# i. PREFACE

THIS ENVIRONMENTAL IMPACT STATEMENT CONSISTS OF THE FOLLOWING DOCUMENTS:

## Volume 1

- NON-TECHNICAL SUMMARY

## Volume 2

- MAIN REPORT

## Volume 3

- FIGURES

## Volume 4

- APPENDICES

## Document Control

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| *FINAL* | *Publication* | *FM*[1] | *December 2013* | *AS*[2] |

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[2] *B.Eng., MBA, C.Eng MIEI*

# ACKNOWLEDGEMENTS

This Environmental Impact Statement (EIS) has been prepared and coordinated by Sligo County Councils National Roads Design Department[3] under the auspices of the National Roads Authority and with the assistance of specialist Environmental sub-consultants as outlined below.

Detailed reports from specialists are available for review in the National Road Design Department of Sligo County Council, Market Yard, Sligo, as are the Constraints Study Report, the Route Selection Report and the Design Report which were prepared during the design process.

## EIS Compilation

The National Road Design Department of Sligo County Council is responsible for the following elements of the EIS publication:

- Compilation of the EIS including development of the following chapters:
  - Introduction;
  - Background to the *Proposed Road Development*;
  - Alternatives Considered;
  - Description of the *Proposed Road Development*;
  - Impact Assessment- Introduction;
  - Schedule of Commitments and summary of proposed ameliorative measures;
  - Summary of Cumulative Impacts.

## Environmental Impact Assessment

Sligo County Council have commissioned the following specialist sub-consultants to carry out an assessment of environmental effects, significant impacts and proposed mitigation measures based on pre-determined specific baseline information.

| Study/Element | Consultant |
|---|---|
| Socio-Economic. | Optimize Consultants,<br>Barracks House,<br>Croghan,<br>Boyle,<br>Co. Roscommon. |
| Agriculture and Non Agricultural property. | Philip Farrelly,<br>Unit 5A Fingal Business Park,<br>Balbriggan,<br>Co. Dublin. |
| Flora, Fauna and Fisheries. | Ecofact Environmental Consultants,<br>Tait Business Centre,<br>Domonic Street,<br>Limerick City. |
| Landscape and Visual. | MosArt Ltd.,<br>The Phoenix Centre,<br>Block 6, |

[3] Which is contained within the Directorate of Infrastructural Services.

| Study/Element | Consultant |
|---|---|
| | Broomhall Business Park,<br>Wicklow,<br>County Wicklow. |
| Hydrology & Hydro-<br>Geology;<br>Soils & Geology. | Minerex Environmental Ltd.,<br>Taney Hall,<br>Eglinton Terrace,<br>Dundrum,<br>Dublin 14. |
| Noise & Vibration;<br>Air Quality and Climate Change. | AWN Consulting,<br>The Tecpro Building,<br>IDA Business and Technology Park,<br>Clonshaugh,<br>Dublin 17. |
| Archaeology, Architectural and Cultural Heritage. | ADS Ltd.,<br>Windsor House,<br>11 Fairview Strand,<br>Fairview,<br>Dublin 3. |

## Design

The National Road Design Department of Sligo County Council is responsible for the design of the *Proposed Road Development* with input at various stages from specialist sub consultants including *inter-alia*:

- Aecom;
- Hydro Environmental; and
- AGL Consulting;

# LIST OF ABBREVIATIONS

| | |
|---|---|
| AA | *Appropriate Assessment* |
| AADT | *Average Annual Daily Traffic* |
| AAP | *Area of Archaeological Potential* |
| AEP | *Annual Exceedance Probability* |
| AGI | *American Geological Institute* |
| ASL | *Above Sea Level* |
| ATC | *Automatic Traffic Counts* |
| BAP | *Biodiversity Action Plan* |
| BD | *Bridge Document* |
| BH | *Bore Hole* |
| BKL | *Bricklieve Limestone Formation Lower* |
| BKU | *Bricklieve Limestone Formation Upper* |
| BOD | *Biochemical Oxygen Demand* |
| BS | *British Standards* |
| BSBI | *Botanical Survey of the British Isles* |
| BTO | *British Trust of Ornithology* |
| c. | *circa or approximate distance* |
| CAFE | *Cleaner Air for Europe* |
| CBA | *Cost Benefit Analysis* |
| CBR | *California Bearing Ratio* |
| CDB | *Congested District Boards* |
| CDP | *County Development Plan* |
| CGSJ | *Compact Grade Separated Junction* |
| Ch. | *Chainage* |
| CHC | *Cultural Heritage Constraint* |
| CHG's | *Greenhouse Gases* |
| CLASP | *Community of Lough Arrow Social Project* |
| CO | *Carbon Monoxide* |
| CO2 | *Carbon Dioxide* |
| COD | *Chemical Oxygen Demand* |
| CPO | *Compulsory Purchase Order* |
| CRTN | *Calculation of Road Traffic Noise* |
| cSAC | *Candidate Special Area of Conservation* |
| CSO | *Central Statistics Office* |
| Cu | *Shear Strength* |
| DEHLG | *Department of Environment, Health and Local Government* |
| DX | *Watercourse Crossing for Hydrological Impact Assessment* |
| EAR | *Environmental Assessment Report* |
| EC | *European Community* |
| ED | *Electoral Division* |
| EEC | *European Economic Community* |
| EIA | *Environmental Impact Assessment* |
| EIS | *Environmental Impact Statement* |
| EM | *Electromagnetic Flow Meter* |
| EMD | *Exploration and Mining Division* |
| EOP | *Environmental Operating Plan* |
| EPA | *Environmental Protection Agency* |
| EPH | *Extractable Petroleum Hydrocarbons* |
| ESB | *Electrical Supply Board* |
| EU | *European Union* |
| FOSD | *Full Overtaking Sight Distance* |
| FE | *Standard Factorial Error* |
| GSI | *Geological Survey of Ireland* |
| GWB | *Groundwater Body* |
| GWDTE | *Groundwater Dependent Terrestrial Ecosystem* |
| HAWRAT | *Highways Agency Water Risk Assessment Tool* |
| HECRAS | *Hydrologic Engineering Centres River Analysis System* |
| HGV | *Heavy Goods Vehicle* |
| HRI | *Heritage Rating Index* |
| HSE | *Health Service Executive* |
| ICD | *Inscribed Circle Diameter* |
| IEEM | *Institute of Ecology and Environmental Management* |
| IFI | *Inland Fisheries Ireland* |
| ING | *Irish National Grid* |
| IPCC | *Intergovernmental Panel on Climate Change* |
| IPPC | *Integrated Pollution Prevention Control* |
| IS EN | *Irish Standard European Norm* |
| ITM | *Irish Transverse Mercator* |
| IUCN | *International Union for Conservation of Nature* |
| LG | *Lisgorman Shale* |
| LMA | *Lands Made Available* |
| MAC | *Maximum Acceptable Concentration* |
| MCC | *Manual Traffic Counts* |
| MCV | *Moisture Condition Value* |
| MIU | *Major Inter Urban* |

**List of Abbreviations (continued)**

| | | | |
|---|---|---|---|
| NDP | *National Development Plan* | QBAR | *An FSR term denoting the Mean Annual Flood flow rate for a river.* |
| NF | *Narrow Fin drain* | RC | *Rotary Core* |
| NHA | *Natural Heritage Area* | RMP | *Record of Monuments and Places* |
| NIAH | *National Inventory of Architectural Heritage* | ROW | *Right of Way* |
| NIS | *Natura Impact Statement* | RPS | *Record of Protected Structures* |
| NMI | *National Museum of Ireland* | RSA | *Road Safety Authority* |
| NO | *Nitrogen Monoxide* | RSP | *Route Selection Process* |
| NO2 | *Nitrogen Dioxide* | RSPB | *Royal Society for the Protection of Birds* |
| NOX | *Nitrogen Oxide* | RSR | *Route Selection Report* |
| NPV | *Net Present Value of Benefits* | RU | *Fish Rearing Unit* |
| NPWS | *National Parks and Wildlife Services* | SAAR | *Seasonal Mean Annual Average Rainfall* |
| NRA | *National Roads Authority* | SAC | *Special Area of Conservation* |
| NRA DMRB | *National Roads Authority Design Manual for Roads and Bridges* | SCC | *Sligo County Council* |
| NRA PAG | *NRA Project Appraisal Guidelines* | SEI | *Sustainable Energy Ireland* |
| NRA PMG | *National Roads Authority Project Management Guidelines* | SI | *Statutory Instrument* |
| NRNS | *National Roads Needs Study* | SL | *Sligo* |
| NSS | *National Spatial Strategy* | SPA | *Special Protection Area* |
| NTS | *Non Technical Summary* | SPT | *Standard Penetration Test* |
| NWRFB | *North Western Regional Fisheries Board* | SUDS | *Sustainable Urban Drainage Systems* |
| O3 | *Ozone* | TD | *Technical Document* |
| OPW | *Office of Public Works* | TP | *Trial Pit* |
| OS | *Ordnance Survey* | TSP | *Total Suspended Particles* |
| OSI | *Ordnance Survey Ireland* | UK DEFRA | *UK Department for Environment, Food and Rural Affairs* |
| PCMNR | *Department of Communications Marine and Natural Resources* | UKDETR | *United Kingdom Department of Environment, Transport and Regions* |
| PH | *Probe Hole* | UNFCC | *United Nations Framework Convention on Climate Change* |
| PIR | *Potential Impact Rating* | USEPA | *United States Environmental Protection Agency* |
| PM | *Particulate Matter* | VOC's | *Volatile Organic Compounds* |
| PM10 | *Particular Matter (fine airborne particles) less than 10 micrometers in diameter* | WFD | *Water Framework Directive* |
| PM2.5 | *Particular Matter (fine airborne particles) less than 2.5 micrometers in diameter* | WHO | *World Health Organization* |
| PR | *Preferred Route* | WRAP | *Winter Rainfall Acceptance Potential* |
| PRD | *Proposed Road Development* | WRBD | *Western River Basin District* |
| PW | *Public Works* | | |
| PVB | *Present Value of Scheme Benefits* | | |

# GLOSSARY OF TERMS

Below is a partial glossary of terms used in this report. The definitions herein are not to be taken as comprehensive, but solely as an aid for the non-technical reader.

