases. Although this would result in less exaggerated ground modelling, the landscape is more sensitive to intrusion. The corridor then swings more easterly to pass close to the north of the settlement of Cavan, with the alignment visible on embankment to cross the local road. Moving more northerly the corridor would pass closely to the west of Astrish Lough to pass through a saddle in the line of taller drumlins around the lough at Astrish Beg.

Physical Effects - Significant adverse.

Visual Effects - Significant adverse.

Node Point 14 - 15

The corridor then turns westward and then northwards to align with, and rejoin the existing N2 at Moy Bridge. Here the landform becomes less pronounced as the corridor nears the Blackwater River.

Physical Effects - Slight adverse.

Visual Effects - Moderate to slight adverse.

Green Corridor (NP 01-02-05-09-11-14-15)

Node Point 01 - 02

The Green corridor springs off the Kilcrow Roundabout heading northwest through the pronounced drumlin landscape of the foothills to the southwest of the Monaghan Drumlin Uplands LCA. This results in significant embankments and cuttings to achieve a suitable vertical alignment. In combination with the wooded hedgerows, however, the landform would conceal the alignment from all but close range views. The alignment then takes a marked loop to the west to skirt the regionally important Castleshane demesne. The wooded demesne and its environs are recognised within the Development Plan as being an Area of Secondary Amenity Value and the corridor would intrude into this setting. The corridor would also cross the existing N2 within the area of a Scenic View from the road at Castleshane Brae.

Physical Effects - Moderate adverse.

Visual Effects - Moderate to significant adverse.

Node Point 02 - 05

The corridor then continues northwards through the Blackwater Valley and Drumlin farmland LCA, threading its way between the sporadic residential properties and farmsteads on a series of cuttings and embankments. The corridor would sever a section of the demesne landscape at Sallymount, before crossing the Ulster Canal.

Physical Effects - Moderate adverse.

Visual Effects - Moderate adverse.

Node Point 05 - 09

After crossing the Ulster Canal, the corridor would cross the River Blackwater and Ulster Canal Cycleway in relatively close succession in an area of pronounced drumlins, resulting in significant cut and fill slopes. The small field sizes in this area would also result in the loss of hedgerows, but again, both the landform and the vegetation would permit the corridor to be concealed and easily mitigated. The corridor would impact on the demesne landscape of Glebe House to the north of Dundonagh before crossing Mountain Water.

Physical Effects - Moderate adverse.

Visual Effects - Moderate adverse.

Node Point 09 - 14

On crossing Mountain Water, the corridor swings eastward to cross the Glaslough Road and round the hills to the back of Emy Lough. The lough is an Area of Secondary Amenity Value as

recognised by the Development Plan with protected views towards the lough from Glaslough Road. With Emyvale and Glaslough, the Lough forms an important chain of landscape and cultural features. A significant cut slope would be required to the hill at the rear (east) of the lough and although this would screen the road, it would alter the environment of the setting of the lough. North of Emy Lough the corridor turns to the northwest to traverse the pronounced drumlin landscape towards Moy Bridge. It would pass closely to the southwest of Cavan, winding its way between properties to pass to the west of Astrish Lough and follow the Yellow corridor out through the drumlins at Astrish Beg.

Physical Effects - Moderate to significant adverse.

Visual Effects - Moderate to significant adverse.

Node Point 14 - 15

Describes the same corridor as the Yellow Corridor in turning westward and then northwards to align with, and rejoin the existing N2 at Moy Bridge. Here the landform becomes less pronounced as the corridor nears the Blackwater River.

Physical Effects - Slight adverse.

Visual Effects - Moderate to slight adverse.

Yellow – Green No.1 Corridor (NP 01-04-05-09-11-14-15)

Node Points 01-04 are as described above for the Yellow Corridor.

Node Point 04 - 05

The link would connect the Yellow Corridor immediately north of the N12 and Ulster Canal to the Green Corridor at Corvally. The alignment cuts across and through a number of drumlins, mainly in cutting, some of which are significant, but the effects would be reduced in time as mitigation measure mature. The curve of the alignment would also prevent long view along the cuttings and would be in keeping with the existing drumlin landform. There are potentially a greater number of properties affected on this section due to the houses around Corvally.

Physical Effects - Moderate adverse.

Visual Effects - Moderate adverse.

Node Points 05-15 are as described above for the Green Corridor.

Yellow – Green No.2 Corridor (NP 01-04-07-10-11-14-15)

Node Points 01-10 are as described above for the Yellow Corridor.

Node Point 10 - 11

This link would connect the Yellow Corridor to the northwest of Glaslough to the Green Corridor east of Emy Lough. The corridor would pass through a sensitive landscape of recognised quality and integrity, cutting the Glaslough Road to the west of Aghaboy and Letloonigan.

Physical Effects - Significant adverse.

Visual Effects - Moderate adverse.

Node Points 11-15 are as described above for the Green Corridor.

Yellow – Red Corridor (NP 01-04-05-08-12-14-15)

Node Points 01-04 are as described above for the Yellow Corridor.

Node Point 04 - 05

The link would connect the Yellow Corridor immediately north of the N12 and Ulster Canal to the Green Corridor at Corvally. The alignment cuts across and through a number of drumlins, mainly in cutting, some of which are significant, but the effects would be reduced in time as mitigation measure mature. The curve of the alignment would also prevent long view along the cuttings and would be in keeping with the existing drumlin landform. There are potentially a greater number of properties affected on this section due to the houses around Corvally.

Physical Effects - Moderate adverse.

Visual Effects - Moderate adverse.

Node Point 05 - 08

This link option heads northwestwards from Corvally to connect the Green Corridor with Red Corridor east of Gortmoney on the existing N2. The fairly straight alignment cuts across and through a number of drumlins, but the effects would be reduced in time as mitigation measures mature. Also, the hedgerows are sparser along this corridor than is normal within this landscape and there would be less immediate impact in this respect and greater opportunity for benefit through mitigatory planting.

Physical Effects - Moderate to slight adverse.

Visual Effects - Moderate to slight adverse.

Node Point 08 - 12

This link crosses the existing N2 to form a close westerly bypass of Emyvale. The corridor would impact upon Grove Lough at Derrynashallog and run closely to the rear of the properties aligned along the existing minor road to Tonynumery.

Physical Effects - Moderate adverse.

Visual Effects - Moderate adverse.

Node Point 12 - 14

This corridor passes to the west of Emyvale clipping both the woodland to the west of Buck Lough and the southeastern corner of Dungillick House demesne before returning to the existing N2 route to the north of the town. The corridor would then remain to the east of the existing N2 and would pass closely to the southwest of Cavan, winding its way between properties to pass to the west of Astrish Lough and follow the Yellow corridor out through the drumlins at Astrish Beg.

Physical Effects - Slight to moderate adverse.

Visual Effects - Slight to moderate adverse.

Node Point 14 - 15

Describes the same corridor as the Yellow Corridor in turning westward and then northwards to align with, and rejoin the existing N2 at Moy Bridge. Here the landform becomes less pronounced as the corridor nears the Blackwater River.

Physical Effects - Slight adverse.

Visual Effects - Moderate to slight adverse.

Green - Yellow Corridor (NP 01-04-05-07-10-14-15)

Node Points 01-05 are as described above for the Green Corridor.

Node Point 05 - 07

This link would connect the Green Corridor at Corvally with the Yellow Corridor to the west of Aghaloughan, south of Glaslough. The corridor would avoid conflict with any protected views or landscapes but would cut through an area of drumlins causing medium term impact until the mitigation measures mature. As a result, however, the corridor would be well screened from view with the curvature of the alignment preventing long view along the cutting.

Physical Effects - Moderate adverse.

Visual Effects - Moderate to slight adverse.

Node Points 07-15 are as described above for the Yellow Corridor.

Green – Yellow - Green Corridor (NP 01-04-05-07-10-11-14-15)

Node Points 01-05 are as described above for the Green Corridor.

Node Point 05 - 07

This link would connect the Green Corridor at Corvally with the Yellow Corridor to the west of Aghaloughan, south of Glaslough. The corridor would avoid conflict with any protected views or landscapes but would cut through an area of drumlins causing medium term impact until the mitigation measures mature. As a result, however, the corridor would be well screened from view with the curvature of the alignment preventing long view along the cutting.

Physical Effects - Moderate adverse.

Visual Effects - Moderate to slight adverse.

Node Points 07-10 are as described above for the Yellow Corridor.

Node Point 10 - 11

This link would connect the Yellow Corridor to the northwest of Glaslough to the Green Corridor east of Emy Lough. The corridor would pass through a sensitive landscape of recognised quality and integrity, cutting the Glaslough Road to the west of Aghaboy and Letloonigan.

Physical Effects - Significant adverse.

Visual Effects - Moderate adverse.

Node Points 11-15 are as described above for the Green Corridor.

Green – Red Corridor (NP 01-02-03-06-08-12-14-15)

Node Points 01-02 are as described above for the Green Corridor.

Node Point 02 - 08

The corridor then continues through a similar landscape of small pastoral fields with well defined hedgerows, as it enters the Blackwater Valley and Drumlin Farmland LCA to parallel the alignment of the existing corridor as it heads northwards from Monaghan towards Emyvale. Through this section the corridor would alternate from cutting to embankment as it crosses the drumlin landscape. From the Ulster Canal and N2 crossing, the corridor would swing north-westward through a network of small fields to enter an area of pronounced drumlin landform. This is greatly apparent immediately before the crossing of the Blackwater River, where the corridor would cut through a low hill and impact on the wooded area to the south of the river. The corridor would continue in a northerly direction through a series of drumlins involving alternating

embankments and cuttings. The hedgerows and trees are not so evident in this section, reducing the impact on vegetation of the landforms and creating a potential beneficial increase in woodland cover through the planting of the cut and fill slopes. It passes Drumcaw Lough, a site of ecological interest closely to the west, before curving westward slightly towards the existing N2. Immediately prior to crossing the N2, the corridor clips the eastern edges of the Anketell Grove Demesne, which is of regional importance.

Physical Effects - Moderate to significant adverse.

Visual Effects - Moderate adverse.

Node Point 08 - 12

This link crosses the existing N2 to form a close westerly bypass of Emyvale. The corridor would impact upon Grove Lough at Derrynashallog and run closely to the rear of the properties aligned along the existing minor road to Tonynumery.

Physical Effects - Moderate adverse.

Visual Effects - Moderate adverse.

Node Point 12 - 14

This corridor passes to the west of Emyvale clipping both the woodland to the west of Buck Lough and the southeastern corner of Dungillick House demesne before returning to the existing N2 route to the north of the town. The corridor would then remain to the east of the existing N2 and would pass closely to the southwest of Cavan, winding its way between properties to pass to the west of Astrish Lough and follow the Yellow corridor out through the drumlins at Astrish Beg.

Physical Effects - Slight to moderate adverse.

Visual Effects - Slight to moderate adverse.

Node Point 14 - 15

Describes the same corridor as the Yellow Corridor in turning westward and then northwards to align with, and rejoin the existing N2 at Moy Bridge. Here the landform becomes less pronounced as the corridor nears the Blackwater River.

Physical Effects - Slight adverse.

Visual Effects - Moderate to slight adverse.

Green – Red2 Corridor (NP 01-02-05-08-12-14-15)

Node Points 01-05 are as described above for the Green Corridor.

Node Point 05 - 08

This link option heads northwestwards from Corvally to Derryhallagh on the existing N2. The fairly straight alignment cuts across and through a number of drumlins, but the effects would be reduced in time as mitigation measures mature. Also, the hedgerows are sparser along this corridor than is normal within this landscape and there would be less immediate impact in this respect and greater opportunity for benefit through mitigatory planting.

Physical Effects - Moderate to slight adverse.

Visual Effects - Moderate to slight adverse.

Node Point 08 - 12

This link crosses the existing N2 to form a close westerly bypass of Emyvale. The corridor would impact upon Grove Lough at Derrynashallog and run closely to the rear of the properties aligned along the existing minor road to Tonynumery.

Physical Effects - Moderate adverse.

Visual Effects - Moderate adverse.

Node Point 12 - 14

This corridor passes to the west of Emyvale clipping both the woodland to the west of Buck Lough and the southeastern corner of Dungillick House demesne before returning to the existing N2 route to the north of the town. The corridor would then remain to the east of the existing N2 and would pass closely to the southwest of Cavan, winding its way between properties to pass to the west of Astrish Lough and follow the Yellow corridor out through the drumlins at Astrish Beg.

Physical Effects - Slight to moderate adverse.

Visual Effects - Slight to moderate adverse.

Node Point 14 - 15

Describes the same corridor as the Yellow Corridor in turning westward and then northwards to align with, and rejoin the existing N2 at Moy Bridge. Here the landform becomes less pronounced as the corridor nears the Blackwater River.

Physical Effects - Slight adverse.

Visual Effects - Moderate to slight adverse.

Black Corridor (NP 01-08-12-15)

Node Point 01 - 08

The key issue with significant improvement works to an existing single carriageway corridor is the impact on the landscape and properties to either side of the road. Despite the strong physical influence and linear nature of the existing road corridor, the landscape and development to either side of the road is in the main well established with abundant hedgerows, property boundaries, and trees closely associated with the road. Relatively minor changes in alignment or the construction of a widened road could have significant detrimental influence on the landscape and properties within the corridor. With such improvements, the impact would be significantly adverse. Impacts to the protected demesne at Castleshane are likely, but depending on the detailed alignment could be remedied with time as planting associated with the scheme matures. An increase in traffic on the road, particularly when consisting of a high level of HGVs would have a detrimental visual impact on the properties along the existing highway and users of the route.

The corridor would follow the route of the existing N2 from the junction with the N12 northwards to a point south of the junction to Knockronaghan. Localised improvements to the route would resolve a number of highways issues along this stretch of the existing N2 but disruption to the margins of the route, including a number of properties, could be significant; for example, to the mature avenue of beech trees to the east of the existing alignment between Mullabrack Scott and Legacurry. South of Knockronaghan junction the corridor would veer markedly to the east, away from the existing alignment, to bypass Gortmoney and join the Red Corridor. The corridor would cut through distinct drumlin landforms, that would cause medium term disruption to the visual landscape, but would put the corridor in to cutting. The strong avenue planting to the north of the Gortmoney to Corracrin road would be cut by the corridor.

Physical Effects - Moderate to significant adverse.

Visual Effects - moderate to significant adverse.

Node Point 08 - 12

Immediately before crossing the N2, the corridor clips the eastern edges of the Anketell Grove Demesne, which is of regional importance. The corridor now crosses the existing N2 to form a close westerly bypass of Emyvale. The corridor would impact upon Grove Lough at Derrynashallog and run closely to the rear of the properties aligned along the existing minor road to Tonynumery.

Physical Effects - Moderate to significant adverse.

Visual Effects - moderate adverse.

Node Point 12 - 15

The corridor would cut through the corner of the woodland to the west of Buck Lough before returning to the existing N2 route to the north of the town. In so doing it would clip the southeastern corner of Dungillick House demesne, before curving northwards to reconnect with the existing alignment north of Emyvale. The corridor would then remain on the existing alignment to Moy Bridge. The nature of the new alignment would seriously disrupt both landscape and property along the existing road corridor.

Physical Effects - Significant adverse.

Visual Effects - Moderate to significant adverse.

The preferences from a landscape and visual perspective are shown in Table 7.13.

Option	Corridor	Ranking	Preference
1	Yellow	10	Least Preferred
2	Green	9	Least Preferred
3	Yellow - Green No.1	6	Intermediate
4	Yellow - Green No.2	4	Intermediate
5	Yellow - Red	1	Preferred
6	Green - Yellow	7	Intermediate
7	Green - Yellow - Green	5	Intermediate
8	Green - Red	2	Preferred
9	Green - Red2	3	Preferred
-	Black	8	Least Preferred

Table 7.13 Landscape and Visual Preference Ratings

The preferred corridor based on landscape and visual criteria is the ***Yellow - Red*** corridor which avoids the Castleshane demesne and its environs, and the more sensitive landscapes between Emyvale and Glaslough and up into the Blackwater Valley. Whilst on the face of it, the ***Black*** corridor could be seen to offer the least damaging in terms of the landscape, the requirements of meeting current highways standards, resulting in parallel road construction would be unacceptably damaging to properties and the well-established landscapes along the existing route.

7.6.6 Archaeology and Cultural Heritage

The Archaeology and Cultural Heritage assessment for the corridors was carried out by identifying all known and recorded archaeological sites, cultural heritage sites and Areas of Archaeological Potential (AAP) within and close to the corridor in accordance with the NRA document entitled *Guidelines for Assessment of Archaeological Heritage Impacts of National Road Schemes*.

All known and recorded archaeological sites, cultural heritage sites and Areas of Archaeological Potential (AAP) were identified within and close to each corridor. All sites within 250m of the centreline of the corridor were assessed. In order to assess impacts, distances were taken as follows: Where the extent of a site is known, the distance is given from the edge of the site to the edge of an assumed corridor. Where the extent of a site is not known, the distance is taken from the centre of the site to the edge of the corridor. Table 7.14 below summarises the numbers of sites impacted by each corridor based on the analyses contained in Tables A3 to A12 in Appendix A.

Impacts of corridor alignments on the receiving archaeological and cultural heritage environment are based on NRA Guidelines 2005 as follows:

- **Profound**: Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. These effects arise where an archaeological site is completely and irreversibly destroyed by a proposed development.
- **Significant/Potentially Significant**: An impact which, by its magnitude, duration or intensity, alters an important aspect of the environment. An impact like this would be where part of a site would be permanently impacted upon, leading to a loss of character, integrity and data about the archaeological feature/site.
- **Moderate**: A moderate direct impact arises where a change to the site is proposed which though noticeable, is not such that the archaeological integrity of the site is compromised and which is reversible. This arises where an archaeological feature can be incorporated into a modern day development without damage and that all procedures used to facilitate this are reversible.
- **Slight**: An impact which causes changes in the character of the environment which are not significant or profound and do not directly impact or affect an archaeological feature or monument.
- **Imperceptible**: An impact capable of measurement but without noticeable consequences.

Option	Corridor	No. of Sites Impacted					
		Profound	Significant	Potentially Significant	Moderate	Slight	Imperceptible
1	Yellow		2	3		2	1
2	Green		1	2		1	
3	Yellow-Green No.1		2	3		3	
4	Yellow-Green No.2	1	3	3		4	
5	Yellow-Red		2	2		2	
6	Green-Yellow		2	2			
7	Green-Yellow-Green	1	2	2		1	
8	Green-Red		1	1		1	
9	Green-Red2		1	1			
-	Black		1	2		3	

Table 7.14 Archaeology Appraisal

Table 7.15 indicates the ranking of the corridors that is based on the number of direct impacts each corridor will have on archaeology, cultural heritage and areas of archaeological potential.

Option	Corridor	Ranking	Preference
1	Yellow	6	Intermediate
2	Green	3	Preferred
3	Yellow - Green No.1	8	Least Preferred
4	Yellow - Green No.2	9	Least Preferred
5	Yellow - Red	7	Intermediate
6	Green - Yellow	5	Intermediate
7	Green - Yellow - Green	10	Least Preferred
8	Green - Red	2	Preferred
9	Green - Red2	1	Preferred
-	Black	4	Intermediate

Table 7.15 Archaeology & Cultural Heritage Preference Ratings

7.6.7 Architectural Heritage

The Architectural Heritage assessment was undertaken in accordance with the NRA's *Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes*, the Department of Environment Heritage and Local Government's (DoEHLG) *Architectural Heritage Protection Guidelines* and the Environmental Protection Agency's (EPA) *Guidelines on the Information to be Contained in Environmental Impact Statements.*

The corridors affect a total of 80 structures or features of architectural heritage merit as listed in Tables A13 to A33 in Appendix A. No National Monuments, National Monuments in Ownership or Guardianship, sites on the Register of Historic Monuments, sites subject to Preservation Orders and Temporary Preservation Orders, or Architectural Conservation Areas are affected by any of the corridors. No structures of international or national significance are impacted upon by the corridors. Of the 80 structures affected by the corridors, the following should be noted:

- 2 are on the Record of Monuments and Places (RMP);
- 9 are on the Record of Protected Structures (RPS);
- 69 sites are unregistered;
- 43 are considered to be Key Constraints;
- 22 are perceived to be of regional importance; and
- 55 are perceived to be of local importance; and

The importance of three structures remains to be confirmed.

The architectural heritage appraisal has taken into account the following factors:

- Total number of impacts on identified sites and features;
- Number of "direct" impacts on these sites Number of direct impacts on higher significance sites
- Number of direct impacts on key constraints

Table 7.16 contains the results of these appraisals.

Corridor		Total Impacts	Ranking	Total Direct impacts	Ranking	Total Direct Impacts on Higher significance sites*	Ranking	Direct Impacts on Key Constraints	Ranking
1	Yellow	22	4th	2	1st	2	5th	2	2nd
2	Green	18	1st	6	10th	2	2nd	5	9th
3	Yellow-Green No. 1	22	5th	5	9th	2	6th	5	10th
4	Yellow-Green No. 2	24	6th	2	2nd	2	7th	2	3rd
5	Yellow-Red	29	9th	3	4th	2	10th	3	8th
6	Green-Yellow	19	2nd	4	6th	2	3rd	3	5th
7	Green-Yellow-Green	21	3rd	4	7th	2	4th	3	6th
8	Green-Red	25	7th	3	3rd	2	8th	2	4th
9	Green-Red2	25	8th	4	8th	2	9th	3	7th
-	Black	54	10th	3	5th	1	1st	1	1st

*** "Higher significance sites" can be deemed as those of international, national and regional importance collectively.**

Table 7.16 Architectural Heritage Appraisal and Preference Ratings

In the corridor appraisal a strong preference emerged for the ***Yellow*** and ***Green-Yellow*** corridors. The ***Yellow*** corridor had a slightly higher number of total impacts but a low rate of impacts on sensitive sites, while the ***Green-Yellow*** corridor had one of the lowest rates of total impacts but a slightly elevated rate of impacts on sensitive sites. Taking all of these factors into account the final ranking is as presented in Table 7.17 below.

Option	Corridor	Ranking	Preference
1	Yellow	1	Preferred
2	Green	6	Intermediate
3	Yellow - Green No.1	8	Least Preferred
4	Yellow - Green No.2	4	Intermediate
5	Yellow - Red	9	Least Preferred
6	Green - Yellow	2	Preferred
7	Green - Yellow - Green	5	Intermediate
8	Green - Red	7	Intermediate
9	Green - Red2	10	Least Preferred
-	Black	3	Preferred

Table 7.17 Architectural Heritage Preference Ratings

It should be noted that the ten corridors assessed are comparatively similar in both quantitative and qualitative terms and that their overall impact on the existing architectural environment is low.