| Term | Glossary |
|---|---|
| Accommodation works | Ancillary works carried out by the road authority to mitigate the effects of the construction of a development (such as access roads) |
| At Grade Junction | Road junction where at least one road meets another at same level |
| Attenuation pond | Pond used for the collection and slow release of run-off |
| Borrow Pits | Excavation, within or outside the limits of the works, for producing materials necessary for its construction. Borrow Pits used for the purposes of the *Proposed Road Development* will be reinstated to original lines and levels |
| Chainage (Ch) | Distance in metres from start of the *Proposed Road Development* |
| Constructed Wetland Attenuation Facility | Attenuation Pond which will be provided as a vegetative treatment system, i.e. a pond which will incorporate ecological landscape planting |
| Culvert | Structure or drain for the bringing of a stream or river under a structure such as the road development proposed herein |
| Cutting (cut) | Section of earthworks where the indicative road level is below the original/existing ground level |
| Design | A design prepared for the purposes of Phase 3 and 4 of the NRA PMG |
| Detailed Design | A design prepared for the purposes of Phase 5 and 6 of the NRA PMG |
| Do Minimum | This scenario assumes construction of the *Proposed Road Development* does not take place and considers minimal maintenance and improvement to the affected section of road |
| Do Nothing Scenario | This scenario assumes construction of the *Proposed Road Development* does not take place |
| Do Something Scenario | This scenario assumes construction of the *Proposed Road Development* does take place |
| Enclosure | Any monument consisting of an enclosing feature such as a bank or a ditch, usually earthen, such as barrows or ringforts |
| Fauna | A collective term for the animals of a region |
| Flora | A collective term for the plants of a region |
| Geometrics | Details of the various vertical and horizontal curves and straights used to make up the *Proposed Road Development* |
| Glacial Till | A mixture of clay, silt, sand, gravel and boulders ranging in size and shape deposited by a glacier |
| Groundwater | Water stored in the soil and rock both above and below the water table |
| Habitat | The dwelling place of a species or community, providing a particular set of environmental conditions |
| $L_{den}$ | The day-evening-night composite noise indicator adopted by the EU for the purposes of assessing overall annoyance |
| Mitigation measures | Measures to ease or soothe the effects of something. Mitigation measures suggest ways to avoid or lessen the negative effects of a project on the environment. |
| National Parks and Wildlife Service (NPWS) | This organisation has responsibility for the protection and conservation of our natural heritage |

| Term | Glossary |
|---|---|
| Nitrogen Dioxide | Pollutant emitted from combustion sources. Most significant source is road transport |
| Particulate Matter | Particulate matter (dust) generally less than 10 micrometres in diameter. Various sources including road traffic, construction works, wind-blown dusts and biological particles |
| Piezometer | An instrument to measure the level of the water table |
| Ringfort | Early Christian defended secular settlement consisting of a bank and external ditch defining a circular area that contained the dwelling structures of the occupants |
| Riparian | The strip of land adjacent to a natural watercourse such as a river or stream. Often supports vegetation that provides the best fish habitat values when growing large enough to overhang the bank |
| Salmonid Waters | Waters (generally of high quality) suitable for the maintenance of viable self-sustaining populations of wild salmon and trout |

# ADDITIONAL INFORMATION

Additional Information not included in this EIS but which may be made available to interested parties includes *inter-alia*:

- Constraints Study Report, Sligo County Council, 2000;
- Route Selection Report, Sligo County Council, 2002;
- Addendum to Route Selection Report, Sligo County Council, 2013;
- EIS Screening Report, Sligo County Council, 2012;
- Informal Scoping Report, Sligo County Council, 2012;
- References to the Main Report of the EIS.

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## Tables

# EIS – General Information

All proposed works indicated in this Environmental Impact Statement and shown on drawings are part of a design developed in accordance with Phase 3 of the *'NRA Project Management Guidelines, 2010'* which has evolved iteratively through the initial stages of the EIA process.

The design and the environmental mitigation measures may be further refined during the detailed design stage, including the mitigation measures contained in such Approval as may be granted by An Bord Pleanála.

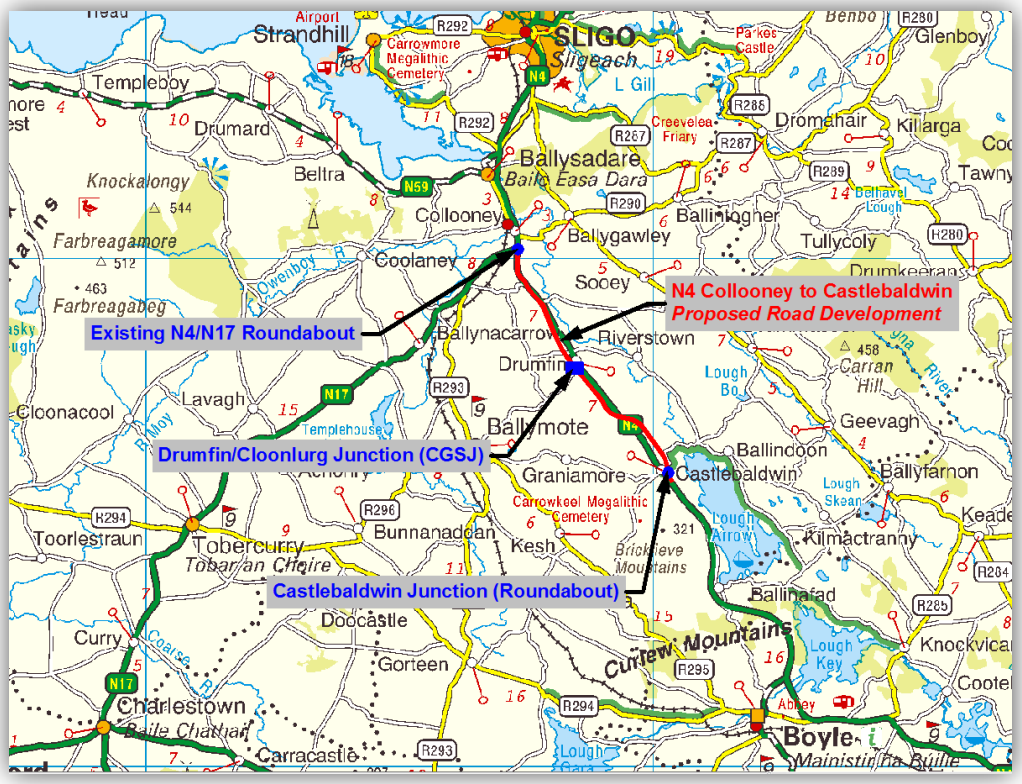
The detailed design will seek to develop the design in a manner such that there is no material change in terms of significant adverse effect on the environment. Opportunities may be identified to further reduce the significance of adverse effect/impact and, in some cases, to improve the residual effect/impact.

# 1 Introduction and Background to the *Proposed Road Development*

## 1.1 Introduction

This EIS Non-Technical Summary Report is a summary of the information, investigations, findings and mitigation recommendations of the Environment Impact Study (EIS) for the N4 Collooney to Castlebaldwin *Proposed Road Development*. The main body of the EIS is contained in Volume Two, with supporting Figures and Appendices in Volumes Three and Four respectively, these volumes read in conjunction with each other provide a statement of the likely impacts of the construction and the long-term future operation of the *Proposed Road Development* on the receiving environment and should be referred to for a more detailed consideration of the Environmental Impact Assessment process.

*Figure 1-1: Location of Proposed Road Development*




## 1.2 Location

The N4 National Primary Route is part of the East/West road corridor linking Irelands largest transportation node (Dublin) with the largest transportation node in the North-West (Sligo). It measures c. 34.8km in County Sligo of which c. 11.6km between Sligo Town and Collooney is Type 1 Dual Carriageway with c. 8.8km south of Castlebaldwin having already been realigned to Standard Single Carriageway standard.

The *Proposed Road Development* (as indicated in *Figure 1-1*) is the remaining portion of the N4 in Co. Sligo requiring improvement and measures approximately 14.71km in length passing through the townlands of *Collooney, Toberbride, Mullaghnabreena, Ardcurley, Cloonamahan, Doorly, Knocknagroagh, Drumfin, Cloonlurg, Carrowkeel, Carrownagark, Kingsbrook, Aghalenane, Ardloy, Springfield, Tawnagh, Cloonymeenaghan, Sheerevagh, Cloongad, Drumderry, Castlebaldwin, Cloghoge Upper and Cloghoge Lower.* The road type will be Type 2 Dual Carriageway tied into the existing network to the south via a section of Standard Single Carriageway.

# 1.3 The Need for the Realignment

## 1.3.1 The NRA, National Road Needs Study

The original basis for the current proposal was highlighted in a report produced by the NRA, entitled *The National Road Needs Study* (NRNS) in 1998. This study assessed the adequacy and performance of the national road network on the basis of the ability of existing roads to deliver a quality level of service consistent with the efficient movement of traffic. The study represented a comprehensive assessment of the network against the level of service objective of an average inter-urban speed of at least 80kph, which is the equivalent to level of service D.

The N4 realignment (Collooney to Ballinafad) was identified at that time as having 'Phase 2' needs. This meant that the existing road was considered to be no longer able to provide a level of service D, equivalent to an inter-urban travel speed of 80kph. By realigning the road, the level of service would be improved; therefore it was scheduled at that time for improvement during the years 2005-2009 under the NRNS.

## 1.3.2 Existing Network

The existing road network in the area is multi-functional and is required to cater for conflicting demands, including accommodating long distance through traffic and locally generated trips.

The existing route is sub-standard with overall pavement widths varying from c. 6.5m to 7.5m and average verge widths of 1.0m. There is restricted overtaking along approximately 70% of its length while it also passes through the village of Castlebaldwin which has a speed limit of 50kph. This is with the exception of a 2.6km section between *Collooney/Toberbride* and *Doorly* which was improved geometrically in the 1980's.

*Plate 1-1: Existing N4 at Carrownagark Td. (picture following a traffic incident in 2012)*

There are a significant number of junctions (29) with local roads along the existing route and including the village of Castlebaldwin there are approximately 78 houses and 130 agricultural entrances onto the existing route. Of these accesses, a high percentage occur (17%) on the aforementioned improved section.

From a safety point of view, field accesses are especially problematic as they encourage slow moving and frequently heavy agricultural traffic onto the high-speed national primary network. The increasing volumes of inter-urban traffic on this strategic east-west route corridor will lead to a greater risk of road accidents and a significant loss of amenity to the local residential population. The rural sections of the existing route are deficient in traffic capacity due to the proliferation of vehicular entrances and inadequacies in cross section and alignment.

It constitutes one of the few sections of the N4 between Dublin and Sligo which is not of a standard commensurate with the NRA DMRB; furthermore, with the exception of its northern limits, this particular section has not received any improvements since its designation from a Trunk Road to a National Primary Route in 1977 and has very restricted opportunities for safe overtaking.

### 1.3.3 Traffic

Traffic count surveys show traffic volumes on the existing N4 in 2008 of 9,300 AADT at *Drumfin Td.* and 7,500 AADT at *Castlebaldwin Td.* rising to 11,600 and 9,200 AADT respectively in a design year of 2032 in a Do-Minimum Medium Growth Scenario. It is also predicted that c. 8-10% of traffic on the existing route consists of HGV's.

The risk of accidents will increase as vehicles seeking to access the N4 from side roads will find fewer opportunities to do so and may through frustration take unnecessary risks. The increase in traffic will give rise to an increase in noise nuisance and community severance.

### 1.3.4 Economy

The existing road is operating within capacity during the Peak Periods under current traffic flows, however travel speeds are impacted by the alignment and gradient of the road together with the high number of on road accesses. The N4/M4 is a key national corridor and delays to traffic have a negative impact upon the economy. It is an objective of the *Proposed Road Development* to reduce journey times and improve journey time reliability, both of which will generate positive economic benefits to businesses and consumers.

### 1.3.5 Safety

There have been 72[4] traffic reported accidents to the Garda Síochána between the period 1996 to 2010 on that c. 14.36km section of existing route proposed to be replaced by the *Proposed Road Development*. These accidents are composed of a notable 8 fatalities, 8 serious injuries and 56 minor injuries. In acknowledgement of the significant number of Material Damage accidents which were reported to An Garda Síochána but are not collated by the Road Safety Authority (RSA), Sligo County Council have collated same for a trial period of 2008 to 2011 which reveals on average 34 traffic accidents per year resulting in Material Damage.

The proposed route will replace the existing section of the N4 with a Type 2 Dual Carriageway. This will reduce the accident rate, due to a higher accident rate for single carriageway roads, and an increasing risk of certain types of accidents, such as fatal and serious injury accidents as a result of overtaking head on collisions. The Type 2 Dual Carriageway also has the benefit of separating local traffic from national traffic and does not allow for right turning movements such as those which would be required at Ghost Islands on a Single Carriageway road.

Such is the severity of the rate of accidents on the route in combination with the weekly unreported accidents and near misses; a local action group has been vociferously campaigning for the upgrade of this section of the N4. To demonstrate the extent of fatal accidents which have occurred along the existing route, this group have erected white crosses along roadside verges indicating 30 fatalities at different locations over the last forty or so years.

*Plate 1-2: Erection of 30th white cross in April, 2013*[5]

In addition to recent minor realignment works carried out at *Ardloy Td.*, numerous local improvement measures have been carried out by Sligo County Council in recent years which have maximised sightline

[4] Compilation of accidents from RSA and CT68 forms prepared by An Garda Síochána.

[5] Picture courtesy of Brian Farrell Photography.

distances achievable at localised junctions such as at *Drumfin Td., Cloonlurg Td.* and *Carrownagark Td*. These improvements although welcomed do not improve driving conditions or geometric deficiencies for National to National through traffic or National to Local traffic; their primary benefit is to the maximise the sight distances currently available on the existing N4 for Local to National traffic.

*Plate 1-3: White Crosses erected north of the Ballymote Junction in the townland of Cloonlurg*

The safety benefits which will be derived from the incorporation of the *Proposed Road Development* into the National Primary Network are expanded upon in section 3.4 of this Non Technical Summary.

### 1.3.6 Environment

The provision of the *Proposed Road Development* will bring benefits to the existing environment in this area of County Sligo. This will include *inter-alia:*

- A reduction in Noise and Vibration impacts for those numerous properties which are currently adjacent to the existing N4.

In addition, considering that the *Proposed Road Development* will be constructed to the increasingly high standard of environmental mitigation practice there are numerous benefits which will arise to the existing environment. This is particularly true in the case of the management and treatment of road runoff which is currently being discharged untreated and un-attenuated to the Unshin River cSAC/pNHA and the Lough Arrow cSAC/pNHA/SPA. The provision of infrastructure to treat this runoff will have ensuing benefits for the aquatic flora and fauna of these important biodiversity sites.

### 1.3.7 Accessibility and Social Inclusion

The *Proposed Road Development* will improve road based public transport at a local, regional and national level, by improving safety along this section of the N4 corridor.

The transference of traffic off the existing N4 will greatly improve the quality of life for properties within the vicinity of the existing route, allowing ease of access to both the local and national network which will improve accessibility to work, education and other activities.

### 1.3.8 Integration

The *Proposed Road Development* is intended to integrate the recent investments in the N4 and the Major Inter Urban (MIU) corridors, namely the M4, as part of a strategy to provide a consistent quality road link between Dublin and Sligo.

## 1.4 Additional Benefits of the *Proposed Road Development*

The project, when complete, will provide a high quality road for the transport of people and goods in safety and comfort in accordance with national and local objectives.

The generation of traffic as a result of the realignment is likely to be modest though there may be some minor increase due to the reduction in journey times to Sligo which may make it a more attractive commuting town for the region.

The provision of the realignment provides the following key benefits:

- Improves the N4 route to modern day standards including the provision of safe overtaking and appropriate road width;
- Provides a high quality road for strategic routes with reserve capacity for future demand;
- Assists in improving the competitiveness and efficiency of the economy both locally and nationally;
- Reduces travel times and improves access to the north-west region;
- Improves transport infrastructure for local traffic;
- Improves safety along the existing roads and at junctions/accesses;
- Reduces environmental and social impacts on the local residents and communities along the existing N4.

# 2 Alternative Options Considered

## 2.1 Introduction

### 2.1.1 General

The Consideration of Alternatives is a key element of the planning process as it recognises the importance of avoiding impacts at an early stage.

The examination of alternatives commenced initially with a Route Selection Process conducted over the period 2001 to 2002. The results of this process were reviewed in the period 2012-2013 through a renewed assessment of the original route options. Additional alternatives in accordance with the NRA Project Appraisal Guidelines (PAG) were also considered including the Traffic Management Alternative.

The preferred route has evolved during the design process as more detailed site specific information became available and where discrete alignment changes were feasible. The result is the current *Proposed Road Development.*

### 2.1.2 Preliminary Options Assessment

#### 2.1.2.1 Route Selection Report (2002) and the addendum report (2012/2013)

The aim of the Route Selection Stage[6] was to develop a number of feasible route options in accordance with the requirements of the NRA DMRB while avoiding, where possible, significant constraints identified in the Constraints Study. These options were then vetted based on environmental, economic and operational assessments leading to the identification of a Preferred Route. The proposed route at the time of Route Selection was a Standard Single Carriageway. This process was reviewed from a current day perspective in 2012/2013 through a Report which now forms an appendix to the original Route Selection Report.

These alternatives were developed within the Constraints Study area and are for the section of the route which is considered to be geometrically deficient in standard, i.e. *Cloonamahan* to *Cloghoge Lower*.

#### 2.1.2.2 Project Appraisal Alternatives

Supplementary to the route selection process an appraisal (in accordance with the NRA publication Project Appraisal Guidelines) was carried out in 2012 of the most appropriate form of improvements required to this section of the existing N4. This assessment compared a Traffic Management Alternative (online upgrade) against a Major Scheme Investment Alternative (offline realignment).

Arising from this assessment, it was considered that the high level of existing agricultural accesses (circa 130), junctions (circa 20) and residential/commercial properties (circa 70) fronting onto the existing N4 between *Cloonamahan* and *Cloghoge Lower* would mean that a Traffic Management Alternative would be impracticable as there would be a potential requirement to partially or fully acquire a significant number of residential properties along the route. Additionally, as the route would continue to pass through the village of Castlebaldwin, the requirement to maintain the 50kph speed limit in this area would significantly impact upon potential journey time savings from the *Proposed Road Development*.

In this regard, due to the predicted increases in traffic along the route and the major constraints to local improvement, an on-line widening alternative which would constitute a Traffic Management Alternative was not considered viable in terms of delivering the required levels of service.

#### 2.1.2.3 Route Options

Based on information from the Constraints Study Stage, five route options were initially identified for the *Proposed Road Development* as indicated in Figure 3.1 contained within Appendix A of this Non Technical Summary. As the assessment progressed it became apparent that a merger of the northern extents of Option 2 and the southern extents of Option 4 could potentially provide for an optimal route. Thus a 6th option was

[6] This was concluded in July 2002 with the adoption by Sligo County Council of a Preferred Route.

proposed which subsequently became the Preferred Route (which is outlined in Figure 3.2 of Appendix A to this Non Technical Summary).

As the design of the *Proposed Road Development* progressed during Phases 3 and 4 of the NRA PMG (2010), the consideration of alternatives was maintained as more detailed site specific information became available and where discrete alignment changes were feasible. This allowed for a subtle evolvement of the route from that which emerged from the Route Selection Report (Option 6). Some changes to the Preferred Route were considered and subsequently incorporated for the reasons which are outlined in section 2.1.3 of this report. This option has become the *Proposed Road Development* and is described figuratively in Fig. 3.2. of Appendix A. This is the route which others are compared to when considering alternatives.

Table 1-1 outlines the aptness of the route to be maintained as the optimal location for the *Proposed Road Development*.

It is generally apparent from the foregoing and the chart provided in Table 1-1 that the route of the *Proposed Road Development* scores high preference ratings for the majority of criteria with the exception of some medium scores on Ground Conditions, Hydrology, Flooding, Hydrogeology, Landscape and Agricultural Property impacts. The economical benefits of the *Proposed Road Development* are considered to be on the threshold of high to medium preference while the comparable cost is considered to be on the threshold of medium to high.

The most comparable alternatives to the *Proposed Road Development* are Options 4 and 5 which both run wholly to the east of the existing N4. The categories which make these options comparable to the *Proposed Road Development* would mainly relate to ground conditions and cost, however, in both of these categories the *Proposed Road Development* still compares well. The most severe impacts of both of these options which ultimately make them both unfavourable relate principally to the crossing of and the direct landtake required within the Unshin River cSAC/pNHA.