7.6.8 Air Quality and Climate

The NRA's document *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* provides guidance on the assessment procedures. The primary aspects of the assessment relate to existing ambient air quality, proximity of sensitive locations and a review of the overall significance of potential changes in air quality. The objective is to indicate whether there are likely to be significant air quality impacts associated with the corridors being assessed. In the assessment, the number of residential properties within 50m of the centre of each corridor has been identified with predicted traffic flows for the design year (2030) being used in the air quality model. A comparison of the corridor options has been carried out based on a calculation of the Index of Overall Change in Exposure to NO_2 and PM_{10}.

Detailed results of the analysis for each corridor are provided in Tables A34 to A53 in Appendix A. The corridor with the lowest exposure index is the preferred option from an air quality perspective, as it leads to the smallest increase in air pollution. A summary of the calculated Index of Overall Change in Exposure for the corridors is provided in Table 7.18.

Option	Corridor	NO_x Exposure Index	Ranking	PM_{10} Exposure Index	Ranking
1	Yellow	-147472	7	-3588	7
2	Green	-207739	1	-4982	1
3	Yellow - Green No.1	-147066	9	-3565	9
4	Yellow - Green No.2	-147454	8	-3585	8
5	Yellow - Red	-184105	5	-4103	5
6	Green - Yellow	-155722	6	-4000	6
7	Green - Yellow - Green	-206881	2	-4952	2
8	Green - Red	-193859	3	-4431	3
9	Green - Red2	-192797	4	-4400	4
-	Black	-129116	10	-2845	10

Table 7.18 Air Quality and Climate Appraisal

The results show that all corridors would have a positive impact on ambient air quality.

The EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the "Habitats Directive") requires an Appropriate Assessment to be carried out where the likelihood of significant effects on the European site cannot be excluded. The NRA requires the Air Quality Specialist to liaise with an ecologist on schemes where there is a European protected site within 2km of the corridor. However, as the potential impact of a scheme is limited to local level, detailed consideration need only be given to roads where there is a significant change to traffic flows (>5%) and the designated site lies within 200m of the corridor centreline. Where these two requirements are fulfilled, the assessment at the route selection stage involves a calculation of nitrogen oxides (NO_x) concentrations using the DMRB screening method.

The ***Green, Yellow-Green 1, Yellow-Green 2,*** and ***Green-Yellow-Green*** corridors are between 150 and 200 metres from the Lough Emy proposed NHA at the closest point which is in the townland of Derrygassan. The UK DMRB air dispersion model was used to determine the impact of each of the corridors on ambient levels of NO_x at the Lough Emy proposed NHA at the location described above. The results of the assessment are detailed in Table 7.19.

Predicted NO_x concentrations are well below the limit value for the protection of ecosystems for each of the corridors assessed. Thus ambient NO_x concentrations resulting from the each individual corridor will not have a significant impact on the Lough Emy proposed NHA. As the NO_x concentrations predicted were lower than the limit value for the protection of ecosystems, no ecologist was required to review the impact.

Corridor	Townland/Ecosystem	NO_x ($\mu g/m^3$) Note 1
Green	Derrygassan, Lough Emy pNHA	17.3
Yellow-Green 1	Derrygassan, Lough Emy pNHA	17.2
Yellow-Green 2	Derrygassan, Lough Emy pNHA	17.2
Green-Yellow-Green	Derrygassan, Lough Emy pNHA	17.3
Limit Value		30 Note 2

Note 1: Including a conservative background NO_x concentration for 2030 of 17.1 $\mu g/m^3$.
Note 2: EU Council Directive 2008/50/EC (as an annual average).

Table 7.19 Impact Assessment of Corridors on Sensitive Ecosystems – Predicted NO_x Concentrations in 2030 at the Lough Emy pNHA.

The results show that all corridors would have a positive impact on ambient air quality with the Green Corridor being the preferred corridor from an air quality perspective. The overall preference order with respect to air quality and climate is shown in Table 7.20 below.

Option	Corridor	Ranking	Preference
1	Yellow	7	Intermediate
2	Green	1	Preferred
3	Yellow - Green No.1	9	Least Preferred
4	Yellow - Green No.2	8	Least Preferred
5	Yellow - Red	5	Intermediate
6	Green – Yellow	6	Intermediate
7	Green - Yellow - Green	2	Preferred
8	Green - Red	3	Preferred
9	Green - Red2	4	Intermediate
-	Black	10	Least Preferred

Table 7.20 Air Quality and Climate Preference Ratings

7.6.9 Noise and Vibration

The NRA's document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* provides guidance on the assessment procedure. The assessment of potential impact is based primarily upon property counts, likely changes in traffic flows and a review of potential for mitigation.

The following has been conducted to assess the impact rating of each of the corridors:

- Property counts have been conducted within four bands either side of the centreline of each corridor, i.e. 0 to 50m, 50 to 100m, 100 to 200m and 200 to 300m.
- Indicative L_{den}[6] calculations have been performed for the four distance bands using the traffic flow information provided for the corridors.

The number of properties potentially sensitive to noise and/or vibration within four bands either side of the centreline of each corridor, i.e. 0 to 50m, 50 to 100m, 100 to 200m and 200 to 300m. Sensitive properties include residential units, schools and retirement homes although at this stage of the assessment no further distinction has been made between these different types of property. This information has been used to establish a Potential Impact Rating (PIR) for each corridor. The corridor with the lowest PIR is the one with the least assessed nominal impact and is assigned the highest preference in relation to noise and vibration.

Table 7.21 shows the Potential Impact Rating for the ten corridors, and the subsequent rankings. Given that the ***Black*** corridor comprises an upgrade mainly within the existing road corridor the majority of properties identified in the property count process are currently affected by existing levels of traffic noise. This has been allowed for in establishing the ranking of the corridors.

[6] L_{den} – the day-evening-night composite noise indicator adopted by the EU for the purposes of assessing overall annoyance.

Corridor		Potential Impact Rating	Ranking
1	Yellow	460	4
2	Green	442	1
3	Yellow-Green No. 1	458	3
4	Yellow-Green No. 2	480	5
5	Yellow-Red	616	9
6	Green-Yellow	455	2
7	Green-Yellow-Green	485	6
8	Green-Red	596	7
9	Green-Red2	600	8
-	Black	1,466	10

Table 7.21 Noise and Vibration Appraisal

Using forecast traffic figures for the design year of 2030 indicative L_{den} noise levels have been predicted at the receptors identified as part of the PIR assessment have been prepared. The predictions presented are worst case and have been assessed for a situation where the new route is at grade in order to consider a typical worst case scenario. Table 7.22 presents the number of locations along each corridor where mitigation measures in relation to noise may need to be considered as part of the detailed design process.

Corridor	No. of Properties above 60dB Lden	Ranking
Yellow	69	2
Green	102	6
Yellow – Green No. 1	59	1
Yellow – Green No. 2	82	3
Yellow – Red	111	8
Green – Yellow	86	4
Green – Yellow - Green	108	7
Green – Red	139	9
Green – Red 2	142	10
Black[7]	504	5

Table 7.22 L_{den} Ranking

The ten corridors were ranked based on an average of the PIR and L_{den} level rankings. Table 7.23 presents a combined ranking and preference rating for the various corridors.

Option	Corridor	Ranking	Preference
1	Yellow	3	Preferred
2	Green	4	Intermediate
3	Yellow - Green No.1	1	Preferred
4	Yellow - Green No.2	5	Intermediate
5	Yellow – Red	9	Least Preferred
6	Green - Yellow	2	Preferred
7	Green - Yellow - Green	7	Intermediate
8	Green - Red	8	Least Preferred
9	Green - Red2	10	Least Preferred
-	Black	6	Intermediate

Table 7.23 Noise and Vibration Preference Ratings

[7] The vast majority of the locations identified here are located along the existing route network (i.e. Black corridor). This has been taken into consideration in assigning rankings in this instance.

7.6.10 Socio–Economics

The socio-economic impact assessment has been undertaken in line with relevant guidelines, namely the *NRA Project Management Guidelines* (NRA 2010), *Guidelines on the Information to be contained in Environmental Impact Statements* (EPA, 2002), *Advice Notes on Current Practice (in the preparation of an EIS)* (EPA, 2003) and *Environmental Impact Assessment of National Road Schemes - A Practical Guide* (NRA, 2006). These guidelines provide advice on impact types, including cumulative impacts, which are especially important where a socio-economic assessment is concerned.

Although it has not been adopted officially in Ireland, reference is also made to the guidance on socio-economic impact types and quantification provided in the Part 8, Section 3 of the UK Highways Agency's publication *Design Manual for Roads and Bridges Volume 11 (UK DMRB 1993, updated 2009)*.

A socio-economic study requires that an understanding of the community is built up through background research, site visits, and discussions with local people and community representatives. Specifically, in the case of this study, data was collected by means of:

- Primary data sources (e.g. demographic data from the Census 2006 and Census 2002 produced by the Central Statistics Office);
- Maps of the surrounding area, including Ordnance Survey 1:50,000 map No. 28;
- Aerial photographs of the study area;
- A review of secondary sources such as the Monaghan County Development Plan 2007-2013, tourism literature and government websites (for example that of the Department of Education);
- Local consultation;
- Observation of local settlement and travel patterns and identification of community facilities.

The desk and field research was undertaken in May 2009 and October 2010.

An assessment was undertaken of the potential constraints and impacts along the various corridors. Prospective impacts can be negative, neutral or positive. Their significance depends, among other considerations, on the nature of the environment affected, the likely duration of an impact and the probability of its occurrence. It often follows that impacts of a socio-economic nature are a function of:

- the scale of the impact itself;
- the numbers of people likely to be affected; and
- the impact on vulnerable or sensitive groups.

This socio-economic assessment generally addresses impacts at a community level rather than for individuals or identifiable properties.

Socio-economic impacts can be broadly categorised as belonging to the following four headings:

- Journey characteristics: an assessment of the impact of the proposed road development on journey time and travel patterns.
- Community severance: an assessment of the impact of the proposed road development with regard to the physical, social or psychological separation of communities from community facilities, particularly schools, recreational facilities or community services with emphasis given to those used by older people or other vulnerable groups.
- Amenity: An assessment of the impact on journey amenity (i.e. relative pleasantness of a journey) and on other aspects affecting general amenity or human well-being.
- Economic impacts: an evaluation of the proposed road development in the context of economic prospects and employment needs and in relation to residential development and projections in the local area.

At this stage, there is no preferred corridor, detailed road design or information on local traffic volumes or road closures or diversions. It is therefore impossible to quantify impact on local journey times or severance. Rather, potential issues have been identified. The NRA Project Management Guidelines (2010) propose that an impact assessment of corridors be carried out with regard to:

- Economic impact.
- Integration: Transport, land use, geographical integration.
- Accessibility and social inclusion, including community accessibility, the impact on vulnerable groups, and the impact on deprived areas.

These headings have been adopted for each of the corridors. In some cases, potential impacts apply at a general level or to a corridor as a whole. This is particularly so for potential economic impacts and impacts relevant to integration. Most of the assessment

of potential impacts between nodes relates to accessibility, particularly where potential severance needs to be considered. Potential impacts on journey and general amenity are also addressed under this heading. As a detailed design is not yet available it is difficult to discuss vulnerable groups except in general terms (i.e. school location and children) as these groups are most likely to be affected by physical severance which cannot as yet be determined. As the scheme is located in a rural area there are no particular issues with respect to deprived areas.

Settlement and Demographics

Aside from Monaghan town, the study area is a largely rural landscape dominated by dairy and other livestock production and punctuated by numerous extensive sheds housing poultry production. There are many small loughs, some smaller semi-natural woodlands (particularly around Glaslough) and three large forested demesnes. Each of these has a varying amenity value, for example, for walking, nature interest, angling or shooting. The existing N2 primary road passes through the study area to the Northern Ireland border just south of Aughnacloy. The road passes east of Monaghan via the Monaghan Town Bypass which was completed in 2006. Other significant roads include the N54 which heads west to Clones from Monaghan town and the N12 which heads east to Middletown and Armagh.

Most settlement is scattered in the form of single rural houses and short stretches of linear development along secondary and minor roads. There is, however, more concentrated settlement at Clontibret, Emyvale, Glaslough and Aughnacloy, while smaller centres include Corcaghan, Ardaghy, Castleshane, Killyneill, Carrickroe, Knockconan and Tydavnet. Monaghan is the main centre with a population of just under 6,221 in 2006, representing an 8.8% increase on the level recorded in the previous Census of 2002. The town is designated as a hub in the National Spatial Strategy. It is the administrative and retail centre for the county and an employment centre focused on engineering and construction.

Community facilities such as churches and primary schools are located throughout the study area. Numerous businesses are located across the study area including poultry farms, mushroom farms, light engineering, building supplies and home improvement companies. County Monaghan is not a major tourist destination, although it has much of historical interest, including the demesne and village of Castle Leslie at Glaslough. The

drumlin landscape itself is appealing and contains cycle ways, the Monaghan Way and a section of the Ulster Canal which has been evaluated for possible future restoration. Coarse fishing occurs on many of the loughs and there are equestrian and paintballing centres.

The county's population has increased by 6.5%. The population of most Electoral Divisions has increased since 2002 with the largest increase of over 21% having occurred on the outskirts of Monaghan. Much of the new residential development of the last ten years has been in the form of one-off rural houses, a good proportion of which have been built along roads to Ballybay and Glaslough and in the vicinity of the Dublin road. Many other areas, particularly to the south and northwest, retain a firmly rural character.

Socio-economic Issues in Relation to Corridors

The character of the study area presents a number of challenges to road development. Firstly, there is quite a high density of minor roads which would require either the construction of under or over passes with the significant expense this involves, or the severance or diversion of roads. Many of these roads are only lightly used, but the scattering of population or community facilities would mean that any severance would inevitably involve some inconvenience at least for a few people, for instance in terms of separation from neighbours or longer journey times. The hilly topography will introduce its own influence on corridors, but so too will the location of community facilities and linear residential development. Most community facilities are, however, point locations that will not be directly affected by a future road as long as there is no significant severance or unless a road were so close as to cause significant noise impacts. The main exceptions in terms of aerial extent are amenities such as the forested demesnes at Rossmore and Glaslough, and Emy Lough.

There are also linear features such as the Monaghan Way, cycle routes, the Ulster Canal and the Blackwater River. The first of these approaches Monaghan town from the eastern border of the study area and is mostly on-road, both minor roads and a section of the N2, but for a short stretch through Castleshane Demesne. The Ulster Canal follows the N12 Armagh Road and is disused at present by either water traffic or for walking, although there are tentative proposals for its restoration. The Ulster Canal Cycle Trail, though, is well-signposted with off-shoots linking up with the Kingfisher Trail

through Co. Cavan to Lough Neagh, Dungannon and Armagh in Northern Ireland. In the study area, the trail links Glaslough and Monaghan before heading out southwest past the Rossmore Forest Park. The Sliabh Beagh No. 1 Cycle Trail passes through Tydavnet and snakes through the countryside east and north of Glaslough and Emyvale, though signposting is patchy and no maps are readily available. The Glassan and Braggan scenic drives in the northwest of the study no longer appear to be promoted or publicised.

Descriptions of the socio-economic issues are provided below for each of the link nodes. The pull out figure in Appendix A shows the locations of the various node points.

NP01- NP02

Potential socio-economic impacts include potentially significant issues in relation to Clontibret National School which is located to the west of the boundary; and for Clontibret Presbyterian Church, which is located outside the boundary of the corridor to the south. For these facilities, severance issues could arise from junctions, particular as regards pedestrian access.

There is a low risk of severance in relation to St Michael's National School Ardaghy for which some access may occur from the north using a minor road crossed by the corridor.

NP02 – NP03

The Monaghan Way transfers from the N2 to the L-54202 between these node points and crossings (journey amenity) by walkers of a major junction with the existing N2 would need to be considered. The other potential impact along this section is the presence of a B&B at Feebane, although the centreline of the corridor is located just north of this business. The power transmission station is now located 200m to the south of the boundary.

Approaching the N12, the corridor includes a site where Monaghan Mushrooms, CNC Turning and Milling and Monaghan Youth Reach are located together with a single access lane. A B&B (Willow House) is accessible from the N12 just to the east and also falls within the corridor. An upholstery company and garden centre are located on a minor cul-de-sac to the east of the corridor at this location. The site containing

Monaghan Mushrooms, CNC Turning and Milling and Monaghan Youth Reach is located on the western edge of the corridor, west of the centreline.

The corridor crosses an important trout spawning stretch of the Blackwater River where mitigation would be necessary. The Ulster Canal is crossed where it runs alongside the N12. The Ulster Canal Cycle Trail is crossed at Straghan.

NP03 – NP06

Within this section, there is a possible amenity impact in relation to Drumcaw Lough as regards angling. The lough is located within the boundary of the corridor to the east of the centreline. In this section, the Red Corridor passes beside St. Patrick's National School. The Sliabh Beagh cycle route also crosses the N2 at this location.

NP06 – NP08

The corridor here runs beside several residential properties and five businesses situated on local road L-1160. These include a car-dismantlers, a plumbing business, a furniture business, a graphics business and a footware business. None of these businesses is likely to be directly impacted by the corridor and none is highly dependent on passing trade.

NP08 – NP12

The corridor here bypasses Emyvale which contains a variety of community facilities including a church, sports pitch, IT and Learning Centre, a Garda station, a post office, supermarkets and pubs. For these community facilities the impact is potentially positive by virtue of the removal of through traffic. There are, however, potential impacts in relation to loss of passing trade to businesses such as grocery stores or newsagents. Just north of Emyvale, the corridor passes just north of Black Lough which is described in the County Development Plan as a potential amenity asset for the community of Emyvale.

NP12 – NP14

The eastern boundary of the corridor runs to the east of St. Mellan's Park GAA ground which has an entrance to existing road at Lisseagh, but the centreline is located 200m west and therefore avoids any potential severance or amenity impact on St. Mellan's Park GAA at Lisseagh and on the community of Knockconan. Aside from one property

located back from the west side of the existing N2, other properties, including a small residential estate, the church, national school and learning centre are located to the east off the L-5120 local road to Drumcondra. The Sliabh Beagh Trail No. 1 also uses this road from where it heads north along the existing N2 for 500m to join another local road to the west. At Drumcondra the corridor passes beside an interiors business. Approximately one kilometre north of here, the corridor passes beside Astrish Lough which has facilities for angling and where noise and visual impacts would be a potential issue.

NP14 – NP15

There are no socio-economic issues in this section aside from the pub and truck stop at Moy where potential passing trade issues are common to all the corridors.

N02 – N05

At the N12 the Green Corridor passes beside the Tyholland Gaelic Football Club. Physical severance here is a possibility in relation to local minor roads, but no severance is likely along the N12 itself. However, an amenity impact could occur as the centreline of the corridor runs beside the club. The Ulster Canal is also crossed at this location. The western edge of the corridor passes within the view of a guesthouse on the R185 so an impact on this business is possible.

N05 – N09

The Billis National School is located just north of the boundary of the corridor on the L-5352. There is no direct impact, but physical severance would need to be avoided at the junction between the L-5352 and other local roads just to the west.

The Blackwater River is crossed to the west of Faulkland Bridge from where some trout fishing is undertaken. The Ulster Canal Cycle Trail is crossed just before the school. The numerous quiet local roads and varied countryside between these nodes is of prospective amenity value.

N09 – N11

On this section, the Sliabh Beagh Cycle Trail is crossed once where it follows the L-5207 and again on the next local road to the north. It is crossed a third time in the next section. With appropriate mitigation the impact of these crossings on general amenity could be

slight, but there would be an inevitable accumulated amenity impact from three crossings.

N11 – N14

The corridor in this section passes just to the east of Ely Lough, a local amenity that is popular for walks and angling and where noise impacts would be a potential issue. The centreline of the corridor is around 500m to the west of Killabely Lough which is occasionally fished.

An interiors business is located within the corridor boundary at Drumcondra. Just to the east of the corridor, one kilometre to the north, is a small lough (Astrish Lough) that has facilities for angling and where noise and visual impacts would be a potential issue.

N01 – N04

There are potential issues in relation to Clontibret National School which is located to the west of the boundary at its start. Further along the corridor, there are potential impacts on community facilities located along the old Dublin road including St. Colman's Church of Ireland, in Gallagh, Clontibret, together with the Garda station, a public house, a grocery store and a service station. These are followed on the same road by St. Mary's Catholic Church and the community centre at Moy Otra. These facilities are accessible from the north and south via two junctions with the current N2. A local road continues through to follow the current N2 through Moy Etra to the north as far as Belnaday Bridge on the L-54513. Accessibility is not compromised subject to the corridor being on-line with the existing road, and with existing junctions being retained.

At Killyneill, the corridor is located 400m further away from residential housing and the Tyholland Chapel. This reduces the potential community, amenity and heritage impact to one of mainly social severance. The corridor passes a business premises on the N12 and crosses the Ulster Canal.

N04 – N07

No significant impacts should apply to a garden centre and community restored mill at Old Mills which are located to the east of the corridor on the River Blackwater.

N07 – N10

There are no potential socio-economic impacts in this section.

N10 – N14

The Sliabh Beagh Cycle Trail is crossed twice by the corridor. Glaslough Villa is located on a local road that is still crossed by the corridor and physical severance here may need to be avoided. A B&B is also located opposite the southern end of this local road.

The corridor passes through quiet countryside of potential amenity value passing to the west of Mullan heritage village and Astrish Lough near N14 which, as noted above, is a local amenity with angling facilities.

N04 – N05

There are no socio-economic issues so long as no severance applies to Tyholland Parish Church and the small St. Sillian's Church of Ireland chapel to the south of the corridor link at Templetane.

N05 – N07

The boundary of this corridor passes to the west of the R185 and the Fernhill Business Park for which no impact is anticipated.

N05 – N08

The boundary of the link runs just below Billis National School for which severance should be avoided. The remainder of the link passes beside a disused Protestant hall and school near Mullaghpeak.

N10 – N11

There are no potential socio-economic impacts as long as no new physical severance to community facilities in Glaslough is introduced.

NP01 – NP08 (Black Corridor)

The corridor enters a zoned area along the Monaghan Bypass where it traverses land zoned mainly for industrial use.

Potential severance impacts could still apply to Clontibret National School and to St. Coleman's Church of Ireland as with other corridor links. It will be advisable to maintain a link to the R184 to Ballybay and to community facilities in Clontibret and Moy Otra with a connection at either end of the existing parallel road provided by the old N2. Likewise, it would be desirable to maintain a link to the R214 and R213 at Castleshane and to the local roads serving Cormurphy and Dromore. There is the potential to link the R213 and the local roads with a single connection. Similarly, an existing parallel minor road connects, or can be used to connect Listrahoagny, Crosses and Killymarley.

The Monaghan Way uses a section of parallel minor roads including the L-54202, but follows the N2 itself for 500m before the R214 and from east of Killymarley into Monaghan town. Few walkers follow the whole route, preferring rather to keep to scenic sections. Therefore, the on-road section into Monaghan town is not as popular as other sections. The corridor has the capacity to provide an improved separation of walkers from through traffic with significant, if slight, journey amenity benefits in terms of improved safety and environment. A number of private houses close in on the existing approach to the southern junction of Monaghan Bypass connecting with the N2 and old Dublin road into Monaghan town.