*Table 1-1: Performance of the Route of the Proposed Road Development in comparison to original route options.*

| Category | Criteria | Rank | | | | | | | Comment |
|---|---|---|---|---|---|---|---|---|---|
| | | Option 1 | Option 2 | Option 3 | Option 4 | Option 5 | Option 6 | Option 6+ | |
| Engineering Assessment | FOSD | 5 | 3 | 7 | 2 | 4 | 6 | 1 | Score from 2002 RSR and 2013 addendum report |
| | Number of Junctions | 1 | 1 | 5 to 7 | 1 | 1 | 1 | 1 | Score from addendum report 2013 |
| | Number of Accesses | 1 | 1 | 5 to 7 | 1 | 1 | 1 | 1 | Score from addendum report 2013 |
| | Ground Conditions | 7 | 5 | 1 | 3 | 2 | 6 | 4 | Score from addendum report 2013 |
| Economics | Cost | 6 | 4 | 1 | 2 | 3 | 5 | 4 to 5 | Score from RSR 2002 |
| | Cost Benefits | 6 | 4 | 5 | 1 | 2 | 3 | 2 to 3 | Score from RSR 2002 |
| Environment | Impact on Archaeology | 1 | 1 | 2 | 4 | 3 | 1 | 1 | Score from 2002 RSR and 2013 addendum report |
| | Ecology | 2 | 3 | 7 | 6 | 5 | 4 | 1 | Score from addendum report 2013 |
| | Hydrology | 3 to 4 | 3 to 4 | 1 to 2 | 3 to 4 | 3 to 4 | 3 to 4 | 3 to 4 | Score from addendum report 2013 |
| | Flooding | 3 | 2 | 1 | 5 | 6 | 4 | 4 | Score from addendum report 2013 |
| | Hydro Geology | 3 to 4 | 3 to 4 | 1 to 2 | 3 to 4 | 3 to 4 | 3 to 4 | 3 to 4 | Score from addendum report 2013 |
| | Air Quality & Climate Change | 4 | 5 | 6 | 2 | 3 | 1 | 1 | Score from addendum report 2013 |
| | Noise & Vibration | 4 | 5 | 6 | 2 | 3 | 1 | 1 | Score from addendum report 2013 |
| | Landscape and Visual | 2 | 3 | 5 | 4 | 1 | 3 | 3 | Score from addendum report 2013 |
| | Socio Economic | 3 | 3 | 4 | 2 | 2 | 1 | 1 | Score from addendum report 2013 |
| | Agri. Property | 3 | 5 | 1 | 2 | 4 | 3 | 3 | Score from addendum report 2013 (Option 6/6+ interpreted) |
| | Non Agri. Property | 4 | 5 | 6 | 2 | 3 | 1 | 1 | Score from addendum report 2013 |

*Table 1-2: Legend for* Table 1-1

| Legend for Table 1-1 | | | | | |
|---|---|---|---|---|---|
| High Preference: Applied for Rankings/Ratings of 1 to 2. | | Medium Preference: Applied for Rankings/Ratings of 3 to 4. | | Low Preference: Applied for Rankings/Ratings of 5 to 7. | |

### 2.1.3 Alternatives considered during the Design/EIS Stages

As outlined in 2.1.1, the consideration of alternatives approach was maintained interactively through the Design and EIA stages of the *Proposed Road Development*. This resulted in the incorporation of a number of minor modifications to the preferred route and the application of criteria to aspects of the design including in particular the vertical alignment. The following presents a brief overview of these considerations.

#### 2.1.3.1 NRA Standards

There have been numerous changes to NRA standards since the development of the Preferred Route; these changes in addition to other factors have resulted most significantly in a change in Road Type from a Standard Single Carriageway to a Type 2 Dual Carriageway with a roundabout in the townland of *Castlebaldwin* tying the route back into the existing network via a section of Standard Single Carriageway.

The final determination on this strategy was based on an incremental analysis approach adopted in accordance with the advice of the NRA PMG.

#### 2.1.3.2 Environmental

In recognising the fact that avoidance is the most effective way of mitigating environmental Impacts, the design remained to a degree flexible during the initial stages of Environmental Impact Assessment. Interaction between the design team, the various sub-consultants, landowners and other interested parties allowed for the identification of potential significant impacts from initial designs which could be eliminated or reduced by modifications to the design while maintaining the general alignment of the Preferred Route. Examples of the main modifications made to the design for this purpose are outlined in 2.1.3.2.1 and 2.1.3.2.2.

##### 2.1.3.2.1 *Horizontal Alignment*

Changes made to the horizontal alignment during the course of the design and EIA stages include localised movements to avoid direct impacts to important ecological sites at:

- *Doorly, Lackagh & Knocknagroagh Td.;*
- *Kingsbrook & Aghalenane Td.;*

In addition and in order to reduce quantities of soft soils materials generated by the works, a localised movement was applied at:

- *Drumfin & Cloonlurg Td.;*

##### 2.1.3.2.2 *Vertical Alignment*

Although changes to the vertical alignment do not impact as significantly on the location of the route, they are none the less important in avoiding/reducing indirect impacts on the environment, particularly where there is a risk of intercepting karstic groundwater flows. In this regard, careful consideration has been had to the vertical alignment at the following locations in order to avoid/reduce environmental impacts:

- *Doorly Td.;*
- *Knocknagroagh Td.;*
- *Cloonlurg Td.;*
- *Carrownagark Td.;*
- *Ardloy & Springfield Td.*

### 2.1.4 The Online Upgrade

The alternatives in terms of the mainline alignment on the geometrically improved section between *Collooney/Toberbride* and *Cloonamahan* were dictated by:

- The current provision of a horizontal alignment which is adequate to accept the geometry of a Type 2 Dual Carriageway; and
- The constraints which occur to the east and west of the existing N4 meaning an offline alternative was not viable. These constraints include Markree Demesne, clusters of houses in *Mullaghnabreena Td.* to the east and Toberscanavan Loughs to the west.

The layout and configuration of the local area network were dictated initially by the objective to separate the local traffic from the national traffic, thus ensuring the consistency of the Type 2 Dual Carriageway is maintained for the overall length of the route.

A value engineering exercise which considered costs, access arrangements and local journey travel impacts was carried for this section of the route, the result of which is the arrangement outlined in Fig. 3.4. of Volume 3 (of the EIS) and described further in Chapter 4 of this EIS.

# 3 Description of the *Proposed Road Development*

## 3.1 General

The following section of this Non Technical Summary contains text extracted or summarised from Chapter 4 of the Main Report (Volume 2). It should not be considered as a full description of the project but merely certain elements which were considered might be of interest to Non-Technical readers. For a more detailed overview of the project, reference should be had to Chapter 4 contained within Volume 2 of this EIS.

The descriptions of the main elements of the design are presented in the following paragraphs covering the route from north to south. References are made herein and throughout the EIS to chainages (Ch.) denoting the distance in metres along the mainline, these quoted chainages should be considered as an approximate position only of the appropriate feature or element being described.

Ch. 0m occurs in the townland of *Toberbride* with chainages increasing as one travels south. However, this is with the exception of a section of alignment occurring north of Ch. 0m which extends negatively for a distance of -190m to the centre of the existing N4/N17 roundabout in the townland of *Collooney/Toberbride*. These negative Ch. values form part of the *Proposed Road Development* and are provided for geometric purposes in order to tie the mainline alignment into the aforementioned roundabout; they are presented on the drawings contained in volume 3 with a blue background to clarify their extent.

The chainages and link lengths described within this chapter have been rounded for reasons of clarity. A fuller representation of chainages and lengths may be obtained from the drawings included in Volume 3 of this EIS.

## 3.2 Road Type and Cross Section

The following outlines the Road Type of the *Proposed Road Development*.

### 3.2.1 **Type of Road**

#### 3.2.1.1 Outline

As already outlined the mainline realignment will comprise two separate forms of Road Type with the change in cross section defined by a roundabout in the townland of *Castlebaldwin*.

Approximately 13.82km of the proposal consists of a Type 2 Dual Carriageway commencing at the existing N4/N17 roundabout[7] in the townland of *Collooney/Toberbride* and extending to a proposed roundabout in the townland of *Castlebaldwin.* The *Proposed Road Development* will tie back into the existing N4 to the south of the aforementioned roundabout with a Standard Single Carriageway alignment measuring approximately 0.89km in length before its conclusion in *Cloghoge Lower*.

The Type 2 Dual Carriageway road consists of two lanes in both directions. For safety reasons a 4 lane undivided road is considered unacceptable on rural sections of the network where a 100kph speed limit applies. Therefore, on this type of road it is proposed to use a segregating barrier within the paved median to separate the traffic streams. Cyclists and pedestrians will be encouraged by signage to use an alternative route, for example the old national primary route.

[7] Physical works start at the Inscribed Circle Diameter of the roundabout.

*Figure 1-2: Photomontage representation of a typical Type 2 Dual Carriageway layout*

The road is designed so as to minimise the number of junctions and to provide drivers with straightforward junction layouts. There will be no gaps provided in the central reserve and there will be no direct access from land or houses onto the road.

The section of road which is proposed to be Standard Single Carriageway will be commensurate with the existing improved section (Curlew Mountains Bypass) of the National Primary route at *Cloghoge Lower Td*. This consists of a single carriageway and hard shoulder in each direction.

Lay-by's will be provided corresponding to Type D as per NRA DMRB TD 69/10 which will be 4m wide[8] and 30m long with a 45m diverge taper and a 25m merging taper. These Lay-By's will be provided at locations of not more than 2.5km centres along the mainline of the *Proposed Road Development*.

For safety reasons, hard standings within verges will be provided for emergency breakdown usage. These hard standings will be a minimum of 1.2m wide and will be of light construction such as compacted cement bound granular material.

### 3.2.2 Description of alignment

The alignment which is indicated in plan terms in Figures 4.1.1-4.1.8 (contained within Appendix A to this Non Technical Summary) has been designed to produce a continuous flowing arrangement throughout. The following gives a brief drive-through perspective of its main characteristics as it transverses from north-west to south-east alternating as outlined from Type 2 Dual Carriageway to Standard Single Carriageway.

#### 3.2.2.1 Section 1

##### 3.2.2.1.1 *Type 2 Dual Carriageway*

The initial section of the *Proposed Road Development* includes a full online upgrade of the existing N4 between its commencement point at the N4/N17 roundabout and c. Ch. 2,430m where it begins to divert offline. This online section includes:

- Widening of the existing Standard Single Carriageway road to a Type 2 Dual Carriageway cross sectional width;
- Modification of the vertical curvature of the existing N4 to provide cover for underbridges and culverts with an emphasis also of eliminating flat spots on the superelevation transition areas of horizontal curves;
- Closure of all existing direct accesses on the route and collection of the severed local network west to east and *vice-versa* via the following:
    - A parallel link road east of the proposed N4 (eastern parallel link road) which will tie the existing N4 into the existing N4/N17 roundabout via an additional roundabout (and additional link described below) provided in the townland of *Toberbride* and located to the south-east of the existing business/enterprise estate. The link road measures c. 2.950km in

[8] Including hardstrip.

length and will over this distance collect the L7611-0, the L-76121-0, numerous residential and agricultural accesses while also accommodating the provision of a 3m wide cycle track. In general it follows the existing topography as closely as possible with the exception of a fill section located in the vicinity of the *Toberbride/Mullaghnabreena* townland boundary which is required to maintain a suitable vertical gradient.

- The aforementioned link will tie into the existing N4/N17 roundabout via the Toberbride East-West Link which will include the upgrade of the existing private road between the aforementioned roundabout and the Toberbride (East) Junction. This link measures c. 320m in length;
- A link measuring c. 260m in length between the aforementioned eastern parallel link road and the L-7611-0 which will itself receive minor improvements. This link will cross on embankment over the proposed N4 via an overbridge (Toberbride Overbridge);
- A western parallel link road between a proposed roundabout (Cloonamahan Junction, North) in the townland of *Cloonamahan* which will connect the L-3606-9 (which will itself receive localised improvements) with an additional roundabout provided south-west of the proposed N4 in the townland of *Doorly* (Doorly Junction). This link will also collect the L-14019-0 and numerous residential and agricultural accesses, it will be connected underneath the proposed N4 to the eastern parallel link road via the Doorly Underbridge (North);

Before diverting offline, the online section from its commencement point travels in a southerly direction, where at c. Ch. 280m it intercepts the aforementioned link between the L-7611-0 and the eastern parallel link which is designed to pass over the proposed N4 on an overbridge, embankments and approach road measuring some 230 metres in length (Toberbride Overbridge). The proposed mainline begins to change direction at c. Ch. 700m to a more south-easterly one passing to the east of Toberscanavan Loughs at c. Ch. 1,300-1,550m before passing over the aforementioned link between the eastern and western parallel links at c. Ch. 2,500m which is accommodated by a road underbridge (Doorly Underbridge, North).

The online upgrade concludes at c. Ch. 2,430m and the realignment continues with an offline section which is described below:

- The alignment diverts offline in a south-south-easterly direction at c. Ch. 2,430m in the townland of *Doorly.* The proposed route continues to pass over the L55015-0 which will be maintained via an underbridge (Doorly Underbridge, South) in order to restore access to agricultural land to the south-west of the proposed alignment. It then continues in a south-south/easterly direction passing to the west of Lackagh Fen and continuing through the townlands of *Doorly* and *Knocknagroagh*, where at c. Ch. 4,020m the local tertiary road L-55016-0 is realigned and designed to pass over the proposed N4 on an overbridge (Knocknagroagh Overbridge) and embankments. This local road is being realigned northwards to form a Major/Minor priority junction with the existing N4 approximately 30 metres north north-west of its existing location;
- The proposed N4 design continues through a more south-easterly direction across agricultural land to c. Ch. 4,440m in the townland of *Knocknagroagh* where it passes over the Turnalaydan Stream (or Lough Corran Outflow). A river diversion and clear span river bridge is being provided at this location;
- It continues to pass to the East of Boathole Lough and Lough Corran while maintaining a south-easterly direction through agricultural and bog land in the townland of *Drumfin*, where at c. Ch. 5,570m the local secondary road L-5502-0 (known locally as the Bog Road) is realigned and designed over c. 500m to pass over the proposed N4 on an overbridge (Drumfin Overbridge, North) and embankments;
- The design continues to maintain its direction passing through agricultural land in the townland of *Drumfin* where at c. Ch. 6,600m the local primary road L-1502-32 is realigned and designed over c. 700m to pass over the proposed N4 on an overbridge (Drumfin Overbridge, South) and embankments. This point provides a strategic location for the only junction on the Type 2 Dual Carriageway which is provided in the form of a Compact Grade Separated Junction (CGSJ) allowing access to the rural hinterland including the nearby towns of Ballymote and Riverstown;
- Continuing in a more south-easterly direction the design passes through the townland of *Cloonlurg* across some agricultural land but mainly forestry. It passes under a 220 kV line at c. Ch. 7,120m which will be required to be raised in advance of the main construction contract.

At c. Ch. 7,360m it crosses a river (marked on OSi maps as the Arrow or Unshin River but known for the purposes of this EIS as the Drumfin River) on embankments. A clear span river bridge is being provided at this location.

- The alignment maintains its general direction passing through agricultural land in *Carrowkeel* and *Carrownagark* to c. Ch. 8,630m where it crosses on embankment over local secondary road L-5402-0. The local road will remain online and will be directed under the proposed N4 via an underbridge (Carrownagark Underbridge);
- The alignment continues through agricultural land and some recently planted forestry in *Kingsbrook Td.* to c. Ch. 9,300m where it crosses on embankment over local tertiary road L-54033-0. The local road is being realigned slightly to the east and will be directed under the proposed N4 via an underbridge (Kingsbrook Underbridge);
- The alignment changes to a more easterly direction via the application of a left hand horizontal curve through *Aghalenane Td.* passing Aghalenane & Ardloy Loughs which are to the north-east of the proposed route. It continues through *Kingsbrook* and *Ardloy Td.* to c. Ch. 10,220m where it crosses on embankment over the existing N4. The existing N4 which has been recently realigned will pass under the proposed realignment via an underbridge (Existing N4: Ardloy Underbridge). At c. Ch. 10,800m the alignment crosses on embankment over local secondary road L-5401-0. The local road will remain online and will be directed under the proposed N4 via an underbridge (Tawnagh Underbridge);
- The alignments direction gradually changes to a south-easterly one via a right hand horizontal curve though the townlands of *Springfield* and *Tawnagh* and continues to maintain this direction passing through agricultural land in the townlands of *Cloonymeenaghan* and *Sheerevagh* to c. Ch. 12,330m where it crosses on low embankment over local tertiary road L-54041-0. This local road is being closed as alternative access to the surrounding hinterland is available via local primary road L-5404-0;
- The alignment continues in a south-easterly direction through agricultural land in the townlands of *Sheerevagh* and *Drumderry* where a right hand horizontal curve gradually begins to change its direction to a more southerly one severing local road L-1404-0 at c. Ch. 13,530m. A roundabout (Castlebaldwin Junction) is proposed at c. Ch. 13,630m in the townland of *Castlebaldwin* which allows for the re-linking of the aforementioned local road providing an access point to Castlebaldwin and the surrounding hinterland. This point marks the end of the Type 2 Dual Carriageway.

#### 3.2.2.2 Section 2

##### 3.2.2.2.1 *Standard Single Carriageway*

The tie-in to the existing national primary network will be via a Standard Single Carriageway re-commencing from the aforementioned roundabout. The alignment continues from the roundabout in a southerly direction passing Castlebaldwin House (National Monument no. 373) to the east before continuing through agricultural land in the townland's of *Castlebaldwin* and *Cloghoge Upper.* It ties back into the existing N4 in a south easterly direction in the townland of *Cloghoge Lower* concluding at c. Ch. 14,522m.

### 3.2.3 **Cross Section**

#### 3.2.3.1 Type 2 Dual Carriageway

The proposed Type 2 Dual Carriageway cross section provided between the 2 aforementioned roundabouts is outlined in Figure 4.4.1 (Appendix A of this Non Technical Summary) and consists of a paved width of 16.5m within an overall cross sectional width of 21.5m. The overall section comprises:

- 2 x 7m paved two-lane carriageway sections;
- 2 x 0.5m paved hard strips;
- 1.5m paved central median with a segregating safety barrier;
- 2 x 2.5m grass verges.

#### 3.2.3.2 Standard Single Carriageway

The proposed Standard Single Carriageway cross section provided to the south of the Castlebaldwin Junction (roundabout) is outlined in Figure 4.4.1 (Appendix A of this Non Technical Summary) and consists of a paved width of 12.3m within an overall cross sectional width of 18.3m. The overall section comprises:

- 2 x 3.65m paved single-lane carriageway sections;
- 2 x 2.5m paved hard shoulders;
- 2 x 3m grass verges.

#### 3.2.3.3 Other Road cross sections

The proposed cross-sections of realigned local roads, compact connector roads and access tracks are shown in Figure 4.4.2 (Appendix A of this Non Technical Summary). In the case of local roads and compact connector roads, these generally consist of carriageways in each direction with hard strips; that is with the exception of the Eastern Parallel Link which will be provided with a cycle track (two way) adjacent to the south bound carriageway. The access tracks generally consist of a 4m road with pull in bays at between c. 200m to c. 250m centres.

*Figure 1-3: Example of a Typical Access Track.*

## 3.3 Traffic Flows

The traffic model shows that for the majority of the existing N4 between the *Proposed Road Developments* tie in points; that there will be substantial reductions in traffic volumes particularly to the south of the existing N4's junction with the L-1502-32 (Known locally as the Ballymote Road). The traffic model also predicts that there will continue to be activity from the village of Riverstown in the direction of Sligo on the existing route, however, there will be adequate capacity to safely cater for this volume of traffic on the existing route particularly insofar as the status of the route will be downgraded to Local Primary on completion of the *Proposed Road Development*.

In terms of the existing local road network the traffic model indicates in general that there will be little change in trip patterns on the existing roads with the exception of a marginal change in trip patterns to Ballymote balanced by a reduction of 300 AADT on the L-1404-0 (to the west of Castlebaldwin village) and a similar increase on the L-1502-32.

## 3.4 Road Safety

Based on projections outlined in the traffic model, it is expected that the *Proposed Road Development* will provide considerable safety and amenity benefits to future users of the existing route while maintaining to a large degree existing travel patterns of users on the existing local roads.

For long distance through traffic, the use of a Type 2 Dual Carriageway with a central reserve segregating barrier will remove the possibility of head-on collisions leading to a reduction in the number and severity of accidents.

Users of the current N4 route making short local trips will find it safer to access and exit the road network as a result of the substantial decrease in traffic volumes and the lower speed limit on what will be the re-designated local road. The provision of a Compact Grade Separated Junction (CGSJ), a roundabout and the removal of numerous private and minor access points means that dangerous at-grade crossing manoeuvres will be eliminated. The Cost Benefit Analysis undertaken as part of the Project Appraisal for the *Proposed Road Development* indicates that; when compared with the Do-Minimum scenario, the proposal will bring about a net reduction of 280 accidents over a 60 year lifetime (including a statistical reduction of 29 fatal casualties, 96 serious causalities and 975 slight causalities). This will contribute €32.444m (High Traffic Growth Scenario) to the Present Value of Scheme Benefits (PVB). The accidents component of the overall PVB is 30-35%, meaning that accident savings from the proposal will account for a significant proportion of the total scheme benefits. The project will therefore bring about a 9% reduction in all accidents and a 12% reduction in fatal accidents over the appraisal period.