There is a possible impact in relation to Drumcaw Lough in relation to angling. The lough is located within the boundary of the corridor. Between here and the existing N2, the link passes St. Patrick's National School. The corridor is in close proximity to the school itself. It would also be necessary to ensure that no significance severance applies to local roads.

From the N2, the corridor runs beside several residential properties and five businesses situated on local road L-1160. These include a car dismantlers, a plumbing business, a furniture business, a graphics business and a footware business. None of these businesses is likely to be directly impacted by the corridor and none are highly dependent on passing trade.

Table 7.24 shows the preferences assigned to the corridors, based on the link node descriptions provided above.

Option	Corridor	Ranking	Preference
1	Yellow	2	Preferred
2	Green	10	Least Preferred
3	Yellow - Green No.1	7	Intermediate
4	Yellow - Green No.2	4	Intermediate
5	Yellow - Red	6	Intermediate
6	Green – Yellow	5	Intermediate
7	Green - Yellow - Green	9	Least Preferred
8	Green - Red	3	Preferred
9	Green - Red2	8	Least Preferred
-	Black	1	Preferred

Table 7.24 Socio-Economic Preference Ratings

In the overall socio-economic assessment the Yellow, Green Red and Black corridors have the highest preference rating.

7.6.11 Agronomy

An assessment of the impacts on agronomy was undertaken in accordance with the EPA's *General Guidelines for Preparing Environmental Impact Assessment (EIA) Reports* and the NRA's (2010) PMG. The assessment seeks to identify the agricultural issues that are likely to be important along each of the corridors options. The primary agricultural issues assessed are; assumed land-take; impacts on dairy and equine farms; and length within existing corridor.

Table 7.25 contains the agronomy appraisal that rates the comparative performance of each corridor. The assumed landtake is based on the route (once developed) being an average of 70 metres wide within the corridor. For the black corridor a reduction has been made as it is presumed that significant sections of existing road would be used for the new route. The assumed landtake, dairy / equine farm landtake and length of route within existing corridor have been used to determine the overall relative performance and ranking for the corridors.

Option	Corridor	Assumed landtake (ha)	Dairy & equine farm landtake (ha)	Length within existing corridor (km)	Ranking	Preference
1	Yellow	172	29	2.4	2	Preferred
2	Green	173	68	0.5	6	Intermediate
3	Yellow - Green No.1	168	38	2.4	5	Intermediate
4	Yellow - Green No.2	161	32	2.4	3	Preferred
5	Yellow - Red	168	34	2.4	4	Intermediate
6	Green - Yellow	187	60	0.5	10	Least Preferred
7	Green - Yellow - Green	175	63	0.5	8	Least Preferred
8	Green - Red	177	85	0.5	9	Least Preferred
9	Green - Red2	174	65	0.5	7	Intermediate
-	Black	129	47	21.8	1	Preferred

Table 7.25 Agronomy Preference Ratings

The assessment confirmed that the ***Black* corridor** has the lowest land-take **impact** and is therefore preferred. While the impact on dairy and equine farms of the ***Black*** corridor is high in terms of the quantity of land-take, the degree of impact should be low because

this land-take would occur along the existing road corridor and therefore general disturbance will be minimised.

7.6.12 Summary of Environmental Preferences and Overall Ratings

The environmental preference ratings described in the previous sections are summarised in Table 7.26 below. The overall environment appraisal preference ratings have been derived by adding up the number of preferences for each corridor across the eleven specialist topic areas.

Corridor	Ecology	Geology	Hydrogeology	Water Quality	Landscape & Visual	Archaeology & Cultural Heritage	Architectural Heritage	Air Quality & Climate	Noise & Vibration	Socio-economics	Agronomy	Total Number of Preferences	Ranking	Overall Preference Rating
Yellow	P			P			P		P	P	P	6	1=	Preferred
Green						P		P				2	8=	Least Preferred
Yellow - Green No.1			P	P					P			3	4=	Intermediate
Yellow - Green No.2			P	P							P	3	4=	Intermediate
Yellow – Red			P		P							2	8=	Least Preferred
Green – Yellow		P					P		P			3	4=	Intermediate
Green - Yellow - Green								P				1	10	Least Preferred
Green - Red	P	P			P	P		P		P		6	1=	Preferred
Green - Red2	P				P	P						3	4=	Intermediate
Black		P					P			P	P	4	3	Preferred

Table 7.26 - Overall Environment Preference Ratings
Key: P – Preferred

7.7 Accessibility

The Department of Transport's Common Appraisal Framework provides guidance on the consideration of accessibility and advises that it is examined in terms of two elements:

- deprived geographical areas; and
- vulnerable groups.

In terms of deprived geographical areas all corridors being considered for the N2 are within a designated CLÁR area. CLÁR (Ceantair Laga Árd-Riachtanais / Programme for Revitalising Rural Areas) is an investment programme designed to tackle the problem of depopulation, decline and lack of services in rural areas. The guidance suggests schemes running through CLÁR areas would be ranked as "moderately positive" by improving accessibility to employment and social services. It is considered all options under consideration would achieve this similar scoring and therefore there is no need to differentiate further between the scenarios with regard to deprived geographical areas.

In relation to vulnerable groups (*e.g.* young people, older people, and people with disability) the proximity of a particular corridor to the main population centres in the study area has been evaluated. This presumes if the corridor is closer to urban areas then it will be better for access to jobs, key facilities and social and recreational opportunities. The three population centres used in this assessment are:

- Monaghan Town (population in 2006 = 6,221)
- Glaslough (population in 2006 = 757)
- Emyvale (population in 2006 = 1,223)

Given that these communities are of different sizes a weighted average proximity value has been calculated that's takes into account the relative populations as well as distance to the three centres. The resulting value provides a means of ranking the options with respect to accessibility.

A summary of the accessibility appraisal is shown in Table 7.27 below.

Option	Corridor	Weighted Average Proximity Value	Ranking	Preference
1	Yellow	4.35	10	Least Preferred
2	Green	3.26	4	Intermediate
3	Yellow - Green No.1	3.95	8	Least Preferred
4	Yellow - Green No.2	4.21	9	Least Preferred
5	Yellow - Red	3.84	7	Intermediate
6	Green - Yellow	3.29	5=	Intermediate
7	Green - Yellow - Green	3.29	5=	Intermediate
8	Green - Red	3.22	3	Preferred
9	Green - Red2	3.16	2	Preferred
-	Black	1.55	1	Preferred

Table 7.27 - Accessibility Appraisal Preference Ratings

7.8 Integration

The Department of Transport defines this criterion as covering '*Transport Integration', 'Land use integration', 'Geographical integration'* and '*Other Government Policy Integration'*.

As these elements deal with high level impacts the impact of individual corridors will be equal or similar in all cases therefore they are defined as 'Similar' for all options within the Project Appraisal assessment.

A summary of the integration appraisal is shown in Table 7.28 below.

Option	Corridor	Preference
1	Yellow	Similar
2	Green	Similar
3	Yellow - Green No.1	Similar
4	Yellow - Green No.2	Similar
5	Yellow - Red	Similar
6	Green - Yellow	Similar
7	Green - Yellow - Green	Similar
8	Green - Red	Similar
9	Green - Red2	Similar
-	Black	Similar

Table 7.28 - Integration Appraisal Preference Ratings

7.9 Project Appraisal Framework Matrix

Having established the methodology of assessing the five criteria and the results achieved the summarising Project Appraisal Matrix has been collated and is shown in Table 7.29 below.

Corridor	Economy	Safety	Environment	Accessibility	Integration
Yellow	Intermediate	Intermediate	Preferred	Least Preferred	Similar
Green	Preferred	Intermediate	Least Preferred	Intermediate	Similar
Yellow - Green No.1	Least Preferred	Least Preferred	Intermediate	Least Preferred	Similar
Yellow - Green No.2	Intermediate	Intermediate	Intermediate	Least Preferred	Similar
Yellow - Red	Preferred	Preferred	Least Preferred	Intermediate	Similar
Green - Yellow	Least Preferred	Least Preferred	Intermediate	Intermediate	Similar
Green - Yellow - Green	Intermediate	Intermediate	Least Preferred	Intermediate	Similar
Green - Red	Preferred	Preferred	Preferred	Preferred	Similar
Green - Red2	Preferred	Preferred	Intermediate	Preferred	Similar
Black	Least Preferred	Least Preferred	Preferred	Preferred	Similar

Table 7.29 - Project Appraisal Framework Matrix

This framework indicates that the Green - Red option is the only corridor that achieves a “preferred” rating in terms of economic, safety, environment and accessibility appraisals. On this basis it is the best performing of the corridors considered. The Black corridor performs poorly in terms of comparative performance, being least preferred in two criteria. This more detailed appraisal confirms the findings of the Stage 1 work and the decision not to choose the Black corridor as a shortlisted option.

7.10 Incremental Analysis of Black Corridor

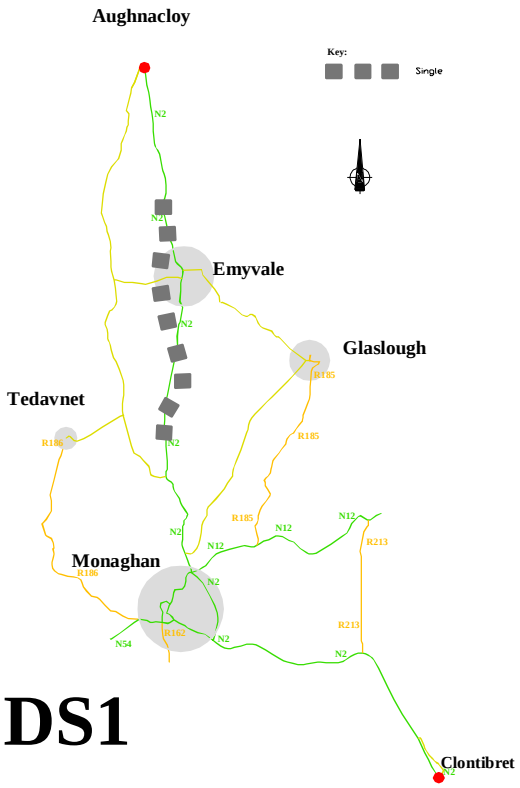
The Common Appraisal Framework (Department of Transport, June 2009, p.6) requires the consideration of incremental options:

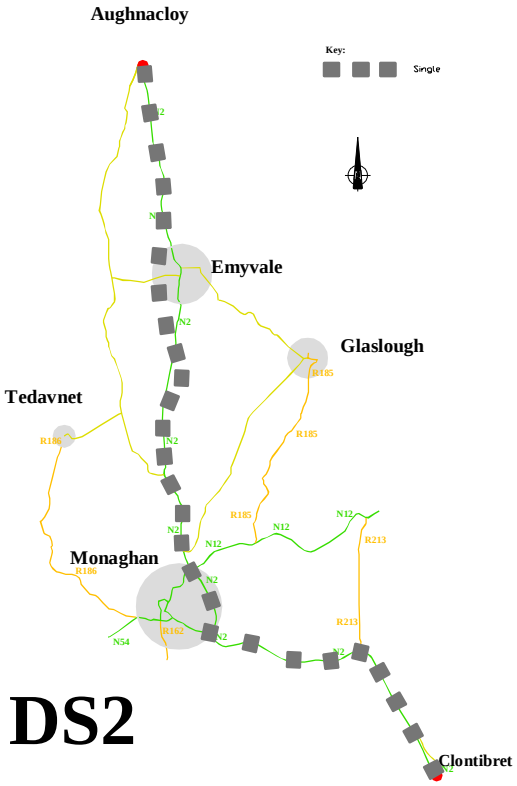
"A valuable approach to option development is to consider a small scale or lower standard investment initially and then to consider incremental increases in scale. Such incremental investments should then be appraised and the higher level investment accepted if the increment yields net benefits. In this manner, an investment approach, which yields a net benefit close to the optimum, may be established".

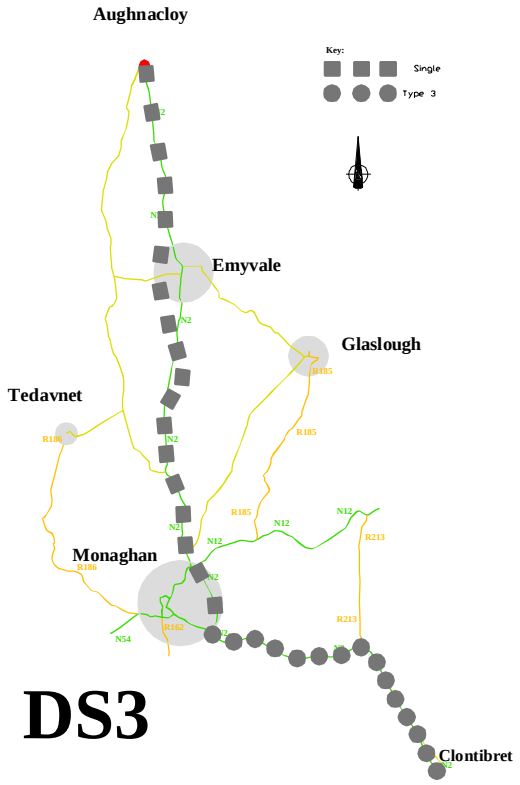
Incremental tests DS1 to DS4 have been identified, based on the Black corridor as shown in Figure 7.20.

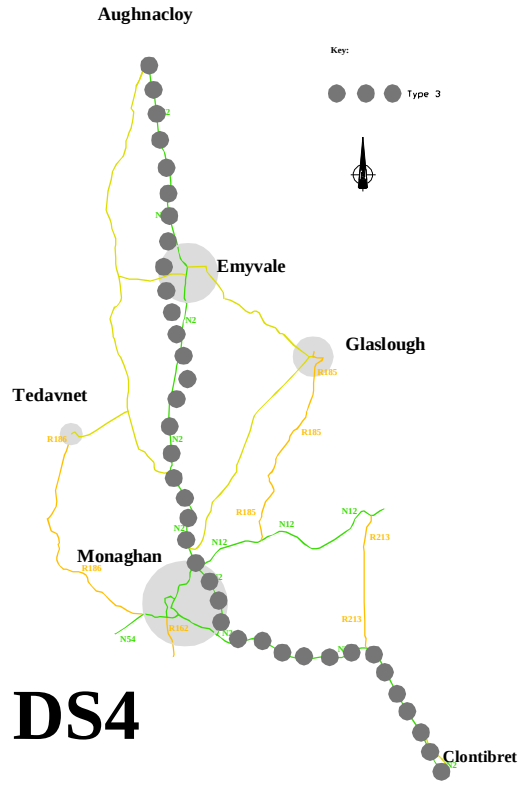
Test DS1 comprises a single carriageway bypass to the east of Corracrin and to the west of Emyvale.
Test DS2 constitutes a single carriageway upgrade of the entire length of the Black corridor including the bypass of Corracrin and Emyvale.
Test DS3 includes a single carriageway upgrade of the Black corridor between the southern roundabout of the Monaghan Bypass and the Border at Moy including the bypass of Corracrin and Emyvale, and a Type 3 single carriageway (2+1) upgrade of the Black corridor between Clontibret and the Monaghan Bypass.
Test DS4 is a further derivative of DS3 comprising a Type 3 single carriageway (2+1) upgrade of the entire length of the Black corridor including the bypass of Corracrin and Emyvale.

The results of their appraisal are described below.









Grontmij

Incremental Testing
Option Plans DS1-4

Figure 7.20

7.10.1 Economy Appraisal

The results of incremental tests for derivatives of the black option are shown in Table 7.30

Test	Corridor	Carriageway	OCE	BCR
DS1	Black (only Emyvale / Corracrin Bypass section)	single	€49m	0.46
DS2	Black	single	€96m	0.78
DS3	Black	South – Type 3 dual North – single	€106m	1.45
DS4	Black	Type 3 dual	€115m	1.64

Table 7.30 Economy Appraisal for Incremental Tests

These results demonstrate that with more investment there is a better economic case. However DS1 and DS2 do not have economic justification, with a BCR less than 1.0. These should therefore not be considered further. For DS3 and DS4 that involve type 3 dual carriageways the economic results show a positive net present value, but the results fall short of three top performing off-line corridor options shown in Table 7.30. It should be noted that these are not directly comparable due to the different carriageway standards assumed. The Stage 3 PABS working paper contains further incremental testing of the preferred corridor in terms of different carriageway cross-sections.

7.10.2 Other Appraisal Topics

Given that scenarios DS3 and DS4 lie within the already evaluated black corridor, the appraisals for environment, accessibility and integration remain valid. In terms of safety it is noted that the benefits rise significantly when a higher standard cross–section is assumed, as shown in Table 7.31. However it would inappropriate to use a framework matrix to compare these scenarios with options in Section 3 of this report since these assume single carriageway provision.

Test	Corridor	Carriageway	PVB Accidents*
DS1	Black (only Emyvale / Corracrin Bypass section)	single	-0.9
DS2	Black	single	0.4
DS3	Black	South – Type 3 dual North – single	12.6
DS4	Black	Type 3 dual	26.6

*values are €m in 2009 prices discounted to 2009

Table 7.31 Safety Appraisal for Incremental Tests

7.10.3 Overall Conclusion on Black Corridor

It can be concluded that in overall appraisal terms the black option, in whatever configuration, does not perform as well as the preferred corridor option. This ratifies the decision that was taken at Stage 1 not to shortlist the Black corridor.

7.11 Conclusion of Stage 2 Project Appraisal

Having completed the Project Appraisal of the corridor options in accordance with the National Roads Authority's 2010 Project Management Guidelines the **Green-Red** Corridor, as shown in Figure 6.3, was taken forward to Stage 3 of Phase 2 Route Selection for further consideration. Of the corridors considered the Green - Red has the highest scoring option, achieving the highest rating available in each of the five criteria: economy, safety, environment, accessibility and integration.

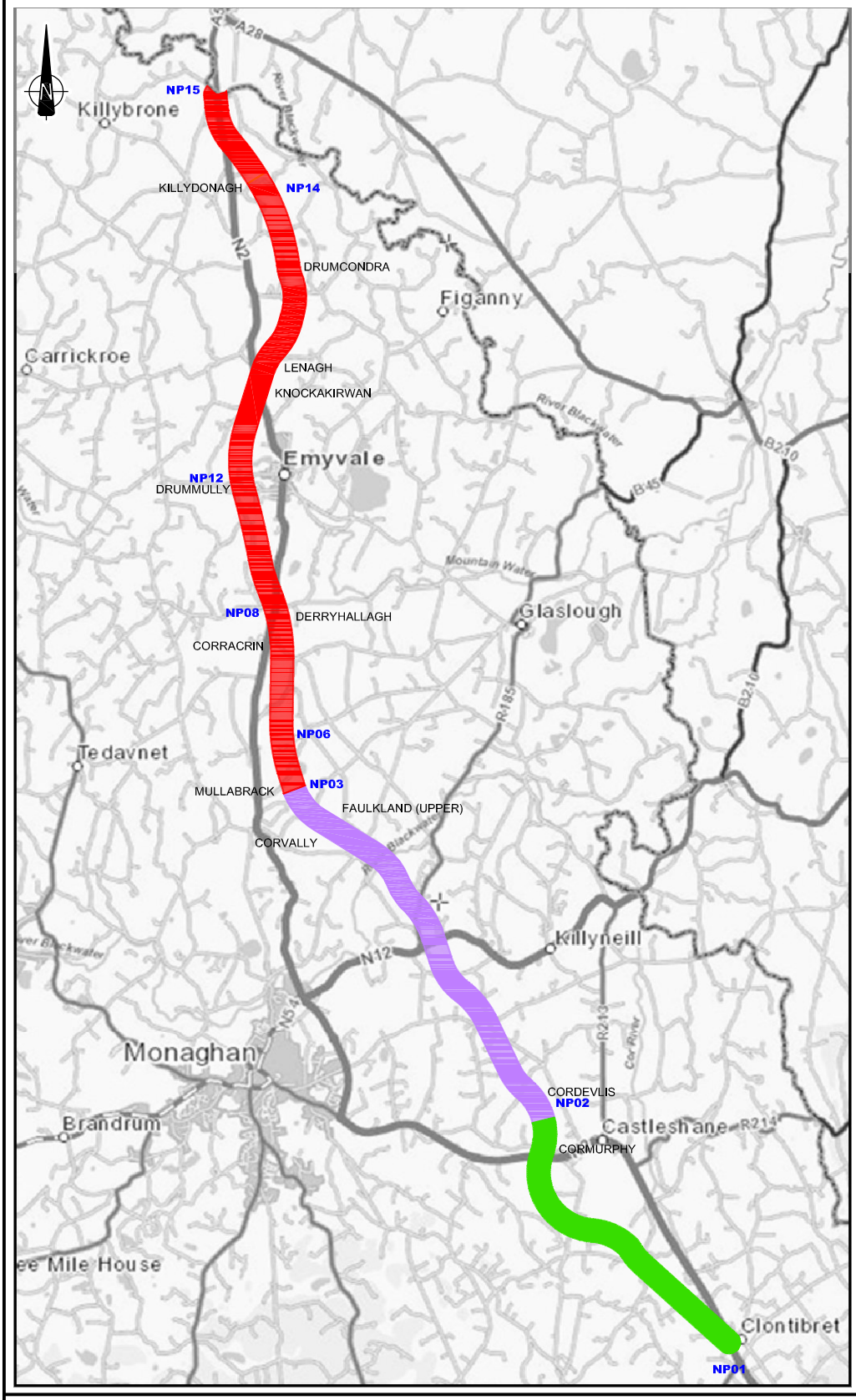
8 Stage 3 - Project Appraisal Balance Sheet (PABS)

8.1 Purpose and Structure of the PABS

The PABS contained herein provides a summary of the appraisals carried out on the Green-Red corridor during the Stage 2 process. The PABS acts as a tool for decision-makers by drawing together the expected impacts of the proposed investment. The PABS is structured to provide short qualitative and quantitative statements on the various elements examined, as shown in Table 8.1. Impacts are also rated by the appraisal team on a seven point scale ranging from "highly positive" to "highly negative".

Criteria	Elements
Environment	• Air, (climate change and general); • Noise and vibration; • Landscape and visual quality; • Biodiversity; • Heritage (Architechtural); • Heritage (Archaeology); • Land Use; • Soils, hydrogeology and geology; and • Water resources.
Safety	• Accidents; and • Security.
Economy	• Efficiency/effectiveness;
Accessibility	• Vulnerable groups; and • Deprived areas.
Integration	• Transport; • Land use; • Geographical, and • Other.