## 3.5 Structures

There are a total of 18 principal structures[9] provided for within the *Proposed Road Development* including:

- 4 no. road overbridges;
- 6 no. road underbridges;
- 2 no. clear span river bridges;
- 2 no. retaining walls (or reinforced earth structure) with a height in excess of 1.5m;
- 1 no. intermediate support ESB tower; and
- 3 no. noise barriers with a height greater than 3m.

In addition there will be a number of minor structures[10] provided for within the *Proposed Road Development* including:

- Culverts for drainage and environmental mitigation with a span of less than 3m;
- Noise mitigation barriers less than 3m in height;
- Cantilever signs at each Compact Grade Separated Junction;
- Retaining walls with a height of less than 1.5m

## 3.6 Environmental Design Features

### 3.6.1 **Drainage Infrastructure**

The drainage infrastructure to be provided as part of the *Proposed Road Development* includes features which insofar as practicable adhere to the principles of Sustainable Urban Drainage Systems (SUDS). These features will include the provision of Grassed Surface Water Channels and Constructed Wetland attenuation facilities.

[9] *Principal Structures* for the purposes of this EIS shall include all those Category 1 and 2 structures as defined in NRA BD 02/09.

[10] *Minor Structures* for the purposes of this EIS shall include all those Category 0 structures as defined in NRA BD 02/09.

*Figure 1-4: Typical examples of a Grassed Surface Water Channel and a Constructed Wetland.*

### 3.6.2 Pedestrian and Cyclist Provision

The provision of safe and adequate facilities for non-motorised road users (NMU's) is an important aspect of any new road scheme. In recognition of this, the *Proposed Road Development* considers specific measures for NMU's including mitigation measures set out in Chapter 6 of the Main Report (Volume 2 of this EIS) including:

- To encourage the use of the existing route via signage provision;
- Provision of a 3m wide cycle track (two way) adjacent to the south bound carriageway on the Eastern Parallel Link which connects the existing N4 to the Toberbride (East) Junction;
- Provision of traffic islands and associated footpaths/cycle tracks at entry/exits from the Castlebaldwin Junctions;
- Provision of traffic islands and associated footpaths at entry/exits from the Drumfin/Cloonlurg Junction (CGSJ) of both the north and south bound Compact Connector Roads where they meet the L1502-32;
- Provision of footpaths on road over and underbridge structures;
- A section of the L-1404-0 which is part of the Beara Breifne Way (a historical trail which follows the line of the march of O'Sullivan Beara in 1602) is severed by the *Proposed Road Development* at circa Ch. 13,530m. The design in considering this trail proposes a 2m wide walking track to re-link pedestrians (over the shortest length possible) via an uncontrolled pedestrian crossing back into the historical trail.

## 3.7 Construction Phase

### 3.7.1 Programme & Contract

The construction period is anticipated to last approximately 2 years. Normal hours of work will be Monday to Saturday 07:00 to 19:00 hours unless specific restrictions are placed on certain activities within certain chapters of the EIS. Certain operations may however be carried out outside of these hours with the permission of the contracting authority.

Where restrictions are placed on the Contractor due to seasonal constraints, as for example in the case of felling of trees, consideration will be given to advance works being undertaken where appropriate.

### 3.7.2 Temporary Road Diversions

The locations where local roads require temporary diversions during construction of the realignment are listed below. These diversions will in most cases be accommodated within the land-take required for construction of the *Proposed Road Development*. However, there are localised instances where the diversion may be via alternative routes on the local road network. All diversion routes will be properly sign posted.

In all additional cases to those described below, local road access shall be maintained throughout the construction process via localised treatment measures within the landtake required for the *Proposed Road Development.*

*Table 1-3: Temporary Road Diversions*

| Location | Temporary Diversion Required |
|---|---|
| c. Ch -190m (Mainline Ref.) to c. Ch. 2,953m (Eastern Parallel Link Ref.) | Temporary localised diversion required through the works area including consideration of the various local roads (public and private) and accesses adjoining this section of the national primary route.<br>This will be a Traffic Management measure. There will be no detours outside the CPO line permitted unless unforeseen conditions dictate. In such circumstance such diversions shall only be carried out with the permission of the Local Authority. |
| L-7611-0/L-7612-0 | Temporary access arrangements to be accommodated during construction (within the CPO) either on or adjacent to the L-7611-0 and the L7612-0. |
| L-55015-0 | Temporary access arrangements to be accommodated during construction (within the CPO) either on or adjacent to the L-55015-0. |
| L-55016-0 | Temporary access arrangements to be accommodated during construction (within the CPO) either on or adjacent to the L-55016-0. |
| L-5502-0 | During the construction period detours may be required to facilitate structure, alignment construction and the operation of the adjacent spoil repositories/borrow pits. Detours shall be via the existing local road network. |
| L-1502-32 | Temporary access arrangements to be accommodated during construction (within the CPO) either on or adjacent to the L-1502-32. |
| L-5402-0 | Temporary access arrangements to be accommodated during construction (within the CPO) either on or adjacent to the L-5402-0. |
| L-54033-0 | Temporary access arrangements to be accommodated during construction (within the CPO) either on or adjacent to the L-54033-0. |
| L-5401-0 | Temporary access arrangements to be accommodated during construction (within the CPO) either on or adjacent to the L-5401-0. |
| L-1403-0/L-1404-0 | Temporary access arrangements to be accommodated during construction (within the CPO) either on or adjacent to the L-1403-0/L-1404-0. |
| Ch. 14,000 – 14,522m (Mainline Ref.) | This will be a Traffic Management measure. There will be no detours outside the CPO line permitted unless unforeseen conditions dictate. In such circumstance such diversions shall only be carried out with the permission of the Local Authority. |

### 3.7.3 Additional Construction points of note

The likely temporary impacts associated with the construction phase of the *Proposed Road Development* are addressed in the EIS. A number of pre-construction activities will be carried out such as environmental surveys and determination of the location of services, which may need to be diverted during the construction phase.

The *Proposed Road Development* will involve substantial earthworks. It is intended that some of the materials arising from these earthworks will be reused as either general engineering fill or for landscaping works. However, the *Proposed Road Development* will traverse areas of poor ground where the excavated materials are likely to be of a poor engineering quality and unsuitable for reuse in road embankment construction. Where practicable, these surplus materials will be placed on site by the Contractor in pre defined spoil repositories or disposed of in accordance with all applicable legislation. There will be a deficit of suitable engineering fill material arising from site and it will have to be sourced from onsite borrow pits or offsite quarries. The Contractor will, for economic reasons, seek this material as close as possible to the area in which it is required and it will be transported to site. It will be impossible to eliminate all the disruption that will occur during construction activities. However, the construction of the *Proposed Road Development* will be undertaken in a manner that aims to manage and control disruption resulting from environmental impacts. Disruption to road users as a result of construction traffic will be minimised through the provision of a Traffic

Management Plan, prepared by the Contractor, and including appropriate signing and traffic controls (e.g. traffic lights).

Potential impacts of construction activities include: -

- Nuisance caused by noise, vibration, mud and dust;
- Disruption to road users due to temporary road closures, roadwork's and construction traffic;
- Potential damage to local roads;
- Interference with access and services.

Occupiers of properties and landowners in close proximity to the proposed route are likely to be the most affected by construction activities. While it is estimated that the *Proposed Road Development* will take approximately two years to complete, at individual locations construction activities are likely to be of a much shorter duration.

Sligo County Council will minimise the construction impact by the measures which will include the following:-

- Setting and implementing standards relating to working hours, discharges to watercourses and the control of dust and emissions.
- Limiting the use of existing roads by construction traffic.
- Limiting the number and duration of road closures.
- Reinstatement/replanting of landscape and habitats disrupted by construction activities.
- Ensuring that the construction contractor locates construction compounds with due regard to the proximity of residential properties and other sensitive receptors and habitats and their visual intrusion in the landscape.
- Ensuring the proper maintenance of roads during the construction period.
- Ensuring access to properties and lands is maintained during construction.

# 4 Environmental Impacts and Mitigation

## 4.1 General

This section provides an overview of the environmental impacts of the N4 Collooney to Castlebaldwin *Proposed Road Development*.

Environmentally sensitive areas in the vicinity of the proposed route were initially identified during the constraints and route selection phases. Throughout the EIS process mitigation by avoidance has been adopted where possible and changes have been made to the design to reduce or eliminate adverse impacts. In areas where this has not been possible mitigation measures have been suggested to reduce or eliminate the impacts.

The following is intended to provide an overall appreciation of environmental impacts and proposed mitigations; therefore no reliance should be placed on the fullness of the information contained herein. Where additional information is required, the reader is recommended to refer to the full body of the EIS.

## 4.2 Human Environment

Human beings interact, to a greater or lesser extent, with all aspects of the receiving environment; therefore impacts on any aspect of the environment have the potential to impact on human beings. The impact of the *Proposed Road Development* as it specifically relates to human beings is covered under the headings Socio-Economic, Non-Agricultural property, Noise and Vibration, Air Quality, Landscape and Visual Impacts, and Agricultural property.

### 4.2.1 **Socio-Economic**

The socio-economic assessment considered predicted impacts to the existing environment as a result of the construction and opening of the proposed road. The report addressed impacts, both positive and negative, in relation to journey characteristics and length, journey quality, severance, quality of life and economics.

#### 4.2.1.1 Existing Environment

In a regional context the N4 is one the State's key national primary routes linking the Midlands and the East of the country with the North-west, including County Sligo, North County Leitrim and County Donegal. The road is described in the National Spatial Strategy as a National Transport Corridor connecting the Gateway City of Sligo and as being fundamental to the development potential of the Western Region.

From a demographic perspective both the existing road and the proposed new alignment pass through a lightly populated rural area. No large towns are directly affected, although Ballymote, Collooney and Ballysadare fall just outside the study area and Sligo town is only eleven kilometres to the north. The largest community in the road corridor is Castlebaldwin, although the core of this settlement is represented by only around 20 properties. Riverstown is a larger community situated three kilometres east of the existing road.

Community facilities along the route are limited given its predominately rural location, however, there are facilities located at Castlebaldwin, Riverstown and numerous townland's along the route which are typical of the settlements in question.

The N4 in the study area carries a significant volume of traffic. Journey times can vary due to the mixture of national, regional and local traffic, their differing speeds and a lack of safe overtaking opportunities. These factors combined with the narrow width of much of the road means that journey times would be sensitive to changes in traffic volumes.

#### 4.2.1.2 Likely Impacts

In terms of journey characteristics, the *Proposed Road Development* represents a contribution to on-going regional improvements to the N4. It will replace the existing stretch of the N4, which is deficient in alignment and includes several sub-standard bends. Consequently, there are positive impacts in that typical journey times would be reduced and road safety improved. This will enhance prospects for economic development and stimulate increased tourist activity.

At a local level there will be both positive and negative impacts. Quality of life for residents adjoining the existing N4 would be improved, particularly due to the significant reduction in Heavy Goods Vehicle (HGV) traffic.

In general, the improved road network brought about by the completion of the *Proposed Road Development* will provide significant benefits. There will be some adverse impacts on a number of individual properties, which are located close to the proposed road.

#### 4.2.1.3 Mitigation Measures

To minimise severance due to the new route ten new road bridges, one roundabout and one Compact Grade Separated Junction are being provided.

In addition, a number of link roads and accommodation roads are being provided to facilitate access. 16 local roads in addition to the existing N4 (At Ardloy Td.) and including the L-7611-0, L-7612-0, L-76121-0, L-3609-0, L-14019-0, L-15015-0, L-55016-0, L-5502-0, L-1502-32, L-5402-0, L-54033-0, L-5401-0, L-54041-0, L-1404-0 and the L-1403-0 will be severed as a result of the *Proposed Road Development*. New Links will be provided in all cases with the exception of the L-54041-0 which has a close alternative via the L-5404-0. These new links will provide for a notable change in trip patterns for traffic using the L-7611-0, L-7612-0, L-76121-0, L-3609-0, and the L-14019-0.

A number of businesses, particularly those along the existing N4, may suffer as a result of the loss of passing trade. In order to mitigate for loss of passing trade occurring as a result of redistribution of national through traffic, general services information signs will be provided at the proposed junction locations. These standard information signs will indicate the range of services along the proposed route.

More specific mitigation measures include:

- Encourage construction traffic to use new alignment where possible;
- Provide footpath (slightly elevated above road surface) and cyclepath (on the southern side of the link between Castlebaldwin village and the roundabout) at Castlebaldwin Junction (roundabout) with the realigned L1404-0;
- Use signage to direct walkers to crossing at Castlebaldwin Junction where the *Proposed Road Development* severs the L1404-0 and Historical Trail;
- Provide signage at Castlebaldwin and Toberbride junctions to encourage cyclists to use the existing road as an alternative to the new alignment in accordance with the provisions of the NRA DMRB;
- Provide tourism signage in line with NRA guidelines at Castlebaldwin Junction including for Carrowkeel Megalithic Complex;
- Provide services signage to encourage use of petrol, retail and food facilities in Castlebaldwin;
- Provide limited car parking for vehicles together with tourism information (for Carrowkeel, Castlebaldwin Fortified House, the Historical Trail and other local facilities) at the proposed landscaped mitigation area in Castlebaldwin as described in the Landscape and Visual Impact Assessment Chapter of the Main Report (Volume 2 of the EIS);
- Allow for access to the landscaped area in Castlebaldwin. See also mitigation proposed in the Landscape and Visual Impact Assessment Chapter.

#### 4.2.1.4 Residual Impacts

Overall, it is predicted that the proposed road provides net positive impacts due to improvements to journey time and journey time reliability, reduction in severance and improvement in the quality of life of people living close to the existing road. There will be some negative impacts relating to loss of passing trade. However, there is the potential to mitigate these impacts over time.

### 4.2.2 **Non-agricultural property**

#### 4.2.2.1 Existing Environment

The existing land use environment along the *Proposed Road Development* can be described as agricultural. In general terms, agriculture is the dominant land use with livestock farms predominating land areas.

#### 4.2.2.2 Likely Impacts

The *Proposed Road Development* will directly impact upon 26 residential properties, 13 miscellaneous properties and 2 commercial properties. On 5 residential properties the land take will consist only of lands currently occupied by public road. Fifteen residential properties will be acquired as part of the *Proposed Road Development*. Eight of the residential properties to be acquired are currently inhabited. The remaining seven residential properties are uninhabited. Twelve of these properties will be demolished. Three properties will be retained for possible resale in the future.

On the remaining residential properties land take will consist of acquisition of part of the entrance, garden or boundary wall of the properties. Land take on the commercial properties will consist of the acquisition of part of the car parking area and access road for a retail unit in Toberbride Business Park and portion of public road and set back area will be acquired in front of a former public house.

Landtake on the miscellaneous properties will consist of the acquisition of the ruins of a shed and a site area on one property and on land take will consist of land and part of public road on the remaining properties. The *Proposed Road Development* will have property impacts on the following:

- Residential houses / buildings;
- Property boundary;
- Property access / entrance;
- Driveway;
- Garden shrubs and trees;

Details of the impact on each of these properties are presented in Appendix 7.1 contained within Volume 4 of this EIS.

#### 4.2.2.3 Mitigation Measures

Monetary compensatory measures for the loss of land, buildings and other injurious affection will comprise part of the land acquisition procedures with property owners affected by the landtake for the *Proposed Road Development*. Such compensation measures do not from part of the EIS and are therefore not considered further in this assessment.

Where existing access is affected, this will be reinstated as described in Appendix 7.1 (Volume 4 of this EIS). In some cases it may not be feasible to reinstate the original access, however, an alternative access will be provided.

Where a boundary wall is impacted upon by the *Proposed Road Development,* mitigation will involve the replacement of the boundary on a like for like basis. If necessary, these works will be carried out as part of the contract or by agreement where the landowner may be compensated to replace the boundary wall.

Where existing services (e.g. electricity supply, water supply) are impacted by the *Proposed Road Development* these will be restored or alternative supplies will be provided.

#### 4.2.2.4 Residual Impacts

Of the 41 non-agricultural properties directly impacted by the *Proposed Road Development*, there are:

- Sixteen properties with a severe residual impact;
- No properties will have a major residual impact;
- One property will have a moderate residual impact;
- Nine properties will have a minor residual impact; and
- Fifteen properties will have a not significant residual impact.

Details of the impact on each of these properties are presented in Appendix 7.1 (Volume 4 of this EIS).

### 4.2.3 Noise and Vibration

This chapter of the EIS assesses the impacts of noise and vibration associated with both the constructional and operational phases of the *Proposed Road Development*. AWN Consulting Limited were commissioned to conduct an assessment into the likely noise and vibration impacts associated with the *Proposed Road Development*.

#### 4.2.3.1 Existing Environment

The existing noise climate has been surveyed and has been found to be typical of a rural area with a major route nearby. Prevailing noise levels are predominantly due to road traffic along the existing N4 road.
When considering a development of this nature, the potential noise & vibration impact on the surroundings must be considered for each of two distinct stages: the short term impact of the construction phase and the longer term impact of the operational phase.

#### 4.2.3.2 Likely Impacts

Likely impacts are described in terms of the operational (traffic) and construction conditions, and are based on receiver locations located at circa 86 locations in the vicinity of the *Proposed Road Development*.

In the design year of 2032 it is predicted that the combined expected maximum traffic noise level from the *Proposed Road Development* together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB $L_{den}$ at 28 locations. At 23 of these locations this is less than the Do Nothing level.

At the remaining 5 locations, i.e. R010, R016, R119, R227, and R254, the Do Something noise level is higher than the Do Minimum level, and in excess of the Design Goal. Therefore it is necessary to consider mitigation measures at these locations based on the design criteria.

#### 4.2.3.3 Mitigation Measures

The noise impact of the road has been assessed in accordance with the NRA Guidelines. Mitigation to offset the operational noise impacts identified at the balance of properties outlined in 4.2.3.2 (5 no) is in the form of noise barriers ranging in height from 1.5m to 4.0m. Mitigations to offset construction noise and vibration are more detailed in nature and include specific noise abatement measures to ensure compliance with statutory and guidance limits for construction noise and vibration. Normal working times are prescribed as being 07:00 to 19:00hrs Monday to Saturday.

#### 4.2.3.4 Residual Impacts

Subject to good working practice during the construction phase and not exceeding any limits proposed within the EIS, it is anticipated that construction noise and vibration can generally be managed to within acceptable limits.

### 4.2.4 Air Quality and Climate Change

The air quality impact assessment investigated the local and regional impacts associated with the *Proposed Road Development*. The local air quality assessment involved determining the impact on pollutant concentrations at properties close to the *Proposed Road Development*. The regional air quality assessment (including climate) involved determining the impact of increased vehicle emissions on a regional and national scale.
The local air quality assessment was conducted for the following pollutants: nitrogen dioxide ($NO_2$), carbon monoxide (CO), particulate matter less than 10 microns ($PM_{10}$), particulate matter less than 2.5 microns ($PM_{2.5}$) and benzene. Pollutant levels were compared to their ambient limit values as set out in the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011 and EU Directive 2008/50/EC). Dust deposition levels during the construction of the *Proposed Road Development* have also been assessed and results compared to the TA Luft Limit Value for Dust Deposition of 350 mg/($m^2$*day).

#### 4.2.4.1 Existing Environment

The assessment of the receiving environment consisted of a baseline air monitoring survey and an assessment of long term monitoring carried out by the Environmental Protection Agency (EPA). The baseline survey measured roadside and rural background levels of these pollutants in the region of the *Proposed Road*

*Development*. Monitoring of nitrogen dioxide ($NO_2$) was carried out using passive diffusion tubes sited at 10 locations close to the route of the proposed N4. Baseline monitoring for $PM_{10}$ and $PM_{2.5}$ was carried out at 1 background location in the region of the *Proposed Road Development* at Sheerevagh.
Based on the baseline monitoring results and an analysis of representative long-term EPA monitoring data, the current air quality in the vicinity of the *Proposed Road Development* is presently below the ambient air quality limit values for $NO_2$, benzene, CO, $PM_{10}$ and $PM_{2.5}$.