Table 8.1 Criteria and Elements in PABS



Green - Red Corridor
(NP 01-02-03-06-08-12-14-15)

This corridor follows the Green corridor from the commencement point, **Node NP01**, as far as **Node NP02** at Cordevlis. The corridor then runs in a north-westerly direction following the route of the Green Corridor until the crossing of the N12 and Ulster Canal where it continues in a north-westerly direction, crossing the Blackwater River at Faulkland (Upper) to **Node NP03** at Mullabrack. From here it runs in a northerly direction towards **Node NP06** at Drumcaw where it runs along the western edge of Drumcaw Lough and then passes **Node NP08** at Derryhallagh where it crosses the existing N2 directly north of Corracrin. Crossing the Mountain Water River and bypassing Emyvale to the west of the village near **Node NP12** at Drummully the corridor then veers in a north-easterly direction and crosses the existing N2 between the townlands of Lenagh and Knockakirwan. It continues to the townland of Drumcondra whereafter it veers in a north-westerly direction to **Node NP14** in the townland of Killydonagh where it runs along the Yellow corridor to the termination point, **Node NP15**.

Grontmij

Green - Red Corridor

Figure 8.1

8.2 PABS

The completed PABS is shown on the following pages. It has been completed using the template from the 2008 Project Appraisal Guidelines. Some cells are intentionally blank (-) since on occasion there is no relevant information available to inform the process in terms of that particular topic.

Criterion	Element	Qualitative Statement	Quantitative Statement	Scaling Statement
Environment	Air (Climate Change)	Higher vehicle speeds increase emissions.	-	Scheme = Slightly Positive Towns = Slightly Positive Overall = Slightly Positive
	Air (General)	Removal of congested traffic from Monaghan town centre to more efficient speeds on the Preferred Route Corridor will result in improved air quality for urban receptors.	Do-Minimum = 11,716,124 tonnes Do-Something = 11,499,051tonnes Net Benefit =217,073 tonnes PVB (CO_2 Emissions) =€0.337m PVC = €128.765m Ratio (PVB(CO_2 Emissions)/PVC) = 0.00262	
	Noise and Vibration	Some properties will be adversely affected by the Preferred Route Corridor. Larger numbers of properties (currently located on or near the N2) will experience a reduction in impacts.	139 properties predicted to be above threshold where mitigation will be considered. Approx 250 properties are within 50 metres of the existing N2 and are likely to experience a reduction in traffic noise.	Slightly Negative.
	Landscape and Visual Quality	Major designated sites avoided.	-	Slightly Negative.
	Biodiversity	The Preferred Route Corridor does not impact any sites of international or national importance. Affects a small number of sites with county and local importance.	Two sites of county importance, five sites of local importance.	Slightly Negative.
	Heritage (Archaeology)	Two potential significant impacts: Ulster Canal (Royal) and River Blackwater (UD). No National Monuments affected.	-	Moderately Negative.
	Heritage (Architecture)	The Preferred Route Corridor does not impact upon sites of national or international importance.	Ten sites of regional importance (imperceptible) and 15 sites of local importance.	Slightly Negative.
	Land Use	The Preferred Route Corridor impacts on multiple farms.	-	Moderately Negative.

Criterion	Element	Qualitative Statement	Quantitative Statement	Scaling Statement
	Soils, Hydrogeology & Geology	Potential impacts on vulnerable aquifers and risk to karst.	-	Slightly Negative.
	Water Resources	Incorporation of road drainage attenuation and pollution control measures will reduce risk of watercourse flooding or pollution from road traffic.	-	Neutral.
Safety	Accidents	Use of modern design standards will lead to reduction in number and severity of accidents. Scheme will improve driving conditions on the N2 which is currently identified in the EuroRAP report as having "medium-high" risk.	Net Benefit = 84 No. PVB = €3.382m PVC = €128.756m PVB/PVC = 0.026	Moderately Positive
	Security	Scheme segregates strategic and local traffic onto different networks to the security benefit of both types of user. Vulnerable users, such as pedestrians and cyclists, will be able to use the local network which will carry significantly less traffic volumes.	-	Moderately Positive
Economy	Effectiveness / Efficiency	The Preferred Route Corridor segregates longer distance strategic traffic who gain a journey time reduction of around 5 minutes.	Option Comparison Estimate = €139.94mPVC = €129m PVB = €239m NPV = €110m BCR = 1.86	Highly Positive
Accessibility	Vulnerable Groups	No specific problems or measures identified at this stage of scheme development.	-	Slightly Positive
	Deprived Areas	The Preferred Route Corridor runs through a CLAR area and thereby will improve access to both employment and social services.	-	Moderately Positive

Criterion	Element	Qualitative Statement	Quantitative Statement	Scaling Statement
Integration	Transport	The Preferred Route Corridor represents a significant step in improving connections between Dublin, Derry and Donegal in the northwest of Ireland.	-	Slightly Positive
	Land Use	The Preferred Route Corridor is consistent with the Development Plan that states "Monaghan as a hub will help energise the potential presented by increased cross border co-operation, capitalise on its midway position on the Dublin-Derry N2 route, and develop tourism/inland waterways opportunities."	-	Slightly Positive
	Geographical	The Preferred Route Corridor will result in a significantly improved cross-border transport link.	-	Moderately Positive
	Other	The Preferred Route Corridor will result in a significantly safer N2 route with greater journey time predictability, which is consistent with the National Development Plan	-	Moderately Positive

8.3 Stage F Road Safety Audit

A Stage F Road Safety Audit was carried out at Phase 2 Route Selection stage and has followed the methodology described in NRA HD 19/09. The audit was carried out via a desktop study on 21st October 2011 and covered the 9 corridors presented for Stage 2 Appraisal and the black corridor as a reference case. The route selection process was undertaken on the basis of comparing 400m wide feasible corridors. Due to the lack of design detail at this stage of the scheme development, the report comments on potential safety related differences between the options rather than stating specific problems and recommendations. The report is included in Appendix B.

8.4 Conclusion of Stage 3 Project Appraisal Balance Sheet

The process of completing the Project Appraisal Balance Sheet has confirmed the overall benefits associated with providing an N2 improvement within the Green - Red corridor. In terms of the five criteria appraised the N2 Clontibret to Northern Ireland Border Road Scheme scores as follows:

- Environment slightly negative
- Safety moderately positive
- Economy moderately positive
- Accessibility and social inclusion slightly positive
- Integration moderately positive

Future Phase 3 design work will identify the positioning of a route within the Green Red corridor which, together with the determination of both carriageway standard and junction strategy, will allow a footprint for the scheme to be confirmed.

8.5 Recommendations

It is recommended that the Green Red is designated as the Preferred Route Corridor and brought forward to Phase 3 (Design) for further development. At this stage the cross-section and junction arrangements will be further assessed and determined in accordance with the NRA Project Management Guidelines. Liaison with Roads Service Northern Ireland will also be required in determining an appropriate strategy for linking with the A5 Western Transport Corridor scheme at the national border. The Green Red corridor is briefly described below (also see Figure 8.1).

The Green Red corridor initially runs from Clontibret in a north-westerly direction passing to the southwest of Castleshane, before crossing the existing N2 near the townland of Cormurphy and continuing to Cordevlis. The corridor then runs in a north-westerly direction, crossing the N12 and Ulster Canal near the townland of Crowey, to the northeast of Monaghan Town and the Blackwater River at Faulkland (Upper), to Mullabrack. From here it runs in a northerly direction towards Drumcaw where it runs along the western edge of Drumcaw Lough and then passes Derryhallagh where it crosses the existing N2 directly north of Corracrin. Crossing the Mountain Water River and bypassing Emyvale to the west of the village at Drummully the corridor then veers in a north-easterly direction and crosses the existing N2 between the townlands of Lenagh and Knockakirwan. It continues to the townland of Drumcondra where after it veers in a north-westerly direction to the townland of Killydonagh where it runs northwards to the termination point at Moy Bridge, the Northern Ireland border.

Appendix A - Environmental Appraisal Stage 2 Supportive Information

Table A1 –Known and Potential Ecological Sites Impacted by the Proposed Corridors

Site	Site Name (if known)	Confirmed Habitats Present (Based on field survey and desk review)	Mammal interest	Watercourse present	Comment/Observation	Assigned Ecological Rating
34	Castleshane Demesne	Castleshane Demesne (extensive area of mixed woodland - conifers and deciduous areas). WN2/WD2.	Signs of badger recorded. Good potential for otter along river. Mature trees offering bat roosting potential. Signs of squirrel foraging recorded likely to be grey squirrel. Potential for red squirrel and pine martin if present in the area.	Blackwater (Cor tributary)	Native Woodland Survey Site No. 0416.	C
35		Blackwater (Cor tributary) wooded river valley (gorse, wild cherry, oak, hawthorn, blackthorn).	Potential for badger, otter and foraging bats.	Blackwater (Cor tributary)		C
37		Replanted woodland, larch, birch, sycamore and conifers.	Signs of badger recorded.	Blackwater (Cor tributary)		D
51	Ulster Canal 001611	Wet marsh adjacent to the canal - *Iris*.	Potential for foraging/commuting otter and bats.	Ulster Canal		C
58		Mature conifer plantation and mixed broadleaved woodland surrounding residential house adjacent to existing N2. Watercourse flowing through the site.	Potential for badger setts, otter and bats. Large mature broadleaved trees with potential for roosting bats.	Tributary of River Blackwater		C

Site	Site Name (if known)	Confirmed Habitats Present (Based on field survey and desk review)	Mammal interest	Watercourse present	Comment/Observation	Assigned Ecological Rating
64	Griggy Lough	Infilling lough surrounded by reedbed. Small remnant wet woodland immediately adjacent to existing N2 road.	Lot of disturbance along eastern side of road due to road works. Site is very close to existing N2 road. Some potential for foraging otter and bats due to the connection with the mature woodland in Site 58 to the south. Too wet for badger setts.	Tributary of River Blackwater		C+
65		Predominantly mature coniferous woodland along the main channel of the River Blackwater. Small area of broadleaved trees also present.	Potential for badger setts, foraging otter and bats. Coniferous trees with little potential for bat roosts.	Main channel of River Blackwater		C
66		Small stand of mixed broadleaved woodland on steep slope adjacent to River Blackwater	Good potential for badger setts in woodland. Badger tracks recorded. Potential for otter holts at river crossing. Potential for foraging bats.	Main channel of River Blackwater		D
67		Wetland with wet woodland (willow, ash, alder, oak).	Some dry areas with potential for badger setts. Potential for otter and bats along the river.	Un-named tributary of the River Blackwater		C
73	Drumcaw Lough	Hard Water Lakes (3140). Lake with large area of reedbed on north west shore. Wet woodland on shores.	Potential for foraging/commuting otter and bats.	Tributary of Mountain Water		C+

Site	Site Name (if known)	Confirmed Habitats Present (Based on field survey and desk review)	Mammal interest	Watercourse present	Comment/Observation	Assigned Ecological Rating
80	Derryveen Wood	Wet woodland (birch, willow, sycamore, ash). WN7 on peaty soil	No watercourses on site. Potential for foraging bats.	None	Native Woodland Survey Site No. 0407.	C
89		Mixed deciduous/coniferous woodland (Scot's pine, beech) with earth banks.	Potential for badger setts and foraging bats.	None		C
94	Grove Lough	Lowland Oligotrophic lake (3110) with wet woodland. Area of freshwater marsh backing onto open water.	Potential for foraging/commuting otter and bats. Mature trees with bat roosting potential nearby.	Tributary of Mountain Water River		C
96		Conifer plantation (larch, Sitka spruce) on drumlin. Areas of broadleaved woodland in the north and south east of site.	Badger tracks and foraging recorded in woodland and surrounding pasture. Fallow deer tracks recorded in woodland and sightings by landowner.	None		D
99	Buck Lough	Lowland Oligotrophic lake (3110) and wet woodland.	Potential for foraging/commuting otter and bats. Badger setts unlikely due to water logging in wet woodland.	Tributary of Mountain Water River.		C+

Site	Site Name (if known)	Confirmed Habitats Present (Based on field survey and desk review)	Mammal interest	Watercourse present	Comment/Observation	Assigned Ecological Rating
108		Mixed plantation (Scot's pine, ash, Sitka spruce, larch and native species). Semi-natural deciduous woodland. Large area of wet woodland in centre of site with river flowing through. Mature conifer plantation in the southern part of site.	Good potential for badger setts in the oak-ash-hazel woodland and plantation woodland especially in the southern end. No potential for badger setts in wet woodland due to water logging. Good potential for otters and bats foraging along watercourse and wet woodland.	Tributary of River Blackwater		C
121		Mixed broadleaved woodland. Ruined church.	Active badger sett 6/7 entrances (not all in use) recorded and foraging in woodland. Mature trees and old church ruin covered in ivy offer roosting potential for bats.	None		D
135		Woodland with ash, wild cherry, birch, willow and hazel. Some clearance of trees.	Suitable for badger setts. No signs of badger recorded. Rabbit burrows recorded. Signs of squirrel foraging.	None		C

Site	Site Name (if known)	Confirmed Habitats Present (Based on field survey and desk review)	Mammal interest	Watercourse present	Comment/Observation	Assigned Ecological Rating
136		Woodland on drumlin slope (dominated by birch with oak, wild cherry, willow, beech and occasional conifers).	Badger sett recorded in earth bank in woodland. Potentially main sett. Two large entrances and a number of smaller ones. Irish hare recorded in wet grassland within site.	Drainage channel		C

Table A2 - Assessment of proposed corridors on ecological sites in terms of site rating and area of sites impacted.

Corridor	Ecological Site Impacted	Area of Site (Ha)	Area of Ecological Site Impacted (Ha)	Impact
Yellow	51			Neutral
	Boundary of 89	2	0.06	-ve minor
	Boundary of 96	11	1.8	-ve minor
	Boundary of 136	3	0.2	-ve mod
	Mammal preference - High			
Green	35	2	0.7	-ve minor
	51			Neutral
	Boundary of 66	1.8	0.4	-ve minor
	80	14.3	2.1	-ve mod
	108	22	4.4	-ve mod
	Boundary of 136	3	0.2	-ve mod
	Mammal preference - Low			
Yellow - Green No.1	51			Neutral
	67	6	1	-ve mod
	Boundary of 66	1.8	0.4	-ve minor
	80	14.3	2.1	-ve mod
	108	22	4.4	-ve major
	Boundary of 136	3	0.2	-ve mod
	Mammal preference - Low			
Yellow - Green No.2	51			Neutral
	108	22	4.4	-ve major
	Boundary of 136	3	0.2	-ve mod
	Mammal preference - Low/Medium			
Yellow - Red	51			Neutral
	67	6	1	-ve mod
	66	1.8	0.8	-ve minor
	Boundary of 94	1.6	0.2	-ve mod

Corridor	Ecological Site Impacted	Area of Site (Ha)	Area of Ecological Site Impacted (Ha)	Impact
	Boundary of 99	13	1.2	-ve mod
	Boundary of 136	3	1	-ve mod
	Mammal preference - Medium/Low			
Green - Yellow	35	2	0.7	-ve minor
	51			Neutral
	66	1.8	0.8	-ve mod
	Boundary of 89	2	0.06	-ve minor
	Boundary of 96	11	1.8	-ve minor
	Boundary of 136	3	0.2	-ve mod
	Mammal preference - Medium			
Green - Yellow - Green	35	2	0.7	-ve minor
	51			Neutral
	66	1.8	0.8	-ve mod
	108	22	4.4	-ve major
	Boundary of 136	3	0.2	-ve mod
	Mammal preference - Low			
Green - Red	35	2	0.7	-ve minor
	51			Neutral
	65	2.1	0.6	-ve minor
	Boundary of 73	5.3	0.16	-ve mod
	Boundary of 94	1.6	0.02	-ve mod
	Boundary of 99	13	1.2	-ve mod
	Boundary of 136	3	1	-ve mod
	Mammal preference - Medium			
Green - Red2	35	2	0.7	-ve minor
	51			Neutral
	66	1.8	0.4	-ve minor
	Boundary of 94	1.6	0.02	-ve minor
	Boundary of 99	13	1.2	-ve mod
	Boundary of 136	3	1	-ve mod
	Mammal preference - High			
Black	34	96	5.4	-ve mod
	Boundary of 37	18.6	1	-ve minor
	51			Neutral

Corridor	Ecological Site Impacted	Area of Site (Ha)	Area of Ecological Site Impacted (Ha)	Impact
	Boundary of 58	4.5	1	-ve mod
	64	1.7	0.5	-ve major
	Boundary of 94	1.6	0.02	-ve mod
	Boundary of 99	13	1.2	-ve mod
	Boundary of 121	1	0.01	-ve minor
	Boundary of 135	1.6	0.01	-ve minor
	Mammal preference - Low			
	Mammal preference - High			

Archaeological and Cultural Heritage Constraints Within 250m of the Centre Line of Each Corridor

Table A3 Yellow: NP 01-15

CSS	RMP NO	Site Type	Townland	S.P	K.C	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C	Impact Level	Construction Impact	Measures to reduce impacts	Residual Impact Assessment
211	None	Graveyard	Tullybuck	None	Yes	Reg		18m	I	Slight	Potential to impact on subsurface archaeology associated with the souterrain	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
027	MO014-043	Possible souterrain	Moy Otra	RMP	Yes	Local	60m		I	Slight	Potential to impact on subsurface archaeology associated with the souterrain	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
270	None	Cor River	Tirmacmoe		No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
062	MO010-012	Ringfort	Tiravary	RMP	Yes	Local	222m		NPI	None	None	None	None
223	None	Ulster canal	Tuckmilltate	None	Yes	Reg		0m	D	Significant	A section of the canal will be directly impacted	Archaeological Investigation	
101a	MO010-003001	Church	Templetate	RMP	Yes	Reg.		200m	NPI	None	None	None	None
101b	MO010-003002	Graveyard	Templetate	RMP	Yes	Reg.		200m	NPI	None	None	None	None
254	None	Shelvin's lough	Shelvins	None	No	Un		179m	NPI	None	None	None	None

CSS	RMP NO	Site Type	Townland	S.P	K.C	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C	Impact Level	Construction Impact	Measures to reduce impacts	Residual Impact Assessment
271	None	River Blackwater	Cornahoe	None	No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
224	None	Disused railway	Aghaloughan	None	Yes	Reg		0m	D	Significant	A section of the railway will be directly impacted		
129a	MO007-007-001	Church	Donagh	RMP	Yes	Regional		155m	NPI	None	None	None	None
129b	MO007-007-002	Cross	Donagh	RMP	No	Reg		155m	NPI	None	None	None	None
129c	MO007-007-003	Cross	Donagh	RMP	No	Reg		155m	NPI	None	None	None	None
129d	MO007-007-004	Graveyard	Donagh	RMP	Yes	Reg		155m	NPI	None	None	None	None
272	None	Mountain water river	Aghnagap	None	No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
136	MO006-008	Earthwork	Desert	RMP	Yes	Local	120m		NPI	None	None	None	None
157	MO007-001	Ringfort	Tonyshandeny	RMP	Yes	Local	132m		NPI	None	None	None	None
173	MO003-033	Enclosure	Cavan (Cope)	RMP	Yes	Local		90m	I	Imperceptible	None	None	None
269	None	Astrish Lough	Astrish More/Dernahinch/Mullananallog	None	No	Local		160m	NPI	None	None	None	None
178	MO003-027	Crannog	Mullannalog	RMP	Yes	Local	215m		NPI	None	None	None	None
186	MO003-020	Ringfort	Killydonagh	RMP	Yes	Local		150m	NPI	None	None	None	None

Table A4 Green: NP 01-15

CSS	RMP NO	Site Type	Townland	S.P	K.C	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C	Impact Level	C.I.	Measures to reduce impacts	RIA
24	MO014-038	Souterrain	Lisaginny	RMP	Yes	Local	205m		NPI	None	None	None	None
23	MO014-004	Enclosure	Creeve	RMP	Yes	Local	200m		NPI	None	None	None	None
42	MO010-010	Earthwork	Cordevlis	RMP	Yes	Local	210m		NPI	None	None	None	None
61	MO010-009	Ringfort	Cordevlis	RMP	Yes	Local	160m		NPI	None	None	None	None
223	None	Ulster canal	Cavanreagh	None	Yes	Reg		0m	D	Significant	A section of the canal will be directly impacted	Archaeological Investigation	
271	No	Blackwater River	Corvally	None	No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
116	MO009-059	Castle unclassified	Faulkland	RMP	Yes	Reg	160m		NPI	None	None	None	None
121	MO006-016	Earthwork	Billis	RMP	Yes	Local	135m		NPI	None	None	None	None
128	M006-012	Ringfort	Dundonagh	RMP	Yes	Local		30m	I	Slight	Potential to impact on subsurface archaeological features associated with the ringfort	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
272	None	Mountain Water River	Dundonagh	None	No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
267	None	Killycooly Lough	Killycolly	None	No	Un		228m	NPI	None	None	None	None
165	MO003-035	Ringfort	Killakeady	RMP	Yes	Local		175	NPI	None	None	None	None
178	MO003-027	Crannog	Mullananallog	RMP	Yes	Local	223m		NPI	None	None	None	None

CSS	RMP NO	Site Type	Townland	S.P	K.C	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C	Impact Level	C.I.	Measures to reduce impacts	RIA
269	None	Astrish Lough	Astrish More/Dernahinch/Mullananallog	None	No	Un		142m	NPI	None	None	None	None
186	MO003-020	Ringfort	Killydonagh	RMP	Yes	Local		150m	NPI	None	None	None	None

Table A5 Yellow – Green No. 1: NP 01-04, 04-05, 05-15

Node NP 01-04

CSS	RMP NO	Site Type	Townland	S.P	K.C	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C	Impact Level	C.I.	Measures to reduce impacts	RIA
211	None	Graveyard	Tullybuck	None	Yes	Reg		18m	I	Slight	Potential to impact on subsurface archaeology associated with the souterrain	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
027	MO014-043	Possible souterrain	Moy Otra	RMP	Yes	Local	60m		I	Slight	Potential to impact on subsurface archaeology associated with the souterrain	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
270	None	Cor River	Tirmacmoe		No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
062	MO010-012	Ringfort	Tiravary	RMP	Yes	Local	222m		NPI	None	None	None	None

Node NP 04-05

CSS	RMP NO	Site Type	Townland	S.P	K.C	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C	Impact Level	C.I.	Measures to reduce impacts	RIA

CSS	RMP NO	Site Type	Townland	S.P	K.C	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C	Impact Level	C.I.	Measures to reduce impacts	RIA
223	None	Ulster canal	Tuckmilltate	None	Yes	Reg		0m	D	Significant	A section of the canal would be impacted	Archaeological Investigation	
104	MO010-002	Possible earthwork	Drumgoole	Yes	Yes	Local	25m		D	Significant	A section of the earthwork may be impacted by the route	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape

Node NP 05-15

CSS	RMP NO	Site Type	Townland	S.P	K.C	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C	Impact Level	C.I.	Measures to reduce impacts	RIA
271	No	Blackwater River	Corvally	None	No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
116	MO009-059	Castle unclassified	Faulkland	RMP	Yes	Reg	160m		NPI	None	None	None	None
121	MO006-016	Earthwork	Billis	RMP	Yes	Local	135m		NPI	None	None	None	None
128	M006-012	Ringfort	Dundonagh	RMP	Yes	Local		30m	I	Slight	Potential to impact on subsurface archaeology associated with the ringfort	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
272	None	Mountain Water River	Dundonagh	None	No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape

CSS	RMP NO	Site Type	Townland	S.P	K.C	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C	Impact Level	C.I.	Measures to reduce impacts	RIA
267	None	Killycooly Lough	Killycolly	None	No	Un		228m	NPI	None	None	None	None
178	MO003-027	Crannog	Mullananallog	RMP	Yes	Local	223m		NPI	None	None	None	None
269	None	Astrish Lough	Astrish More/Dernahinch/Mullananallog	None	No	Un		142m	NPI	None	None	None	None
165	MO003-035	Ringfort	Killakeady	RMP	Yes	Local		175	NPI	None	None	None	None
186	MO003-020	Ringfort	Killydonagh	RMP	Yes	Local		150m	NPI	None	None	None	None

Table A6 Yellow – Green No. 2: NP 01-10, 10-11, 11-15

Node: NP 01-10

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
211	None	Graveyard	Tullybuck	None	Yes	Reg		18m	I	Slight	Potential to impact on subsurface archaeology associated with the souterrain	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
027	MO014 -043	Possible souterrain	Moy Otra	RMP	Yes	Local	60m		I	Slight	Potential to impact on subsurface archaeology associated with the souterrain	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
270	None	Cor River	Tirmacmoe		No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
062	MO010 -012	Ringfort	Tiravary	RMP	Yes	Local	222m		NPI	None	None	None	None
223	None	Ulster canal	Tuckmilltate	None	Yes	Reg		0m	D	Significant	A section of the canal will be directly impacted	Archaeological Investigation	
101a	MO010 - 003001	Church	Templetate	RMP	Yes	Reg		198m	NPI	None	None	None	None
101b	MO010 -003- 002	Graveyard	Templetate	RMP	Yes	Reg		198m	NPI	None	None	None	None
254	None	Shelvin's Lough	Shelvin	No	No	Un		175m	NPI	None	None	None	None
271	None	Blackwater River	Cornahoe	No	No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
224	None	Disused railway	Aghaloughan	No	No	Un		0n		Significant	A section of the railway will be directly impacted		
129a	MO007 -007- 001	Church	Donagh	RMP	Yes	Reg		155m	NPI	None	None	None	None
129b	MO007 -007- 002	Cross	Donagh	RMP	No	Reg		155m	NPI	None	None	None	None
129c	MO007 -007- 003	Cross	Donagh	RMP	No	Reg		155m	NPI	None	None	None	None

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
129d	MO007 -007- 004	Graveyard	Donagh	RMP	Yes	Reg		155m	NPI	None	None	None	None

Node: NP 10-11

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	V.I.	Measures to reduce impacts	RIA
272	None	Mountain water river	Desert	None	No	un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features		Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
136	MO006 -008	Earthwork	Desert	RMP	Yes	Local		0m	D	Significant				
137	MO006 -034	Possible Ringfort	Desert	RMP	Yes	Local	80m		I	Slight	Potential to impact on subsurface associated archaeological features			

Node: NP 11-15

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	V.I.	Measures to reduce impacts	RIA
267	None	Killycooly Lough	Killycolly	None	No	Un		228m	NPI	None	None		None	None
178	MO003 -027	Crannog	Mullananallog	RMP	Yes	Local	223m		NPI	None	None		None	None
269	None	Astrish Lough	Astrish More/Dernahinch /Mullananallog	None	No	Un		142m	NPI	None	None		None	None
165	MO003 -035	Ringfort	Killakeady	RMP	Yes	Local		175	NPI	None	None		None	None

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	V.I.	Measures to reduce impacts	RIA
186	MO003 -020	Ringfort	Killydonagh	RMP	Yes	Local		150m	NPI	None	None		None	None
136	MO006 -008	Earthwork	Desert	RMP	Yes	Local		0m	D	Profound				
137	MO006 -034	Possible ringfort	Desert	RMP	Yes	Local	80m		I	Slight				

Table A7 Yellow – Red: NP 01-04, 04-08, 08-15

Node: NP 01-04

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
211	None	Graveyard	Tullybuck	None	Yes	Reg		18m	I	Slight	Potential to impact on subsurface archaeology associated with the souterrain	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
027	MO014 -043	Possible souterrain	Moy Otra	RMP	Yes	Local	60m		I	Slight	Potential to impact on subsurface archaeology associated with the souterrain	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
270	None	Cor River	Tirmacmoe		No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
062	MO010 -012	Ringfort	Tiravary	RMP	Yes	Local	222m		NPI	None	None	None	None

Node: NP 04-08

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
223	None	Ulster canal	Tuckmilltate	None	Yes	Reg		0m	D	Significant	A section of the canal will be directly impacted	Archaeological Investigation	
104	MO010 -002	Possible earthwork	Drumgoole	Yes	Yes	Local	25m		D	Significant	A section of the earthwork will be impacted	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
271	None	Blackwater River	Corvally	None	No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
116	MO009 -059	Castle unclassified	Faulkland	RMP	Yes	Reg	160m		NPI	None	None	None	None
121	MO006 -016	Earthwork	Billis	RMP	Yes	Local	160m		NPI	None	None	None	None
125	MO006 -132	Possible enclosure	Drumgaghan	RMP	Yes	Local	100m		NPI	None	None	None	None
217	None	Graveyard	Derryhallagh	None	Yes	Reg		85m	NPI	None	None	None	None

Node: NP 08-15

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
216	None	Graveyard	Carrigans	None	Yes	Reg		185m	NPI	None	None	None	None
262	None	Grove Lough	Derrynashaallog/ Cornacreeve	None	No	Un		28m	NPI	None	None	None	None
142	MO006 -002	Castle unclassified poss	Derrynashallog	RMP	Yes	Reg	210m		NPI	None	None	None	None
265	None	Buck Lough	Scarnageeragh/Corlattallan	None	No	Un		155m	NPI	None	None	None	None
155	MO003 -044	Ringfort	Knockakirwan	RMP	Yes	Local		130m	NPI	None	None	None	None
163	MO003 -038	Enclosure	Lenagh	RMP	Yes	Local		225m	NPI	None	None	None	None
178	MO003 -027	Crannog	Mullananallog	RMP	Yes	Local	223m		NPI	None	None	None	None
269	None	Astrish Lough	Astrish More/Dernahinch /Mullananallog	None	No	Un		142m	NPI	None	None	None	None
186	MO003 -020	Ringfort	Killydonagh	RMP	Yes	Local		150m	NPI	None	None	None	None

Table A8 Green - Yellow: NP 01-05, 05-07, 07-15

Node: NP 01-05

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
24	MO014 -038	Souterrain	Lisaginny	RMP	Yes	Local	205m		NPI	None	None	None	None
23	MO014 -004	Enclosure	Creeve	RMP	Yes	Local	200m		NPI	None	None	None	None
42	MO010 -010	Earthwork	Cordevlis	RMP	Yes	Local	210m		NPI	None	None	None	None
61	MO010 -009	Ringfort	Cordevlis	RMP	Yes	Local	160m		NPI	None	None	None	None
223	None	Ulster canal	Cavanreagh	None	Yes	Reg		0m	D	Significant	A section of the canal would be impacted	Archaeological Investigation	

Node: NP 05-07

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
271	None	Blackwater River	Corvally	None	No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
224	None	Disused railway	Aghaloughan	None	No	Local		0m	D	Significant	A section of the railway will be impacted		

Node: NP 07-15

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
129a	MO007 -007- 001	Church	Donagh	RMP	Yes	Reg		155m	NPI	None	None	None	None

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
129b	MO007-007-002	Cross	Donagh	RMP	No	Reg		155m	NPI	None	None	None	None
129c	MO007-007-003	Cross	Donagh	RMP	No	Reg		155m	NPI	None	None	None	None
129d	MO007-007-004	Graveyard	Donagh	RMP	Yes	Reg		155m	NPI	None	None	None	None
272	None	Mountain water river	Aghnagap	None	No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
136	MO006-008	Earthwork	Desert	RMP	Yes	Local	120m		NPI	None	None	None	None
157	MO007-001	Ringfort	Tonyshandeny	RMP	Yes	Local	132m		NPI	None	None	None	None
173	MO003-033	Enclosure	Cavan (Cope)	RMP	Yes	Local		90m	NPI	None	None	None	None
269	None	Astrish Lough	Astrish More/Dernahinch /Mullananallog	None	No	Local		160m	NPI	None	None	None	None
178	MO003-027	Crannog	Mullannalog	RMP	Yes	Local	215m		NPI	None	None	None	None
186	MO003-020	Ringfort	Killydonagh	RMP	Yes	Local		150m	NPI	None	None	None	None

Table A9 Green – Yellow - Green: NP 01-05, 05-07, 07-10, 10-11, 11-15

Node: NP 01-05

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
24	MO014 -038	Souterrain	Lisaginny	RMP	Yes	Local	205m		NPI	None	None	None	None
23	MO014 -004	Enclosure	Creeve	RMP	Yes	Local	200m		NPI	None	None	None	None
42	MO010 -010	Earthwork	Cordevlis	RMP	Yes	Local	210m		NPI	None	None	None	None
61	MO010 -009	Ringfort	Cordevlis	RMP	Yes	Local	160m		NPI	None	None	None	None
223	None	Ulster canal	Cavanreagh	None	Yes	Reg		0m	D	Significant	A section of the canal would be impacted	Archaeological Investigation	

Node: NP 05-07

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
271	None	Blackwater river	Corvally	None	No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
224	None	Disused Railway	Aghaloughan	None	No	Reg		0m	D	Significant	A section of the railway will be impacted		

Node: NP 07-10

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
129a	MO007 -007- 001	Church	Donagh	RMP	Yes	Reg		155m	NPI	None	None	None	None

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
129b	MO007-007-002	Cross	Donagh	RMP	No	Reg		155m	NPI	None	None	None	None
129c	MO007-007-003	Cross	Donagh	RMP	No	Reg		155m	NPI	None	None	None	None
129d	MO007-007-004	Graveyard	Donagh	RMP	Yes	Reg		155m	NPI	None	None	None	None

Node: NP 10-11

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
272	None	Mountain water river	Desert	None	No	un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
136	MO006-008	Earthwork	Desert	RMP	Yes	Local		0m	D	Profound			
137	MO006-034	Possible Ringfort	Desert	RMP	Yes	Local	80m		I	Slight			

Node: NP 11-15

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
267	None	Killycooly Lough	Killycolly	None	No	Un		228m	NPI	None	None	None	None
165	MO003-035	Ringfort	Killakeady	RMP	Yes	Local		175	NPI	None	None	None	None
178	MO003-027	Crannog	Mullananallog	RMP	Yes	Local	223m		NPI	None	None	None	None
269	None	Astrish Lough	Astrish More/Dernahinch /Mullananallog	None	No	Un		142m	NPI	None	None	None	None
186	MO003-020	Ringfort	Killydonagh	RMP	Yes	Local		150m	NPI	None	None	None	None

Table A10 Green – Red : NP 01-02, 02-03, 03-15

Node: NP 01-02

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
24	MO014 -038	Souterrain	Lisaginny	RMP	Yes	Local	205m		NPI	None	None	None	None
23	MO014 -004	Enclosure	Creeve	RMP	Yes	Local	200m		NPI	None	None	None	None
42	MO010 -010	Earthwork	Cordevlis	RMP	Yes	Local	210m		NPI	None	None	None	None

Node: NP 02-03

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
61	MO010 -009	Ringfort	Cordevlis	RMP	Yes	Local	160m		NPI	None	None	None	None
223	None	Ulster canal	Cavanreagh	None	Yes	Reg		0m	D	Significant	A section of the canal will be impacted	Archaeological investigation	
108	MO009 -013	Earthwork	Crumlin	RMP	Yes	Local		205m	NPI	None	None	None	None
110	MO009 -012	Earthwork	Crumlin	RMP	Yes	Local	95m		I	Slight			
271	None	Blackwater river	Crumlin	None	NO	Un		0m	D	Potentially significant	Potential to impact on previously unknown archaeological features	Archaeological investigation	

Node: NP 03-15

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
118	MO006 -024	Enclosure	Drumcaw	RMP	Yes	Local		190m	NPI	None	None	None	None
256	None	Drumcaw Lough	Drumcaw/Tonygarvey/Skinnagin	None	No	Un		57m	NPI	None	None	None	None
120	MO006 -028	Crannog	Drumcaw	RMP	Yes	Local	150m		NPI	None	None	None	None
123	MO006 -015	Possible battlefield	Belderg	RMP	Yes	Reg	230m		NPI	None	None	None	None
217	None	Graveyard	Derryhallagh	None	Yes	Reg		55m	NPI	None	None	None	None
216	None	Graveyard	Carrigans	None	Yes	Reg		185m	NPI	None	None	None	None
262	None	Grove Lough	Derrynashaallog/ Cornacreeve	None	No	Un		28m	NPI	None	None	None	None
142	MO006 -002	Castle unclassified poss	Derrynashallog	RMP	Yes	Reg	210m		NPI	None	None	None	None
265	None	Buck Lough	Scarnageeragh/Corlattallan	None	No	Un		155m	NPI	None	None	None	None
155	MO003 -044	Ringfort	Knockakirwan	RMP	Yes	Local		130m	NPI	None	None	None	None
163	MO003 -038	Enclosure	Lenagh	RMP	Yes	Local		225m	NPI	None	None	None	None
178	MO003 -027	Crannog	Mullananallog	RMP	Yes	Local	223m		NPI	None	None	None	None
269	None	Astrish Lough	Astrish More/Dernahinch /Mullananallog	None	No	Un		142m	NPI	None	None	None	None
186	MO003 -020	Ringfort	Killydonagh	RMP	Yes	Local		150m	NPI	None	None	None	None

Table A11 Green – Red 2: NP 01-05, 05-08, 08-15

Node: NP 01-05

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
24	MO014 -038	Souterrain	Lisaginny	RMP	Yes	Local	205m		NPI	None	None	None	None
23	MO014 -004	Enclosure	Creeve	RMP	Yes	Local	200m		NPI	None	None	None	None
42	MO010 -010	Earthwork	Cordevlis	RMP	Yes	Local	210m		NPI	None	None	None	None
61	MO010 -009	Ringfort	Cordevlis	RMP	Yes	Local	160m		NPI	None	None	None	None
223	None	Ulster canal	Cavanreagh	None	Yes	Reg		0m	D	Significant	A section of the canal would be impacted	Archaeological Investigation	

Node: NP 05-08

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
271	None	Blackwater river	Corvally	None	No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
116	MO009 -059	Castle unclassified	Faulkland	RMP	Yes	Reg	160m		NPI	None	None	None	None
121	MO006 -016	Earthwork	Billis	RMP	Yes	Local		125m	NPI	None	None	None	None
125	MO006 -032	Possible enclosure	Drumgaghan	RMP	Yes	Local	100m		NPI	None	None	None	None
217	None	Graveyard	Derryhallagh	None	Yes	Reg		84m	NPI	None	None	None	None

Node: NP 08-15

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
216	None	Graveyard	Carrigans	None	Yes	Reg		185m	NPI	None	None	None	None
262	None	Grove Lough	Derrynashaallog/ Cornacreeve	None	No	Un		28m	NPI	None	None	None	None
142	MO006 -002	Castle unclassified poss	Derrynashallog	RMP	Yes	Reg	210m		NPI	None	None	None	None
265	None	Buck Lough	Scarnageeragh/C orlattallan	None	No	Un		155m	NPI	None	None	None	None
155	MO003 -044	Ringfort	Knockakirwan	RMP	Yes	Local		130m	NPI	None	None	None	None
163	MO003 -038	Enclosure	Lenagh	RMP	Yes	Local		225m	NPI	None	None	None	None
178	MO003 -027	Crannog	Mullananallog	RMP	Yes	Local	223m		NPI	None	None	None	None
269	None	Astrish Lough	Astrish More/Dernahinch /Mullananallog	None	No	Un		142m	NPI	None	None	None	None
186	MO003 -020	Ringfort	Killydonagh	RMP	Yes	Local		150m	NPI	None	None	None	None

Table A12 Black: NP 01-16, 16-12, 12-15

Node: NP 01-16

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
211	None	Graveyard	Tullybuck	None	Yes	Reg		18m (ER)	I	Slight	Potential to impact on subsurface archaeology associated with the souterrain	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
027	MO014 -043	Possible souterrain	Moy Otra	RMP	Yes	Local	60m (ER)		I	Slight	Potential to impact on subsurface archaeology associated with the souterrain	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
270	None	Cor River	Tirmacmoe		No	Un		0m (ER)	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
045	MO010 -013	Ringfort	Castleshane Demesne	RMP	Yes	Local		95m (ER)	NPI	None	None	None	None
052	MO010 -011	Enclosure	Lismenan	RMP	Yes	Local		207m (ER)	NPI	None	None	None	None
051	MO009 -055	Earthwork	Bellanagall	RMP	Yes	Local	240m (ER)		NPI	None	None	None	None
068	MO009 -076	Fulacht fiadh (site excavated as part of Monaghan Bypass)	Annahagh	RMP	Yes	Local		0m (ER)		None	None (site is excavated)	None	None
074	MO009 -075	Fulacht fiadh	Annahagh	RMP	Yes	Local	120m (ER)		NPI	None	None	None	None
080	MO009 -074	Possible fulacht fiadh (site excavated as part of Monaghan Bypass)	Tullyhirm	RMP	Yes	Local		0m (ER)			None (site is excavated)	None	None
223	None	Ulster Canal	Tullyhirm	None	Yes	Reg		0m (ER)	D	Significant	A section of the canal would be impacted	Archaeological Investigation	
224	None	Disused railway	Tullyhirm	None	No	Local		65m	NPI	None	None	None	None

Node: NP 16-12

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
271	None	River Blackwater	Derrynagrew	None	No	Un		0m	D	Potentially Significant	Potential to impact on previously unknown archaeological features	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
252	None	Griggy Lough	Griggy/Coolkill East/Tirnaneill	None	No	Un		38m	NPI	None	None	None	None
114	MO000 09-008		Mullabrack (Scott)	RMP	Yes	Local		185m	I	Slight	Potential to impact on previously unknown archaeological features associated with the ringfort	Archaeological Investigation	If archaeology is found and excavated, site will be removed from the landscape
217	None	Graveyard	Derryhallagh	None	Yes	Reg		55m	NPI	None	None	None	None
216	None	Graveyard	Carrigans	None	Yes	Reg		185m	NPI	None	None	None	None
262	None	Grove Lough	Derrynashaallog/ Cornacreeve	None	No	Un		28m	NPI	None	None	None	None
142	MO006 -002	Castle unclassified poss	Derrynashallog	RMP	Yes	Reg	210m		NPI	None	None	None	None

Node: NP 12-15

CSS	RMP	Site Type	Townland	S.P.	K.C.	P.I.	Dist. from centre of the site	Dist. from edge of the site	I.C.	Impact Level	C.I.	Measures to reduce impacts	RIA
265	None	Buck Lough	Scarnageeragh/C orlattallan	None	No	Un		155m	NPI	None	None	None	None
155	MO003 -044	Ringfort	Knockakirwan	RMP	Yes	Local		130m	NPI	None	None	None	None
163	MO003 -038	Enclosure	Lenagh	RMP	Yes	Local		118m (ER)	NPI	None	None	None	None
221	None	Graveyard	Tavanagh	None	Yes	Reg		130m (ER)	NPI	None	None	None	None

TABLE A13 Structures Affected by Corridor Link NP1-NP2

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0041	House	Kilcrow House	Kilcrow	None	No	Local	162 m	Imperceptible negative	Imperceptible negative
AHC 0042	Settlement	Clontibret (2)	Kilcrow	None	Yes	Local	30 m	Imperceptible negative	Imperceptible negative

TABLE A14 Structures Affected by Corridor Link NP1-NP4

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0041	House	Kilcrow House	Kilcrow	None	No	Local	154 m	Imperceptible negative	Imperceptible negative
AHC 0042	Settlement	Clontibret (2)	Kilcrow/ Glennyhorn	None	Yes	Local	0 m	Imperceptible negative	Imperceptible negative
AHC 0051	Church, Presbyterian	Methodist Meeting House	Carrickaderry	None	Yes	Undetermined	173 m	Imperceptible negative	Imperceptible negative
AHC 0052	House	Carrickaderry House	Carrickaderry	None	No	Undetermined	130 m	Imperceptible negative	Imperceptible negative
AHC 0055	House	Glennyhorn House	Glennyhorn	None	No	Local	126 m	Imperceptible negative	Imperceptible negative
AHC 0057	Settlement	Clontibret (1)	Tullybuck/ Moyotra	None	Yes	Local	0 m	Imperceptible negative	Imperceptible negative
AHC 0058	Church, RC	St Mary's Church	Tullybuck	RPS	Yes	Regional	91 m	Imperceptible negative	Slight negative
AHC 0059	School	Moys School	Tullybuck	RPS	Yes	Regional	47 m	Imperceptible negative	Slight negative
AHC 0165	Country House	Castleshane House	Castleshane Demesne	None	No	Local	651 m	Imperceptible negative	Imperceptible negative
AHC 0166	Demesne	Castleshane House Demesne	Castleshane Demesne	None	Yes	Regional	93 m	Imperceptible negative	Imperceptible negative
AHC 0187	Bridge	Kinard Bridge	Kinard/ Tiravray	None	No	Local	91 m	Imperceptible negative	Imperceptible negative
AHC 0263	Settlement	Tyholland	Killyneill	None	Yes	Local	88 m	Imperceptible negative	Imperceptible negative

TABLE A15 Structures Affected by Route Link NP1-NP16

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0041	House	Kilcrow House	Kilcrow	None	No	Local	162 m	Imperceptible negative	Imperceptible negative
AHC 0042	Settlement	Clontibret (2)	Kilcrow	None	Yes	Local	30 m	Imperceptible negative	Imperceptible negative
AHC 0051	Church, Presbyterian	Methodist Meeting House	Carrickaderry	None	Yes	Undetermined	173 m	Imperceptible negative	Imperceptible negative
AHC 0052	House	Carrickaderry House	Carrickaderry	None	No	Undetermined	130 m	Imperceptible negative	Imperceptible negative
AHC 0055	House	Glennyhorn House	Glennyhorn	None	No	Local	126 m	Imperceptible negative	Imperceptible negative
AHC 0057	Settlement	Clontibret (1)	Tullybuck/ Moyotra	None	Yes	Local	0 m	Imperceptible negative	Imperceptible negative
AHC 0058	Church, RC	St Mary's Church	Tullybuck	RPS	Yes	Regional	91 m	Imperceptible negative	Imperceptible negative
AHC 0059	School	Moys School	Tullybuck	RPS	Yes	Regional	47 m	Slight negative	Imperceptible negative
AHC 0092	Canal	Ulster Canal	Tullyhirm	None	Yes	Regional	0 m	Imperceptible negative	Imperceptible negative
AHC 0104	Railway	Portadown & Cavan Branch of the Great Northern Railway	Coolshannagh/ Tullyhirm	None	Yes	Regional	0 m	Imperceptible negative	Imperceptible negative
AHC 0142	Country House	Corlatt House	Corlat	None	No	Local	228 m	Imperceptible negative	Imperceptible negative
AHC 0143	Demesne	Corlatt House Demesne	Corlat	None	No	Local	0 m	Slight negative	Imperceptible negative
AHC 0144	Hall	Bellanagall Orange Hall	Ballymacforban	None	No	Local	51 m	Slight negative	Imperceptible negative
AHC 0145	Mill	Corn Mill	Aghintamy	None	No	Local	192 m	Imperceptible negative	Imperceptible negative
AHC 0151	House	Listraheagny House	Listraheagny	None	No	Local	70 m	Imperceptible negative	Imperceptible negative
AHC 0152	House	Corrawillin House	Corrawillin	None	No	Local	190 m	Imperceptible negative	Imperceptible negative
AHC 0165	Country House	Castleshane House	Castleshane Demesne	None	No	Local	386 m	Imperceptible negative	Imperceptible negative

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0166	Demesne	Castleshane House Demesne	Castleshane Demesne	None	Yes	Regional	0 m	Slight negative	Imperceptible negative
AHC 0167	Estate Building	Stables	Castleshane Demesne	None	No	Undetermined	164 m	Imperceptible negative	Imperceptible negative
AHC 0169	Estate Building	Lodge	Castleshane Demesne	RPS	Yes	Regional	29 m	Significant negative	Imperceptible negative
AHC 0175	Estate Building	Bell Tower	Castleshane Demesne	RPS	Yes	Local	190 m	Imperceptible negative	Imperceptible negative
AHC 0176	Bridge	Lismenan Bridge	Lismenan/ Castle-shane Demesne	None	No	Local	2 m	Significant negative	Imperceptible negative
AHC 0179	Post Office	Castleshane Post Office	Lattigar	None	No	Local	36 m	Moderate negative	Imperceptible negative
AHC 0180	Dispensary	Dispensary	Lattigar	None	No	Local	44 m	Moderate negative	Imperceptible negative
AHC 0190	House	The Bungalow	Tullyhirm	None	No	Local	150 m	Imperceptible negative	Imperceptible negative
AHC 0238	Railway Feature	Bridge	Tullyhirm/ Mullamurphy	None	Yes	Local	186 m	Imperceptible negative	Imperceptible negative
AHC 0462	Canal Feature	Tullyhirm Bridge	Tullyhirm	None	Yes	Local	86 m	Imperceptible negative	Imperceptible negative

TABLE A16 Structures Affected by Corridor Link NP2-NP3

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0092	Canal	Ulster Canal	Crowey	None	Yes	Regional	0 m	Significant negative	Significant negative
AHC 0104	Railway	Portadown & Cavan Branch of the Great Northern Railway	Straghan/ Drumcarn	None	Yes	Regional	0 m	Significant negative	Significant negative
AHC 0148	House	Culdaloo House	Culdaloo	None	No	Local	120 m	Slight negative	Significant negative
AHC 0243	Railway Feature	Possible Bridge	Straghan/ Drumcarn	None	Yes	Local	72 m	Moderate negative	Significant negative
AHC 0253	Country House	Sallymount House	Golree	None	No	Local	152 m	Imperceptible negative	Significant negative
AHC 0254	Demesne	Sallymount House Demesne	Golree	None	No	Local	0 m	Significant negative	Significant negative
AHC 0268	Canal Feature	14th Lock	Crowey	None	Yes	Regional	84 m	Moderate negative	Significant negative
AHC 0269	Canal Feature	13th Lock	Crowey	None	Yes	Regional	80 m	Moderate negative	Significant negative
AHC 0270	Canal Feature	Crowey Bridge	Crowey	None	Yes	Regional	104 m	Slight negative	Significant negative
AHC 0286	Country House	Faulkland Castle	Faulkland	RMP	Yes	Local	713 m	Imperceptible negative	Significant negative
AHC 0287	Demesne	Faulkland Castle Demesne	Faulkland	None	Yes	Local	0 m	Slight negative	Significant negative

TABLE A17 Structures Affected by Corridor Link NP2-NP5

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0092	Canal	Ulster Canal	Crowey	None	Yes	Regional	0 m	Significant negative	Significant negative
AHC 0148	House	Culdaloo House	Culdaloo	None	No	Local	119 m	Slight negative	Significant negative
AHC 0253	Country House	Sallymount House	Golree	None	No	Local	153 m	Imperceptible negative	Significant negative
AHC 0254	Demesne	Sallymount House Demesne	Golree	None	No	Local	0 m	Significant negative	Significant negative
AHC 0268	Canal Feature	14th Lock	Crowey	None	Yes	Regional	110 m	Slight negative	Significant negative
AHC 0269	Canal Feature	13th Lock	Crowey	None	Yes	Regional	60 m	Moderate negative	Significant negative
AHC 0270	Canal Feature	Crowey Bridge	Crowey	None	Yes	Regional	84 m	Moderate negative	Significant negative

TABLE A18 Structures Affected by Corridor Link NP4-NP5

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0092	Canal	Ulster Canal	Tuckmilltate/ Kildoagh	None	Yes	Regional	0 m	Significant negative	Significant negative
AHC 0263	Settlement	Tyholland	Killyneill	None	Yes	Local	88 m	Imperceptible negative	Slight negative

TABLE A19 Structures Affected by Corridor Link NP4-NP7

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0092	Canal	Ulster Canal	Tuckmilltate/ Kildoagh	None	Yes	Regional	0 m	Significant negative	Significant negative
AHC 0104	Railway	Portadown & Cavan Branch of the Great Northern Railway	Aghaloughan/ Mullaghbane	None	Yes	Regional	0 m	Significant negative	Significant negative
AHC 0263	Settlement	Tyholland	Killyneill	None	Yes	Local	88 m	Imperceptible negative	Slight negative
AHC 0284	School	Leitrim School	Leitrim	None	No	Local	178 m	Imperceptible negative	Imperceptible negative
AHC 0347	Railway Feature	Level Crossing	Aghaloughan	None	Yes	Local	190 m	Imperceptible negative	Imperceptible negative

TABLE A20 Structures Affected by Corridor Link NP5-NP7

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0104	Railway	Portadown & Cavan Branch of the Great Northern Railway	Aghaloughan/ Mullaghbane	None	Yes	Regional	0 m	Significant negative	Significant negative
AHC 0286	Country House	Faulkland Castle	Faulkland	RMP	Yes	Local	319 m	Imperceptible negative	Significant negative
AHC 0287	Demesne	Faulkland Castle Demesne	Faulkland	None	Yes	Local	0 m	Significant negative	Significant negative
AHC 0347	Railway Feature	Level Crossing	Aghaloughan	None	Yes	Local	200 m	Imperceptible negative	Imperceptible negative

TABLE A21 Structures Affected by Corridor Link NP5-NP8

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0104	Railway	Portadown & Cavan Branch of the Great Northern Railway	Faulkland	None	Yes	Regional	0 m	Significant negative	Significant negative
AHC 0286	Country House	Faulkland Castle	Faulkland	RMP	Yes	Local	68 m	Moderate negative	Profound negative
AHC 0287	Demesne	Faulkland Castle Demesne	Faulkland	None	Yes	Local	0 m	Significant negative	Profound negative
AHC 0292	Railway Feature	Level Crossing	Faulkland	None	Yes	Local	92 m	Moderate negative	Moderate negative
AHC 0308	Hall	Mullaghpeak Protestant Hall	Mullaghpeak	None	No	Local	156 m	Imperceptible negative	Imperceptible negative
AHC 0309	Church, RC	St Patrick's Church	Derryhallagh	None	Yes	Regional	205 m	Imperceptible negative	Imperceptible negative
AHC 0312	Country House	Anketell Grove	Gortmoney	RPS	Yes	Regional	408 m	Imperceptible negative	Imperceptible negative
AHC 0313	Demesne	Anketell Grove Demesne	Gortmoney	None	Yes	Regional	0 m	Slight negative	Slight negative

TABLE A22 Structures Affected by Corridor Link NP5-NP9

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0104	Railway	Portadown & Cavan Branch of the Great Northern Railway	Faulkland	None	Yes	Regional	0 m	Significant negative	Significant negative
AHC 0286	Country House	Faulkland Castle	Faulkland	RMP	Yes	Local	68 m	Moderate negative	Profound negative
AHC 0287	Demesne	Faulkland Castle Demesne	Faulkland	None	Yes	Local	0 m	Significant negative	Profound negative
AHC 0292	Railway Feature	Level Crossing	Faulkland	None	Yes	Local	92 m	Moderate negative	Moderate negative
AHC 0328	Glebe House	Glebe House	Dundonagh	None	Yes	Local	15 m	Significant negative	Profound negative

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0329	Demesne	Glebe Land	Dundonagh	None	Yes	Local	0 m	Significant negative	Significant negative

TABLE A23 Structures Affected by Corridor Link NP6-NP8

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0307	House	Drumcaw House	Drumcaw	None	No	Local	170 m	Imperceptible negative	Significant negative
AHC 0309	Church, RC	St Patrick's Church	Derryhallagh	None	Yes	Regional	165 m	Imperceptible negative	Imperceptible negative
AHC 0312	Country House	Anketell Grove	Gortmoney	RPS	Yes	Regional	414 m	Imperceptible negative	Imperceptible negative
AHC 0313	Demesne	Anketell Grove Demesne	Gortmoney	None	Yes	Regional	0 m	Slight negative	Slight negative

TABLE A24 Structures Affected by Corridor Link NP7-NP10

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0343	Church, Unspecified	Church (in ruins)	Donagh	RMP	Yes	Local	191 m	Imperceptible negative	Significant negative
AHC 0344	House	Mullaghbane House	Mullaghbane	None	No	Local	134 m	Slight negative	Significant negative

TABLE A25 Structures Affected by Corridor Link NP8-NP12

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0311	Smithy	Smithy	Carrigans	None	No	Local	80 m	Moderate negative	Significant negative

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0312	Country House	Anketell Grove	Gortmoney	RPS	Yes	Regional	165 m	Imperceptible negative	Imperceptible negative
AHC 0313	Demesne	Anketell Grove Demesne	Gortmoney	None	Yes	Regional	0 m	Slight negative	Slight negative
AHC 0322	Mill	Corn & Flax Mills (Disused)	Drummully	None	No	Local	85 m	Moderate negative	Significant negative
AHC 0413	Settlement	Emyvale	Kiltubbrid/ Emyvale/ Drummully	None	Yes	Local	96 m	Imperceptible negative	Imperceptible negative

TABLE A26 Structures Affected by Corridor Link NP9-NP11

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0328	Glebe House	Glebe House	Dundonagh	None	Yes	Local	N/A	Imperceptible negative	Significant negative
AHC 0329	Demesne	Glebe Land	Dundonagh	None	Yes	Local	138 m	Imperceptible negative	Significant negative

TABLE A27 Structures Affected by Corridor Link NP10-NP11

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0330	Country House	Fort Johnston	Stramore	None	No	Local	341 m	Imperceptible negative	Moderate negative
AHC 0331	Demesne	Fort Johnston Demesne	Stramore	None	Yes	Regional	126 m	Slight negative	Significant negative
AHC 0334	Mill	Flax Mill	Aghnacap	None	No	Local	188 m	Imperceptible negative	Imperceptible negative

TABLE A28 Structures Affected by Corridor Link NP10-NP14

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0334	Mill	Flax Mill	Aghnacap	None	No	Local	90 m	Moderate negative	Significant negative
AHC 0419	Mill	Corn Mill	Cavan (Cope)	None	Yes	Regional	151 m	Slight negative	Slight negative
AHC 0423	School	Killyrane School	Killyrean Upper	None	No	Local	220 m	Imperceptible negative	Imperceptible negative

TABLE A29 Structures Affected by Corridor Link NP11-NP14

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0404	Settlement	Knockconan	Killeanly	None	Yes	Local	126 m	Imperceptible negative	Imperceptible negative
AHC 0421	Demesne	Lough Emy House Demesne	Killycooly	None	No	Local	90 m	Moderate negative	Significant negative

TABLE A30 Structures Affected by Corridor Link NP12-NP14

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0404	Settlement	Knockconan	Killeanly	None	Yes	Local	60 m	Imperceptible negative	Imperceptible negative
AHC 0411	Country House	Dungillick House	Dungillick	None	Yes	Regional	387 m	Imperceptible negative	Significant negative
AHC 0412	Demesne	Dungillick House Demesne	Dungillick	None	Yes	Regional	0 m	Moderate negative	Significant negative
AHC 0413	Settlement	Emyvale	Kiltubbrid/ Emyvale/ Drummully	None	Yes	Local	110 m	Imperceptible negative	Imperceptible negative
AHC 0480	Estate Building	Lodge	Dungillick	None	No	Local	192 m	Slight negative	Slight negative

TABLE A31 Structures Affected by Corridor Link NP12-NP15

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0397	Country House	Fort Singleton	Aghaliskeevan	RPS	Yes	Regional	654 m	Imperceptible negative	Imperceptible negative
AHC 0398	Demesne	Fort Singleton Demesne	Curkin/ Lisgrew	None	Yes	Regional	40 m	Imperceptible negative	Imperceptible negative
AHC 0401	House	Bloomfield	Mullabryan	None	No	Local	38 m	Moderate negative	Imperceptible negative
AHC 0402	House	St Joseph's	Mullabryan	None	No	Local	40 m	Moderate negative	Imperceptible negative
AHC 0403	Rectory	Shanco Rectory	Mullabryan	None	Yes	Regional	104 m	Slight negative	Imperceptible negative
AHC 0404	Settlement	Knockconan	Knockconan/ Mullabryan	None	Yes	Local	0 m	Imperceptible negative	Imperceptible negative
AHC 0406	Church, RC	St Mary's Church	Knockconan	RPS	Yes	Local	167 m	Imperceptible negative	Imperceptible negative
AHC 0407	Bridge	Blaney's Bridge	Shanco	None	No	Local	173 m	Imperceptible negative	Imperceptible negative
AHC 0408	House	Shanco House	Shanco	None	No	Local	185 m	Imperceptible negative	Imperceptible negative
AHC 0409	Church, C of I	Church (in ruins)	Shanco	RPS	Yes	Local	111 m	Imperceptible negative	Imperceptible negative
AHC 0411	Country House	Dungillick House	Dungillick	None	Yes	Regional	388 m	Imperceptible negative	Significant negative
AHC 0412	Demesne	Dungillick House Demesne	Dungillick	None	Yes	Regional	0 m	Moderate negative	Significant negative
AHC 0413	Settlement	Emyvale	Kiltubbrid/ Emyvale/ Drummully	None	Yes	Local	111 m	Imperceptible negative	Imperceptible negative
AHC 0451	House	Grange House	Mullaghnahegny	None	No	Local	118 m	Imperceptible negative	Significant negative
AHC 0480	Estate Building	Lodge	Dungillick	None	No	Local	166 m	Slight negative	Slight negative

TABLE A32 Structures Affected by Corridor Link NP14-NP15

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0451	House	Grange House	Mullaghnahegny	None	No	Local	149 m	Slight negative	Significant negative

TABLE A33 Structures Affected by Corridor Link NP16-NP8

AHC No.	Site Type	Site Name	Townland	Statutory Protection	Key Constraint (Yes/No)	Perceived Architectural Importance	Distance from Centre Line	Significance of Impact	Potential Visual Impact
AHC 0210	Country House	Legacurry House	Legacurry	None	Yes	Regional		Imperceptible negative	Imperceptible negative
AHC 0211	Demesne	Legacurry House Demesne	Legacurry	None	Yes	Regional	0 m	Slight negative	Slight negative
AHC 0212	Church, Presbyterian	Tirnaneill Presbyterian Church	Mullabrack (Scott)	None	Yes	Local		Imperceptible negative	Imperceptible negative
AHC 0225	Manse	Manse	Derrynagrew	None	Yes	Local	167 m	Imperceptible negative	Imperceptible negative
AHC 0228	School	St McCarthan's College	Mullamurphy	RPS	Yes	Regional	170 m	Imperceptible negative	Imperceptible negative
AHC 0229	House	The Wood	Kilnadreen	None	No	Local	70 m	Imperceptible negative	Imperceptible negative
AHC 0309	Church, RC	St Patrick's Church	Derryhallagh	None	Yes	Regional	165 m	Imperceptible negative	Imperceptible negative
AHC 0312	Country House	Anketell Grove	Gortmoney	RPS	Yes	Regional	165 m	Imperceptible negative	Imperceptible negative
AHC 0313	Demesne	Anketell Grove Demesne	Gortmoney	None	Yes	Regional	0 m	Slight negative	Slight negative
AHC 0482	House	Unnamed	Kilnadreen	None	No	Local	23 m	Significant negative	Significant negative

Table A34. Black: Detailed Results for NO_x Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		NO_X Emissions Rate (kg/yr)			Change in NO_X Emission Rate (kg/km/yr)	NO_X Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	13600	7	2.7	2.7	6702	6702	0	0	0
N2 Node D to R213	13600	13600	8	1.9	1.9	4716	4716	0	0	0
N2 R213 to Green Corridor Jctn.	12700	12700	5	1.0	1.0	2194	2194	0	0	0
N2 Green Corridor Jctn. To R162	12700	12700	26	3.9	3.9	8558	8558	0	0	0
N2 R162 to N12 Jctn. (Bypass)	7800	7800	2	2.5	2.5	3938	3749	-190	-76	-152
N2 N12 Jctn. To Griggy Lough	9100	7800	2	1.9	1.9	3708	2740	-969	-510	-1020
N2 Griggy Lough to Node NP8	9100	9700	9	4.8	4.8	9672	3967	-5705	-1189	-10697
N2 Node NP8 to Emyvale	8200	3800	57	2.5	2.5	4539	1745	-2794	-1118	-63714
N2 Emyvale to Blaney's Bridge	5900	1400	65	1.5	1.5	1874	360	-1514	-1009	-65601
N2 Blaney's Bridge to Aughnacloy	5900	6300	30	5.3	5.3	6620	7069	449	85	2540
Black Corridor NP8 to Blaney's Bridge		5000	9		3.9		4128	4128	1059	9527
TOTAL						**52522**	**45927**			**-129116**

Table A35. Black Corridor: Detailed Results for PM_{10} Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		PM_{10} Emissions Rate (kg/yr)			Change in PM_{10} Emission Rate (kg/km/yr)	PM_{10} Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	13600	7	2.7	2.7	170	170	0	0	0
N2 Node D to R213	13600	13600	8	1.9	1.9	119	119	0	0	0
N2 R213 to Green Corridor Jctn.	12700	12700	5	1.0	1.0	57	57	0	0	0
N2 Green Corridor Jctn. To R162	12700	12700	26	3.9	3.9	224	224	0	0	0
N2 R162 to N12 Jctn. (Bypass)	7800	7800	2	2.5	2.5	94	92	-2	-1	-2
N2 N12 Jctn. To Griggy Lough	9100	7800	2	1.9	1.9	83	65	-17	-9	-18
N2 Griggy Lough to Node NP8	9100	9700	9	4.8	4.8	221	165	-56	-12	-105
N2 Node NP8 to Emyvale	8200	3800	57	2.5	2.5	104	39	-65	-26	-1471
N2 Emyvale to Blaney's Bridge	5900	1400	65	1.5	1.5	44	8	-35	-24	-1532
N2 Blaney's Bridge to Aughnacloy	5900	6300	30	5.3	5.3	155	165	10	2	59
Black Corridor NP8 to Blaney's Bridge		5000	9		3.9		96	96	25	223
TOTAL						**1270**	**1202**			**-2845**

Table A36. Green Corridor: Detailed Results for NO_x Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		NO_X Emissions Rate (kg/yr)			Change in NO_X Emission Rate (kg/km/yr)	NO_X Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	3900	7	2.7	2.7	6702	1477	-5224	-1935	-13545
N2 Node D to R213	13600	3900	8	1.9	1.9	4716	1040	-3676	-1935	-15480
N2 R213 to Green Corridor Jctn.	12700	3900	5	1.0	1.0	2194	547	-1647	-1647	-8236
N2 Green Corridor Jctn. To R162	12700	9500	26	3.9	3.9	8558	3592	-4966	-1273	-33108
N2 R162 to N12 Jctn.(Bypass)	7800	3700	2	2.5	2.5	3938	1412	-2526	-1010	-2021
N2 N12 Jctn. To Griggy Lough	9100	3800	2	1.9	1.9	3708	1548	-2160	-1137	-2274
N2 Griggy Lough to Node NP8	9100	3800	9	4.8	4.8	9672	4028	-5644	-1176	-10582
N2 Node NP8 to Emyvale	8200	3800	57	2.5	2.5	4539	2098	-2441	-977	-55662
N2 Emyvale to Blaney's Bridge	5900	1700	65	1.5	1.5	1874	626	-1247	-831	-54046
N2 Blaney's Bridge to Aughnacloy	5900	1700	30	5.3	5.3	6620	2213	-4407	-831	-24944
Green Corridor Clontibret to NP2		9800	3		5.2		10682	10682	2054	6163
Green Corridor NP2 to N12 Jctn.		4200	1		4.4		4254	4254	967	967
Green Corridor N12 Jctn. To NP11		4700	2		8.0		7108	7108	889	1777
Green Corridor NP11 to Aughnacloy		4300	4		7.9		6422	6422	813	3252
TOTAL						**52522**	**47049**			**-207739**

Table A37. Green Corridor: Detailed Results for PM_{10} Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		PM_{10} Emissions Rate (kg/yr)			Change in PM_{10} Emission Rate (kg/km/yr)	PM_{10} Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	3900	7	2.7	2.7	170	39	-130	-48	-338
N2 Node D to R213	13600	3900	8	1.9	1.9	119	28	-92	-48	-386
N2 R213 to Green Corridor Jctn.	12700	3900	5	1.0	1.0	57	15	-43	-43	-214
N2 Green Corridor Jctn. To R162	12700	9500	26	3.9	3.9	224	125	-99	-25	-657
N2 R162 to N12 Jctn.(Bypass)	7800	3700	2	2.5	2.5	94	36	-59	-23	-47
N2 N12 Jctn. To Griggy Lough	9100	3800	2	1.9	1.9	83	31	-52	-27	-55
N2 Griggy Lough to Node NP8	9100	3800	9	4.8	4.8	221	81	-140	-29	-262
N2 Node NP8 to Emyvale	8200	3800	57	2.5	2.5	104	42	-61	-25	-1402
N2 Emyvale to Blaney's Bridge	5900	1700	65	1.5	1.5	44	12	-32	-21	-1383
N2 Blaney's Bridge to Aughnacloy	5900	1700	30	5.3	5.3	155	42	-113	-21	-638
Green Corridor Clontibret to NP2		9800	3		5.2		342	342	66	198
Green Corridor NP2 to N12 Jctn.		4200	1		4.4		128	128	29	29
Green Corridor N12 Jctn. To NP11		4700	2		8.0		246	246	31	61
Green Corridor NP11 to Aughnacloy		4300	4		7.9		222	222	28	112
TOTAL						**1270**	**1388**			**-4982**

Table A38. Green – Yellow Corridor: Detailed Results for NO_x Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		NO_X Emissions Rate (kg/yr)			Change in NO_X Emission Rate (kg/km/yr)	NO_X Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	3900	7	2.7	2.7	6702	1477	-5224	-1935	-13545
N2 Node D to R213	13600	3900	8	1.9	1.9	4716	1040	-3676	-1935	-15480
N2 R213 to Green Corridor Jctn.	12700	3900	5	1.0	1.0	2194	547	-1647	-1647	-8236
N2 Green Corridor Jctn. To R162	12700	9200	26	3.9	3.9	8558	3478	-5080	-1302	-33864
N2 R162 to N12 Jctn.(Bypass)	7800	3900	2	2.5	2.5	3938	1489	-2450	-980	-1960
N2 N12 Jctn. To Griggy Lough	9100	5200	2	1.9	1.9	3708	2119	-1589	-837	-1673
N2 Griggy Lough to Node NP8	9100	5200	9	4.8	4.8	9672	5512	-4160	-867	-7800
N2 Node NP8 to Emyvale	8200	5200	57	2.5	2.5	4539	2871	-1668	-667	-38038
N2 Emyvale to Blaney's Bridge	5900	3100	65	1.5	1.5	1874	1142	-731	-488	-31694
N2 Blaney's Bridge to Aughnacloy	5900	3100	30	5.3	5.3	6620	4036	-2584	-488	-14628
Green-Yellow Corridor Clontibret to NP2		9800	3		5.2		10682	10682	2054	6163
Green-Yellow Corridor NP2 to N12 Jctn.		4200	1		4.4		4254	4254	967	967
Green-Yell Corridor N12 Jctn. To East of Emyvale		3500	2		7.2		4764	4764	662	1323
Green-Yell Corridor East of Emyvale to Aughnacloy		2900	5		9.9		5428	5428	548	2741
TOTAL						**52522**	**48839**			**-155722**

Table A39. Green – Yellow Corridor: Detailed Results for PM_{10} Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		PM_{10} Emissions Rate (kg/yr)			Change in PM_{10} Emission Rate (kg/km/yr)	PM_{10} Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	3900	7	2.7	2.7	170	39	-130	-48	-338
N2 Node D to R213	13600	3900	8	1.9	1.9	119	28	-92	-48	-386
N2 R213 to Green Corridor Jctn.	12700	3900	5	1.0	1.0	57	15	-43	-43	-214
N2 Green Corridor Jctn. To R162	12700	9200	26	3.9	3.9	224	121	-103	-26	-683
N2 R162 to N12 Jctn.(Bypass)	7800	3900	2	2.5	2.5	94	38	-57	-23	-45
N2 N12 Jctn. To Griggy Lough	9100	5200	2	1.9	1.9	83	42	-41	-22	-43
N2 Griggy Lough to Node NP8	9100	5200	9	4.8	4.8	221	111	-110	-23	-206
N2 Node NP8 to Emyvale	8200	5200	57	2.5	2.5	104	58	-46	-18	-1048
N2 Emyvale to Blaney's Bridge	5900	3100	65	1.5	1.5	44	22	-22	-15	-960
N2 Blaney's Bridge to Aughnacloy	5900	3100	30	5.3	5.3	155	76	-78	-15	-443
Green-Yellow Corridor Clontibret to NP2		9800	3		5.2		342	342	66	198
Green-Yellow Corridor NP2 to N12 Jctn.		4200	1		4.4		128	128	29	29
Green-Yell Corridor N12 Jctn. To East of Emyvale		3500	2		7.2		165	165	23	46
Green-Yell Corridor East of Emyvale to Aughnacloy		2900	5		9.9		188	188	19	95
TOTAL						**1270**	**1371**			**-4000**

Table A40. Green – Yellow – Green Corridor: Detailed Results for NO_x Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		NO_X Emissions Rate (kg/yr)			Change in NO_X Emission Rate (kg/km/yr)	NO_X Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	3900	7	2.7	2.7	6702	1477	-5224	-1935	-13545
N2 Node D to R213	13600	3900	8	1.9	1.9	4716	1040	-3676	-1935	-15480
N2 R213 to Green Corridor Jctn.	12700	3900	5	1.0	1.0	2194	547	-1647	-1647	-8236
N2 Green Corridor Jctn. To R162	12700	9500	26	3.9	3.9	8558	3592	-4966	-1273	-33108
N2 R162 to N12 Jctn.(Bypass)	7800	3600	2	2.5	2.5	3938	1374	-2564	-1026	-2051
N2 N12 Jctn. To Griggy Lough	9100	3800	2	1.9	1.9	3708	1548	-2160	-1137	-2274
N2 Griggy Lough to Node NP8	9100	3800	9	4.8	4.8	9672	4028	-5644	-1176	-10582
N2 Node NP8 to Emyvale	8200	3800	57	2.5	2.5	4539	2098	-2441	-977	-55662
N2 Emyvale to Blaney's Bridge	5900	1700	65	1.5	1.5	1874	626	-1247	-831	-54046
N2 Blaney's Bridge to Aughnacloy	5900	1700	30	5.3	5.3	6620	2213	-4407	-831	-24944
Grn-Yell-Grn Corridor Clontibret to NP2		9800	3		5.2		10682	10682	2054	6163
Grn-Yell-Grn Corridor NP2 to N12 Jctn.		4200	1		4.4		4254	4254	967	967
Grn-Yell-Grn Corridor N12 Jctn. To East of Emyvale		4900	2		7.6		7040	7040	926	1853
Grn-Yell-Grn Corridor East of Emyvale to Aughnacloy		4300	5		7.9		6422	6422	813	4065
TOTAL						**52522**	**46943**			**-206881**

Table A41. Green – Yellow – Green Corridor: Detailed Results for PM_{10} Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		PM_{10} Emissions Rate (kg/yr)			Change in PM_{10} Emission Rate (kg/km/yr)	PM_{10} Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	3900	7	2.7	2.7	170	39	-130	-48	-338
N2 Node D to R213	13600	3900	8	1.9	1.9	119	28	-92	-48	-386
N2 R213 to Green Corridor Jctn.	12700	3900	5	1.0	1.0	57	15	-43	-43	-214
N2 Green Corridor Jctn. To R162	12700	9500	26	3.9	3.9	224	125	-99	-25	-657
N2 R162 to N12 Jctn.(Bypass)	7800	3600	2	2.5	2.5	94	35	-60	-24	-48
N2 N12 Jctn. To Griggy Lough	9100	3800	2	1.9	1.9	83	31	-52	-27	-55
N2 Griggy Lough to Node NP8	9100	3800	9	4.8	4.8	221	81	-140	-29	-262
N2 Node NP8 to Emyvale	8200	3800	57	2.5	2.5	104	42	-61	-25	-1402
N2 Emyvale to Blaney's Bridge	5900	1700	65	1.5	1.5	44	12	-32	-21	-1383
N2 Blaney's Bridge to Aughnacloy	5900	1700	30	5.3	5.3	155	42	-113	-21	-638
Grn-Yell-Grn Corridor Clontibret to NP2		9800	3		5.2		342	342	66	198
Grn-Yell-Grn Corridor NP2 to N12 Jctn.		4200	1		4.4		128	128	29	29
Grn-Yell-Grn Corridor N12 Jctn. To East of Emyvale		4900	2		7.6		243	243	32	64
Grn-Yell-Grn Corridor East of Emyvale to Aughnacloy		4300	5		7.9		222	222	28	140
TOTAL						**1270**	**1384**			**-4952**

Table A42. Yellow Corridor: Detailed Results for NO_x Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		NO_X Emissions Rate (kg/yr)			Change in NO_X Emission Rate (kg/km/yr)	NO_X Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	9200	7	2.7	2.7	6702	3639	-3063	-1134	-7940
N2 Node D to R213	13600	9200	8	1.9	1.9	4716	2561	-2155	-1134	-9074
N2 R213 to Green Corridor Jctn.	12700	9400	5	1.0	1.0	2194	1377	-817	-817	-4086
N2 Green Corridor Jctn. To R162	12700	9400	26	3.9	3.9	8558	5144	-3414	-875	-22761
N2 R162 to N12 Jctn.(Bypass)	7800	3800	2	2.5	2.5	3938	1686	-2252	-901	-1802
N2 N12 Jctn. To Griggy Lough	9100	5500	2	1.9	1.9	3708	1779	-1930	-1016	-2031
N2 Griggy Lough to Node NP8	9100	5500	9	4.8	4.8	9672	4686	-4987	-1039	-9350
N2 Node NP8 to Emyvale	8200	5500	57	2.5	2.5	4539	2440	-2099	-840	-47858
N2 Emyvale to Blaney's Bridge	5900	3400	65	1.5	1.5	1874	1063	-810	-540	-35119
N2 Blaney's Bridge to Aughnacloy	5900	3400	30	5.3	5.3	6620	3756	-2864	-540	-16209
Yellow Corridor Clontibret to NP4		4500	5		7.5		6728	6728	897	4485
Yellow Corridor NP4 to East of Emyvale		5300	1		7.6		8857	8857	1165	1165
Yellow Corridor East of Emyvale to Aughnacloy		2700	5		9.9		6153	6153	621	3107
TOTAL						**52522**	**49869**			**-147472**

Table A43. Yellow Corridor: Detailed Results for PM_{10} Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		PM_{10} Emissions Rate (kg/yr)			Change in PM_{10} Emission Rate (kg/km/yr)	PM_{10} Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	9200	7	2.7	2.7	170	94	-75	-28	-195
N2 Node D to R213	13600	9200	8	1.9	1.9	119	66	-53	-28	-223
N2 R213 to Green Corridor Jctn.	12700	9400	5	1.0	1.0	57	36	-22	-22	-108
N2 Green Corridor Jctn. To R162	12700	9400	26	3.9	3.9	224	137	-86	-22	-575
N2 R162 to N12 Jctn.(Bypass)	7800	3800	2	2.5	2.5	94	39	-56	-22	-45
N2 N12 Jctn. To Griggy Lough	9100	5500	2	1.9	1.9	83	40	-43	-23	-45
N2 Griggy Lough to Node NP8	9100	5500	9	4.8	4.8	221	107	-113	-24	-213
N2 Node NP8 to Emyvale	8200	5500	57	2.5	2.5	104	56	-48	-19	-1088
N2 Emyvale to Blaney's Bridge	5900	3400	65	1.5	1.5	44	22	-22	-14	-940
N2 Blaney's Bridge to Aughnacloy	5900	3400	30	5.3	5.3	155	78	-77	-14	-434
Yellow Corridor Clontibret to NP4		4500	5		7.5		224	224	30	149
Yellow Corridor NP4 to East of Emyvale		5300	1		7.6		274	274	36	36
Yellow Corridor East of Emyvale to Aughnacloy		2700	5		9.9		185	185	19	93
TOTAL						**1270**	**1358**			**-3588**

Table A44. Yellow – Green 1 Corridor: Detailed Results for NO_x Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		NO_X Emissions Rate (kg/yr)			Change in NO_X Emission Rate (kg/km/yr)	NO_X Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	9200	7	2.7	2.7	6702	3639	-3063	-1134	-7940
N2 Node D to R213	13600	9200	8	1.9	1.9	4716	2561	-2155	-1134	-9074
N2 R213 to Green Corridor Jctn.	12700	10700	5	1.0	1.0	2194	1568	-627	-627	-3134
N2 Green Corridor Jctn. To R162	12700	10700	26	3.9	3.9	8558	5855	-2703	-693	-18018
N2 R162 to N12 Jctn.(Bypass)	7800	5100	2	2.5	2.5	3938	2263	-1676	-670	-1340
N2 N12 Jctn. To Griggy Lough	9100	5100	2	1.9	1.9	3708	1649	-2059	-1084	-2167
N2 Griggy Lough to Node NP8	9100	5100	9	4.8	4.8	9672	4345	-5327	-1110	-9989
N2 Node NP8 to Emyvale	8200	5100	57	2.5	2.5	4539	2263	-2276	-911	-51904
N2 Emyvale to Blaney's Bridge	5900	3400	65	1.5	1.5	1874	1063	-810	-540	-35119
N2 Blaney's Bridge to Aughnacloy	5900	3400	30	5.3	5.3	6620	3756	-2864	-540	-16209
Yellow-Green 1 Corridor Clontibret to NP4		4500	5		7.5		6728	6728	897	4485
Yellow-Green 1 Corridor NP4 to East of Emyvale		3900	1		8.7		7461	7461	858	858
Yellow-Green 1 Corridor East of Emyvale to Aughnacloy		2700	4		7.9		4910	4910	621	2486
TOTAL						**52522**	**48061**			**-147066**

Table A45. Yellow – Green 1 Corridor: Detailed Results for PM_{10} Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		PM_{10} Emissions Rate (kg/yr)			Change in PM_{10} Emission Rate (kg/km/yr)	PM_{10} Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	9200	7	2.7	2.7	170	94	-75	-28	-195
N2 Node D to R213	13600	9200	8	1.9	1.9	119	66	-53	-28	-223
N2 R213 to Green Corridor Jctn.	12700	10700	5	1.0	1.0	57	41	-17	-17	-83
N2 Green Corridor Jctn. To R162	12700	10700	26	3.9	3.9	224	156	-67	-17	-448
N2 R162 to N12 Jctn.(Bypass)	7800	5100	2	2.5	2.5	94	52	-43	-17	-34
N2 N12 Jctn. To Griggy Lough	9100	5100	2	1.9	1.9	83	37	-46	-24	-49
N2 Griggy Lough to Node NP8	9100	5100	9	4.8	4.8	221	100	-121	-25	-227
N2 Node NP8 to Emyvale	8200	5100	57	2.5	2.5	104	52	-52	-21	-1181
N2 Emyvale to Blaney's Bridge	5900	3400	65	1.5	1.5	44	22	-22	-14	-940
N2 Blaney's Bridge to Aughnacloy	5900	3400	30	5.3	5.3	155	78	-77	-14	-434
Yellow-Green 1 Corridor Clontibret to NP4		4500	5		7.5		224	224	30	149
Yellow-Green 1 Corridor NP4 to East of Emyvale		3900	1		8.7		231	231	27	27
Yellow-Green 1 Corridor East of Emyvale to Aughnacloy		2700	4		7.9		147	147	19	75
TOTAL						**1270**	**1300**			**-3565**

Table A46. Yellow – Green 2 Corridor: Detailed Results for NO_x Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		NO_X Emissions Rate (kg/yr)			Change in NO_X Emission Rate (kg/km/yr)	NO_X Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	9200	7	2.7	2.7	6702	3639	-3063	-1134	-7940
N2 Node D to R213	13600	9200	8	1.9	1.9	4716	2561	-2155	-1134	-9074
N2 R213 to Green Corridor Jctn.	12700	9300	5	1.0	1.0	2194	1363	-832	-832	-4159
N2 Green Corridor Jctn. To R162	12700	9300	26	3.9	3.9	8558	5089	-3469	-889	-23125
N2 R162 to N12 Jctn.(Bypass)	7800	3800	2	2.5	2.5	3938	1686	-2252	-901	-1802
N2 N12 Jctn. To Griggy Lough	9100	5500	2	1.9	1.9	3708	1779	-1930	-1016	-2031
N2 Griggy Lough to Node NP8	9100	5500	9	4.8	4.8	9672	4686	-4987	-1039	-9350
N2 Node NP8 to Emyvale	8200	5500	57	2.5	2.5	4539	2440	-2099	-840	-47858
N2 Emyvale to Blaney's Bridge	5900	3400	65	1.5	1.5	1874	1063	-810	-540	-35119
N2 Blaney's Bridge to Aughnacloy	5900	3400	30	5.3	5.3	6620	3756	-2864	-540	-16209
Yellow-Green 2 Corridor Clontibret to NP4		4500	5		7.5		6728	6728	897	4485
Yellow-Green 2 Corridor NP4 to East of Emyvale		5100	2		7.9		8860	8860	1121	2243
Yellow-Green 2 Corridor East of Emyvale to Aughnacloy		2700	4		7.9		4910	4910	621	2486
TOTAL						**52522**	**48559**			**-147454**

Table A47. Yellow – Green 2 Corridor: Detailed Results for PM_{10} Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		PM_{10} Emissions Rate (kg/yr)			Change in PM_{10} Emission Rate (kg/km/yr)	PM_{10} Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	9200	7	2.7	2.7	170	94	-75	-28	-195
N2 Node D to R213	13600	9200	8	1.9	1.9	119	66	-53	-28	-223
N2 R213 to Green Corridor Jctn.	12700	9300	5	1.0	1.0	57	35	-22	-22	-110
N2 Green Corridor Jctn. To R162	12700	9300	26	3.9	3.9	224	136	-88	-22	-585
N2 R162 to N12 Jctn.(Bypass)	7800	3800	2	2.5	2.5	94	39	-56	-22	-45
N2 N12 Jctn. To Griggy Lough	9100	5500	2	1.9	1.9	83	40	-43	-23	-45
N2 Griggy Lough to Node NP8	9100	5500	9	4.8	4.8	221	107	-113	-24	-213
N2 Node NP8 to Emyvale	8200	5500	57	2.5	2.5	104	56	-48	-19	-1088
N2 Emyvale to Blaney's Bridge	5900	3400	65	1.5	1.5	44	22	-22	-14	-940
N2 Blaney's Bridge to Aughnacloy	5900	3400	30	5.3	5.3	155	78	-77	-14	-434
Yellow-Green 2 Corridor Clontibret to NP4		4500	5		7.5		224	224	30	149
Yellow-Green 2 Corridor NP4 to East of Emyvale		5100	2		7.9		275	275	35	69
Yellow-Green 2 Corridor East of Emyvale to Aughnacloy		2700	4		7.9		147	147	19	75
TOTAL						**1270**	**1319**			**-3585**

Table A48. Yellow – Red Corridor: Detailed Results for NO_x Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		NO_X Emissions Rate (kg/yr)			Change in NO_X Emission Rate (kg/km/yr)	NO_X Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	9200	7	2.7	2.7	6702	3639	-3063	-1134	-7940
N2 Node D to R213	13600	9200	8	1.9	1.9	4716	2561	-2155	-1134	-9074
N2 R213 to Green Corridor Jctn.	12700	9700	5	1.0	1.0	2194	1361	-833	-833	-4167
N2 Green Corridor Jctn. To R162	12700	9700	26	3.9	3.9	8558	5308	-3250	-833	-21666
N2 R162 to N12 Jctn.(Bypass)	7800	3500	2	2.5	2.5	3938	1390	-2548	-1019	-2039
N2 N12 Jctn. To Griggy Lough	9100	5600	2	1.9	1.9	3708	1744	-1965	-1034	-2068
N2 Griggy Lough to Node NP8	9100	5600	9	4.8	4.8	9672	4604	-5068	-1056	-9503
N2 Node NP8 to Emyvale	8200	5600	57	2.5	2.5	4539	2398	-2141	-857	-48823
N2 Emyvale to Blaney's Bridge	5900	1400	65	1.5	1.5	1874	347	-1527	-1018	-66165
N2 Blaney's Bridge to Aughnacloy	5900	1500	30	5.3	5.3	6620	1312	-5307	-1001	-30042
Yellow-Red Corridor Clontibret to NP4		4500	5		7.5		6728	6728	897	4485
Yellow-Red Corridor NP4 to NP8		3100	0		8.2		5851	5851	714	0
Yellow-Red Corridor NP8 to Blaney's Bridge		4800	9		3.9		4501	4501	1154	10388
Yellow-Red Corridor Blaney's Bridge to Aughnacloy		4700	5		5.8		2912	2912	502	2510
TOTAL						**52522**	**44656**			**-184105**

Table A49. Yellow – Red Corridor: Detailed Results for PM_{10} Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		PM_{10} Emissions Rate (kg/yr)			Change in PM_{10} Emission Rate (kg/km/yr)	PM_{10} Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	9200	7	2.7	2.7	170	94	-75	-28	-195
N2 Node D to R213	13600	9200	8	1.9	1.9	119	66	-53	-28	-223
N2 R213 to Green Corridor Jctn.	12700	9700	5	1.0	1.0	57	36	-21	-21	-105
N2 Green Corridor Jctn. To R162	12700	9700	26	3.9	3.9	224	142	-82	-21	-546
N2 R162 to N12 Jctn.(Bypass)	7800	3500	2	2.5	2.5	94	34	-60	-24	-48
N2 N12 Jctn. To Griggy Lough	9100	5600	2	1.9	1.9	83	40	-43	-23	-45
N2 Griggy Lough to Node NP8	9100	5600	9	4.8	4.8	221	108	-113	-24	-212
N2 Node NP8 to Emyvale	8200	5600	57	2.5	2.5	104	56	-47	-19	-1082
N2 Emyvale to Blaney's Bridge	5900	1400	65	1.5	1.5	44	8	-35	-24	-1537
N2 Blaney's Bridge to Aughnacloy	5900	1500	30	5.3	5.3	155	31	-123	-23	-697
Yellow-Red Corridor Clontibret to NP4		4500	5		7.5		224	224	30	149
Yellow-Red Corridor NP4 to NP8		3100	0		8.2		176	176	21	0
Yellow-Red Corridor NP8 to Blaney's Bridge		4800	9		3.9		131	131	34	302
Yellow-Red Corridor Blaney's Bridge to Aughnacloy		4700	5		5.8		158	158	27	136
TOTAL						**1270**	**1304**			**-4103**

Table A50. Green – Red Corridor: Detailed Results for NO_x Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		NO_X Emissions Rate (kg/yr)			Change in NO_X Emission Rate (kg/km/yr)	NO_X Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	3900	7	2.7	2.7	6702	1477	-5224	-1935	-13545
N2 Node D to R213	13600	3900	8	1.9	1.9	4716	1040	-3676	-1935	-15480
N2 R213 to Green Corridor Jctn.	12700	3900	5	1.0	1.0	2194	547	-1647	-1647	-8236
N2 Green Corridor Jctn. To R162	12700	9000	26	3.9	3.9	8558	4707	-3850	-987	-25670
N2 R162 to N12 Jctn.(Bypass)	7800	4100	2	2.5	2.5	3938	1629	-2310	-924	-1848
N2 N12 Jctn. To Griggy Lough	9100	5700	2	1.9	1.9	3708	1843	-1865	-982	-1963
N2 Griggy Lough to Node NP8	9100	5700	9	4.8	4.8	9672	4856	-4816	-1003	-9031
N2 Node NP8 to Emyvale	8200	5700	57	2.5	2.5	4539	2529	-2010	-804	-45834
N2 Emyvale to Blaney's Bridge	5900	1400	65	1.5	1.5	1874	360	-1514	-1009	-65601
N2 Blaney's Bridge to Aughnacloy	5900	1400	30	5.3	5.3	6620	1271	-5349	-1009	-30277
Green-Red Corridor Clontibret to NP2		9800	3		5.2		10682	10682	2054	6163
Green-Red Corridor NP2 to N12 Jctn.		4200	1		4.4		4254	4254	967	967
Green-Red Corridor N12 Jctn. To NP8		3100	0		6.7		4781	4781	714	0
Green-Red Corridor NP8 to Aughnacloy		4900	14		9.7		11429	11429	1178	16495
TOTAL						**52522**	**51405**			**-193859**

Table A51. Green – Red Corridor: Detailed Results for PM_{10} Assessment.

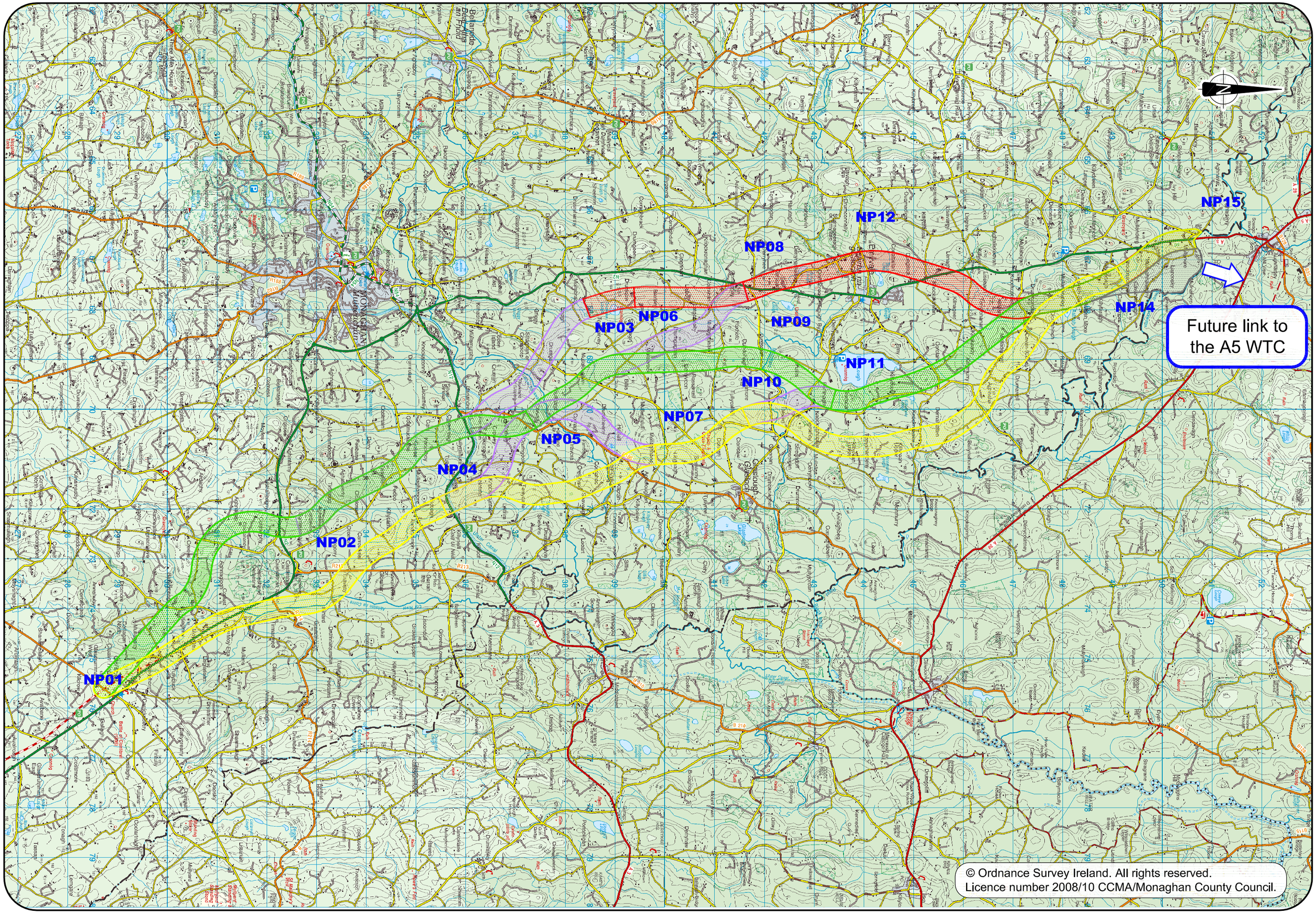
Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		PM_{10} Emissions Rate (kg/yr)			Change in PM_{10} Emission Rate (kg/km/yr)	PM_{10} Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	3900	7	2.7	2.7	170	39	-130	-48	-338
N2 Node D to R213	13600	3900	8	1.9	1.9	119	28	-92	-48	-386
N2 R213 to Green Corridor Jctn.	12700	3900	5	1.0	1.0	57	15	-43	-43	-214
N2 Green Corridor Jctn. To R162	12700	9000	26	3.9	3.9	224	130	-94	-24	-626
N2 R162 to N12 Jctn.(Bypass)	7800	4100	2	2.5	2.5	94	40	-54	-22	-43
N2 N12 Jctn. To Griggy Lough	9100	5700	2	1.9	1.9	83	41	-42	-22	-44
N2 Griggy Lough to Node NP8	9100	5700	9	4.8	4.8	221	111	-110	-23	-205
N2 Node NP8 to Emyvale	8200	5700	57	2.5	2.5	104	58	-46	-18	-1042
N2 Emyvale to Blaney's Bridge	5900	1400	65	1.5	1.5	44	8	-35	-24	-1532
N2 Blaney's Bridge to Aughnacloy	5900	1400	30	5.3	5.3	155	30	-125	-24	-707
Green-Red Corridor Clontibret to NP2		9800	3		5.2		342	342	66	198
Green-Red Corridor NP2 to N12 Jctn.		4200	1		4.4		128	128	29	29
Green-Red Corridor N12 Jctn. To NP8		3100	0		6.7		143	143	21	0
Green-Red Corridor NP8 to Aughnacloy		4900	14		9.7		333	333	34	480
TOTAL						**1270**	**1446**			**-4431**

Table A52. Green – Red 2 Corridor: Detailed Results for NO_x Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		NO_X Emissions Rate (kg/yr)			Change in NO_X Emission Rate (kg/km/yr)	NO_X Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	3900	7	2.7	2.7	6702	1477	-5224	-1935	-13545
N2 Node D to R213	13600	3900	8	1.9	1.9	4716	1040	-3676	-1935	-15480
N2 R213 to Green Corridor Jctn.	12700	3900	5	1.0	1.0	2194	547	-1647	-1647	-8236
N2 Green Corridor Jctn. To R162	12700	9100	26	3.9	3.9	8558	4760	-3798	-974	-25321
N2 R162 to N12 Jctn.(Bypass)	7800	4100	2	2.5	2.5	3938	1629	-2310	-924	-1848
N2 N12 Jctn. To Griggy Lough	9100	5700	2	1.9	1.9	3708	1843	-1865	-982	-1963
N2 Griggy Lough to Node NP8	9100	5700	9	4.8	4.8	9672	4856	-4816	-1003	-9031
N2 Node NP8 to Emyvale	8200	5700	57	2.5	2.5	4539	2529	-2010	-804	-45834
N2 Emyvale to Blaney's Bridge	5900	1400	65	1.5	1.5	1874	360	-1514	-1009	-65601
N2 Blaney's Bridge to Aughnacloy	5900	1400	30	5.3	5.3	6620	1271	-5349	-1009	-30277
Green-Red 2 Corridor Clontibret to NP2		9800	3		5.2		10682	10682	2054	6163
Green-Red 2 Corridor NP2 to N12 Jctn.		4200	1		4.4		4254	4254	967	967
Green-Red 2 Corridor N12 Jctn. To NP8		3100	1		6.4		4567	4567	714	714
Green-Red 2 Corridor NP8 to Aughnacloy		4900	14		9.7		11429	11429	1178	16495
TOTAL						**52522**	**51243**			**-192797**

Table A53. Green – Red 2 Corridor: Detailed Results for PM_{10} Assessment.

Link	AADT (2030)		No. Receptors (0-50m)	Link Length (km)		PM_{10} Emissions Rate (kg/yr)			Change in PM_{10} Emission Rate (kg/km/yr)	PM_{10} Score
	Do Minimum	Do Something		Do Minimum	Do Something	Do Minimum	Do Something	Change In Emissions		
N2 Clontibret to Node D	13600	3900	7	2.7	2.7	170	39	-130	-48	-338
N2 Node D to R213	13600	3900	8	1.9	1.9	119	28	-92	-48	-386
N2 R213 to Green Corridor Jctn.	12700	3900	5	1.0	1.0	57	15	-43	-43	-214
N2 Green Corridor Jctn. To R162	12700	9100	26	3.9	3.9	224	131	-93	-24	-617
N2 R162 to N12 Jctn.(Bypass)	7800	4100	2	2.5	2.5	94	40	-54	-22	-43
N2 N12 Jctn. To Griggy Lough	9100	5700	2	1.9	1.9	83	41	-42	-22	-44
N2 Griggy Lough to Node NP8	9100	5700	9	4.8	4.8	221	111	-110	-23	-205
N2 Node NP8 to Emyvale	8200	5700	57	2.5	2.5	104	58	-46	-18	-1042
N2 Emyvale to Blaney's Bridge	5900	1400	65	1.5	1.5	44	8	-35	-24	-1532
N2 Blaney's Bridge to Aughnacloy	5900	1400	30	5.3	5.3	155	30	-125	-24	-707
Green-Red 2 Corridor Clontibret to NP2		9800	3		5.2		342	342	66	198
Green-Red 2 Corridor NP2 to N12 Jctn.		4200	1		4.4		128	128	29	29
Green-Red 2 Corridor N12 Jctn. To NP8		3100	1		6.4		137	137	21	21
Green-Red 2 Corridor NP8 to Aughnacloy		4900	14		9.7		333	333	34	480
TOTAL						**1270**	**1441**			**-4400**



Appendix B – Road Safety Audit Stage F Report

N2 Clontibret to Northern Ireland Border Road Scheme

Stage F Road Safety Audit

October 2011

Prepared for:

Monaghan County Council

Prepared by:

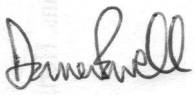
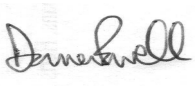
Grontmij
Spectrum House
2 Powderhall Road
Edinburgh
EH7 4GB

T +44 (0) 131 550 6300
F +44 (0) 131 550 6499

E enq@grontmij.co.uk

Report Status: ***Final***

Job No: P45810

	Name	Signature	Date
Prepared By:	Ronan Lyng		31/10/11
Checked By:	Darren Powell		31/10/11
Approved By:	Darren Powell		31/10/11

1 INTRODUCTION

1.1 This report results from a Stage F Road Safety Audit carried out on a proposed National Strategic Route between Clontibret and the Northern Ireland Border in Co. Monaghan.

1.2 In accordance with the requirements of the National Roads Authority's 2010 Project Management Guidelines (PMG) this Stage F Audit has been carried out at Phase 2 Route Selection stage and has followed the methodology described in NRA HD 19/09.

1.3 The audit was carried out via a desktop study on 21st October 2011 by;

Darren Powell	Team Leader
Ronan Lyng	Team Member

The audit team considered the following information in examining the corridor options:

- Constraints Study Report (November 2009);
- Videos of existing route from Site Visits;
- Traffic Modelling Report (July 2011);
- Cost Benefit Analysis Report (September 2011)

Note a site visit was not deemed necessary due to the high level nature of the audit.

1.4 The terms of reference of the audit are as described in NRA HD 19/09. The audit has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the designs to any other criteria.

1.5 The route selection process is being undertaken on the basis of comparing 400m wide feasible corridors. Due to the lack of design detail at this stage of

the scheme development, the report comments on potential safety related differences between the options rather than stating specific problems and recommendations.

1.6 The existing N2 has been identified as a medium – high risk road in terms of traffic safety (European Road Assessment Programme (EuroRAP) 2005 and 2008) due to the existing cross section, poor vertical and horizontal geometry and a high number of accesses onto and from the existing route. The N2 Clontibret to the Northern Ireland Border Road Scheme will be designed in accordance with the NRA's Design Manual for Roads and Bridges (DMRB) and ensure road safety is improved.

1.7 The NRA's reported data relating to road accident and collision facts (up to 2004) reveals a relatively high collision and injury rate for the N2 when compared to the other primary and secondary national routes. More specific to the Scheme, the NRA's High Accident Locations (1996-2000) Report reflects a high accident location ("black spot") at the Castleshane bend to the south of Monaghan.

1.8 The N2 Route has been recently upgraded in several locations; the N2 Ashbourne Bypass consisting of approximately 17km of dual two-lane all purpose (D2AP) carriageway with a posted speed of 120kph, and the N2 Castleblayney/Clontibret Road Scheme consisting of almost 16km of '2 plus 1' (2+1) carriageway with a posted speed of 100kph opened in November 2007. In Northern Ireland there is a planned upgrade of the A5 consisting of approximately 88km of dual carriageway. The N2 Ashbourne to Ardee scheme consisting of approximately 45km of D2AP carriageway is currently at constraints study stage. The Compulsory Purchase Order (CPO) and Environmental Impact Statement (EIS) for the N2 Slane Bypass consisting of 3.5km of Dual Carriageway were published in December 2009. Between 1996 and 2006 a scheme from Monaghan to Emyvale was investigated and was sub-divided into 2 phases:

- Phase 1 - The N2 Monaghan Bypass, consisting of a single carriageway relief road to the East of Monaghan Town; and
- Phase 2 - A single carriageway improvement scheme from north of Monaghan to Emyvale.

1.9 Phase 1 (the N2 Monaghan Bypass) was constructed and opened in September 2006.

1.10 Phase 2 (the N2 Monaghan to Emyvale Realignment Scheme) was progressed through the Part 8 planning process in 2004. Whilst this scheme would have fulfilled the requirements of County Monaghan at a more local level, the progression of the Clontibret to the Northern Ireland Border Road Scheme focuses on improving the N2 as a strategic cross-border link and thereby improving transport links from Donegal to Dublin.

1.11 For the year 2009 the annual average daily traffic (AADT) flow was recorded as 5,729 vehicles, of which 12.2% were heavy goods vehicles. A comprehensive set of traffic surveys, carried out in September 2009 to allow the preparation of a traffic model of the local area for use in the Stage 2 – Project Appraisal, revealed higher traffic flows between Emyvale and Monaghan of over 7,000 vehicles per day. At the southern extent of the study area, a temporary automatic traffic counter recorded N2 flows over two weeks that are equivalent to 11,600 vehicles AADT, around 1,400 of which were heavy goods vehicles (12%).

1.12 A total of 9 shortlisted corridors and the black corridor as a reference case have been identified. The key components of each of these are presented in Table 1 below. A carriageway cross-section has not yet been identified however the proposed route will include the following tie-in locations:

- southern tie-in, the existing roundabout adjacent of Clontibret; and

- northern tie-in, adjacent to the existing border crossing at Moy bridge south of Aughnacloy.

The traffic modelling carried out to date has assumed likely node points where traffic would interact with the local road network. For the purposes of this road safety comparison it has been assumed by the audit team that these node points would form the location of junctions.

Corridor	Length (km)	No. of Junctions*
Yellow	25.3	4
Green	25.8	5
Yellow - Green No.1	25.4	4
Yellow - Green No.2	24.5	4
Yellow - Red	25.2	5
Green - Yellow	26.6	5
Green - Yellow - Green	25.8	5
Green - Red	26	5
Green - Red2	25.7	5
Black	28.1	5

***Includes Start and End Points**

Table 1 Key Components of Route Options

2 RECOMMENDATIONS ARISING FROM SAFETY AUDIT

2.1 Comment 1

The existing route has been identified in the Constraints Study Report as being a medium to high risk road in terms of traffic safety. One of the primary reasons given for this is the existing sub-standard cross-section.

The proposed route, a National Strategic Route (approximately 26km long), will tie in to a recently upgraded "2 + 1" scheme to the south and to the existing single carriageway at the border crossing to the north. It is likely however that a link will be eventually included to tie-in with the proposed A5 dual carriageway in Northern Ireland (the specific details of the tie-ins are unknown at this time and may be subject to an independent study which will be audited under that works).

The proposed cross-section should be consistent to reduce driver confusion and frustration, which can potentially lead to an increase in collisions. This is particularly relevant in the case of long distance drivers.

A cross-section has not yet been defined for the route. The Constraints Study Report highlights, in reference to Eurorap 2008, that collision rates are generally almost twice as high on a single carriageway as on a dual carriageway. A single carriageway, with relatively high HGV volumes (>13%), located between higher standards of road can induce driver frustration. With respect to reducing collisions, the following cross-section hierarchy would be preferable: Type 2 Dual Carriageway; Type 3 Dual Carriageway; S2 Single Carriageway.

2.2 Comment 2

Junctions have higher accident rates than links. It follows that accident rates will be higher on a route that has more junctions. In assessing the various corridor options it can be seen that the options with the fewest junctions are Yellow, Yellow-Green No.1 and Yellow-Green No.2 (all of which have four junctions). Options Green, Green-Red2, Green-Red, Yellow-Red, Green-Yellow and Green-Yellow-Green all have five junctions. As the Black corridor generally follows the existing alignment of the N2 it can be assumed that it will have many junctions/accesses.

As a strategic route the preference should therefore lie with those with fewer junctions. On the basis of junctions the order of preference would be as follows: Yellow, Yellow-Green No.1, Yellow-Green No.2, Green, Green-Red, Green-Red2, Yellow-Red, Green-Yellow, Green-Yellow-Green and Black.

2.3 **Comment 3**

Accident rates are a function of scheme length and traffic volume. The corridor options vary in length between 24.5km and 28.1km, a difference of approximately 3.6km. The Yellow-Green No.2 is the shortest corridor and the Black is the longest corridor. On the basis of corridor length the order of preference would be as follows: Yellow-Green No.2, Yellow-Red, Yellow, Yellow-Green No.1, Green-Red2, Green, Green-Yellow-Green, Green-Red, Green-Yellow and Black.

Based on Table 7.1 Cost Benefit Analysis Results for Corridor Options of the Cost Benefit Analysis Report the rankings of the corridors with respect to accident benefits are as follows:

Yellow-Red
Green-Red2
Green-Red
Yellow
Green
Yellow-Green No.2
Green-Yellow-Green
Green-Yellow
Black
Yellow-Green No.1

2.4 **Comment 4**

The majority of the likely junction locations link the proposed strategic route (N2) with other national routes (eg. existing N2, N12). There are however instances where junctions are proposed with non-national routes (between Emyvale and Glaslough) – Green, Green-Yellow and Green-Yellow-Green, Yellow, Yellow-Green No.2 and Yellow-Green No.2. It is likely that the junctions will induce additional traffic volumes to the non-national routes. Should these corridor options be considered further, safety impacts on the local road network would need to be considered and improvements included as part of the assessment process.

2.5 **Comment 5**

All of the corridor options have the same north/south tie-in points. The subsequent stages of Road Safety Audit will highlight and address any specific problems related to the tie-ins.

2.6 **Comment 6**

As a strategic route it is anticipated that the N2 would offer local traffic and non-motorised users (NMUs) greater protection through separation ie. there would be a local road for local traffic and NMUs, rather than the new N2, hence providing separation between strategic traffic and local traffic.

The Black is the only corridor that may not offer an acceptable level of road safety to NMUs. As a primarily online upgrade corridor the existing high levels of potential conflict would remain between vehicles and non-motorised users, turning traffic, and local traffic (farm machinery in particular).

2.7 **Comment 7**

Temporary traffic management (TTM), when implemented for the construction of road schemes, can lead to collisions as a result of driver confusion. Off-line corridor options are preferred on the basis that TTM would only be required at specific locations. The primarily on-line Black corridor would require extensive TTM across the length of the existing route. Such widespread disruption could encourage road users to use alternative routes throughout the construction period and increase the risk to road users on these other, often poorer, standard roads.

2.8 **Comment 8**

A corridor that successfully transfers traffic from an existing below standard route to a new higher standard route would be preferred i.e. the option that has the greatest flows on the new N2.
For the purposes of clarity Table 2 below summarises the predicted traffic volumes on the corridors and the remaining volumes on the existing route for each corridor. The Black corridor has not been included as there will be little/no transfer of traffic from the local network.

	Yellow	Green	Yellow - Green No.1	Yellow - Green No.2	Yellow - Red	Green - Yellow	Green - Yellow - Green	Green - Red	Green - Red2
Do-Something									
New Road section 1	4500	9800	4500	4500	4500	9800	9800	9800	9800
New Road Section 2	5300	4200	3900	5100	3100	4200	4200	4200	4200
New Road Section 3	2700	4700	2700	2700	4800	3500	4900	3100	3100
New Road Section 4		4300			4700	2900	4300	4900	4900
Existing Network									
N2 between Clontibret and N2 west of R213	9200	3900	9200	9200	9200	3900	3900	3900	3900
N2 between new junction and	9400	9500	10700	9300	9700	9200	9500	9000	9100
N2 Monaghan Bypass	3800	3700	5100	3800	3500	3900	3600	4100	4100
N2 South of Emyvale	5500	3800	5100	5500	5600	5200	3800	5700	5700
N2 North of Emyvale	3400	1700	3400	3400	1400*	3100	1700	1400	1400
					1500**				

*N2 North of Emyvale south of new road junction
**N2 North of Emyvale north of new road junction

Table 2 2030 Traffic Volumes

The order of corridor preference based on the above traffic volumes is as follows:
Green-Yellow-Green, Green, Green-Red, Green-Red2, Green-Yellow, Yellow-Red, Yellow-Green No.2, Yellow, Yellow-Green No.1.

3 AUDIT TEAM STATEMENT

Safety related issues have been identified and noted in the report, together with suggested corridor preferences. No one on the Audit team has been involved with the design of the works.

AUDIT TEAM LEADER

Darren Powell - BEng(Hons) CEng MICE MCIHT MSoRSA

Technical Director

Grontmij

Grove House

Mansion Gate Drive

Leeds

LS7 4DN

Signed: ..... Date 31.10.11

AUDIT TEAM MEMBER

Ronan Lyng - BE (Hons) CEng MIEI

Senior Engineer

Grontmij

Spectrum House

2 Powderhall Road

Edinburgh

EH7 4GB

Signed: ..... Date 31.10.11