#### 4.2.4.2 Likely Impacts

The operational impact of the *Proposed Road Development* was assessed using the DMRB screening model, which is a recommended screening model for assessing the impact of road traffic emissions on air quality. The inputs to the air dispersion model consist of information on road layouts, receptor locations, annual average daily traffic movements (AADT), annual average traffic speeds and background concentrations. Ambient pollutant concentrations for the "do minimum" and "do something" scenarios were predicted at 23 worst-case assessment locations close to the *Proposed Road Development* as well as the existing N4.
The results of the dispersion modelling assessment show that concentrations of CO, benzene, $PM_{10}$, $PM_{2.5}$ and $NO_2$ in the region of the *Proposed Road Development* during the opening year (2017) and design year (2032) are below the ambient air quality limit values. Based on the National Roads Authority (NRA) air quality assessment criteria, the impact of the *Proposed Road Development* on levels of CO, benzene, $PM_{10}$, and $PM_{2.5}$ is negligible at all 23 assessment locations. The impact on levels of $NO_2$ is slight beneficial at 12 locations and negligible at the remaining 11 assessment locations. In summary, although some increases in the pollutant concentrations may occur at nearby properties, the resulting pollutant levels will be significantly lower than the limit values.
The regional air quality assessment investigated the impact of the *Proposed Road Development* on national emissions of the following pollutants: nitrogen oxides ($NO_x$), volatile organic compounds (VOCs) and carbon dioxide ($CO_2$). Emissions of these pollutants were investigated using the DMRB screening model.
With regard to $NO_x$ and VOCs, results indicate that the impact of the *Proposed Road Development* on Ireland's obligations under the Gothenburg Protocol is negligible. For the assessment year of 2017, the predicted impact of the proposed road is to increase $NO_x$ levels by 0.005% of the $NO_x$ emissions ceiling and increase VOC levels by 0.00006% of the VOC emissions ceiling which was to be complied with in 2010. For the assessment year of 2032, the predicted impact of the proposed road is to increase $NO_x$ levels by 0.0017% of the $NO_x$ emissions ceiling and decrease VOC levels by 0.00004% of the VOC emissions ceiling which was to be complied with in 2010.
With regard to operational $CO_2$ emissions and climate impacts, the assessment results show that the impact of the *Proposed Road Development* will be to increase $CO_2$ emissions by 0.002% of Ireland's Kyoto target in 2017 and 0.0025% of Ireland's Kyoto target in 2032. Thus, the impact of the *Proposed Road Development* on national greenhouse gas emissions will be negligible in terms of Ireland's obligations under the Kyoto Protocol.

#### 4.2.4.3 Mitigation Measures

Mitigation measures proposed relate principally to the construction phase and include:

- Site roads will be regularly cleaned and maintained as appropriate. Hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads will be restricted to essential site traffic only. Any road that has the potential to give rise to fugitive dust will be regularly watered during dry and/or windy conditions;
- Vehicles using site roads will have their speeds restricted where there is a potential for dust nuisance at nearby properties;
- Where practicable, vehicles exiting the site shall make use of a wheel wash facility prior to entering onto public roads. This will ensure that mud and other wastes are not tracked onto public roads. Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions;
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods;

- The dust minimisation procedures put in place will be monitored and assessed. In the event of dust nuisance occurring outside the site boundary, the effectiveness of existing measures will be reviewed and further mitigation will be implemented to rectify the problem.

#### 4.2.4.4 Residual Impacts

The results of the air dispersion modelling study show that the residual impacts of the *Proposed Road Development* on air quality and climate will be insignificant.

In terms of Construction Impacts, provided the dust minimisation measures outlined above are adhered to, the air quality impacts during the construction phase will not be significant.

### 4.2.5 **Landscape and Visual impact**

#### 4.2.5.1 Description of the Existing Environment

The *Proposed Road Development* is through a generally undulating rural landscape, consisting of drumlin hills and small lakes with a predominant land cover of pasture farmland and occasional conifer forests which is considered to be generally of Low Sensitivity concurrent with the current Sligo County Development Plan Landscape Characterisation Map, where the landscape surrounding the route is predominantly judged to be 'Normal Rural Landscape' with a '*capacity to absorb a wide range of new development forms.'*. That being said, the current Sligo County Development plan has designated a small number of relatively confined 'Sensitive Rural Landscape' areas in the vicinity of the route. They are located to the west of Doorly Hill, at Drumfin, the Toberscanavan Loughs and the Markree Estate at the northern half of the *Proposed Road Development*. South of the study area are further 'Sensitive Rural Landscapes' including Lough Arrow and the Bricklieve Mountains. Lough Arrow is not visible from the proposed route.

#### 4.2.5.2 Description of Likely Impacts

Impacts are assessed in terms of Landscape, Visual and Direct/Indirect impacts. In terms of the Macro Landscape level the most significant impacts are predicted at local drumlin hills around Ardloy, Springfield, Tawnagh and Cloonymeenaghan (Significant Adverse) and in the vicinity of Drumderry (Moderate to Significant Adverse). In terms of predicted visual impacts to individual properties it is predicted that:

- 10% of properties are expected to experience Significant Adverse Impacts;
- 14.5% will experience Moderate Adverse Impacts;
- 35.5% will experience Slight Adverse Impacts;
- 26% will be imperceptible; while
- 14% will experience Slight Positive Impacts.

#### 4.2.5.3 Description of Mitigation Measures

A series of mitigation measures has been prepared for the project with a view to offsetting the impacts outlined in 4.2.5.2, integrating the *Proposed Road Development* into the surrounding landscape, reducing the sense of intrusion and obstruction for nearby residents, maximising ecological potential and framing views where appropriate for future road users.

The proposed mitigation measures and planting proposals are based on the NRA publication *'A Guide to Landscape Treatments for National Road Schemes in Ireland'.* They consist of screen barriers and various planting mixes which are proposed to reduce adverse impacts and enhance the *Proposed Road Development* to integrate with the local landscape. They are graphically represented in detail drawings contained within Volume 3 of the EIS (Fig. 10.1.1 to 10.1.8).

#### 4.2.5.4 Residual Impacts

The residual impact assessment assesses impacts after a 5-7 year establishment period of planting areas. After this period it is assumed that shrub and woodland planting areas are established and that areas of disturbed open ground have been largely re-colonised by surrounding vegetation.

The majority of Macro Landscape areas surrounding the *Proposed Road Development* have been judged to continue to experience 'Slight Adverse' or 'Slight to Moderate Adverse' landscape impacts following completion of reinstatement and mitigation works and after a planting establishment and re-colonisation period of 5-7 years. The highest rating impacts remain at the local drumlin hills at Springfield, Ardloy Bridge and Cloonymeenaghan with 'Moderate to Significant Adverse' post-mitigation landscape impacts and at

Drumderry Hill and Castlebaldwin with 'Moderate Adverse' Impacts. Visual impacts to road users post mitigation have been judged to range from 'Slight Adverse' or 'Slight to Moderate Adverse' on the majority of route sections. The highest ratings remain at the local drumlin hills at Springfield, Ardloy Bridge and Cloonymeenaghan and at Drumderry Hill and Castlebaldwin with 'Moderate Adverse' Impacts.
Overall visual impacts of the *Proposed Road Development* in relation to individual properties post mitigation measures and following completion of a 5-7 year establishment period is summarised as 'imperceptible to positive' for 40% of properties assessed. 'Slight adverse' impacts will be experienced by a further 43.5% of properties as result of the *Proposed Road Development*. 'Moderate Adverse' impacts will be experienced by 12.5% of the receptor dwellings, whilst 'Significant Adverse' Impacts will be experienced by 4% of properties assessed.

### 4.2.6 **Agriculture**

Philip Farrelly & Company carried out an agricultural impact assessment on the construction of the N4 *Proposed Road Developmen*t from October to December 2006, November 2009, November to December 2012 and June to August 2013. The *Proposed Road Development* will affect a total of 92 farms.

#### 4.2.6.1 Existing Environment

The area to be removed from agricultural production as a result of the *Proposed Road Development* is approximately 170 Ha. The topography is generally drumlin in nature with soils being of a dry mineral soils nature which have a limited use range. Grassland farming is the primary land use in the area through which the proposed route passes.

#### 4.2.6.2 Likely Impacts

Of the 92 farms assessed, there are 22 farms on which the overall impact would be described as major. On 36 farms, the overall impact would be moderate. On 19 farms, the overall impact would be minor. On 15 farms, the impact would be described as not significant. Dairy farms and other livestock farms where stock have to be moved on a daily basis will be most severely affected by developments that sever the farm. Farms where equine stock are present are also a concern. Dry-stock enterprises (e.g. beef, sheep) are less severely impacted than dairy farms. Tillage farms are less severely impacted than dairy or beef farms, in all cases mitigation measures are possible, which will reduce the impact.
The main impacts on agricultural activity during the construction phase of the new road will be:

- Disturbance;
- Temporary Diversions;
- Restricted access to severed land portions;
- Noise and Dust.

#### 4.2.6.3 Mitigation Measures

Mitigation measures detailed in this section relate to engineering accommodation works alone. Further measures to compensate farmers due to land acquisition, drainage works and loss of facilities can be agreed by the valuer at a later stage.

A total of twenty eight land parcels, out of the 106 assessed land parcels, have areas of lands, which have been severed. New access will be required on 39 land parcels. Access is deemed to be required where it has to be provided to a sub-divided area or to a retained area of land where the entire road frontage is removed. There are fifty land parcels on which the existing access point(s) will be affected or a new access point off an existing road may be required. The access points will have to be reinstated on these land parcels.

The extent and complexity of such access provisions vary with each farm depending on the nature of the impact and the type of enterprise being carried out. In some cases simple gateways will suffice, while in other cases new accommodation roads and bridges may have to be constructed.

Timber post and rail fencing with stock proofing as appropriate will be provided along the main line, regional, local and accommodation roads. The Local Authority will maintain the fence along the National road. It will be the responsibility of the landowners to maintain the fence along regional, local and accommodation roads.

#### 4.2.6.4 Residual Impacts

In all cases mitigation measures are possible, which will reduce the impact of the above. Following recommended mitigation works the residual impact of the *Proposed Road Development* resulted in 8 farms with a major impact, 47 farms with a moderate impact, 22 farms with a minor impact, and 15 farms with a not significant impact.

The impacts of the *Proposed Road Development* upon agriculture, while significant to individual farmers, are not significant on a county or national level.

## 4.3 Natural Environment

A study was carried out to provide an assessment of the likely significant effects / impacts of the *Proposed Road Development* on the natural environment (i.e. Flora, Fauna and Fisheries; Geological; Hydrological and Hydro-Geological).

Field surveys were undertaken to gather data on the existing environment. Consultations were held with relevant statutory bodies.

### 4.3.1 **Flora, Fauna and Fisheries**

The ecological (Flora, Fauna and Fisheries) impact assessment aims to identify the areas of ecological interest along the *Proposed Road Development* and its associated zone of influence that may present constraints to development or where special mitigation is necessary. An evaluation is made of the scientific and/or conservation value of the ecological features and conservation sites identified.

#### 4.3.1.1 Existing Environment

The *Proposed Road Development* footprint and zone of influence was surveyed systematically over an extended period from October 2005 to June 2006. The extensive information obtained during the initial baseline surveys was further supplemented by additional targeted fieldwork undertaken during November 2009 and September 2010. Follow-up surveys including detailed habitat assessments and species specific surveys were undertaken between September and December 2012 and during June to October 2013 to provide up-to-date verification of baseline conditions. Habitat surveys and classification was undertaken following Fossitt (2000). Mammal surveys and bat surveys were undertaken following the guidelines prepared by the NRA, with reference to national guidelines published by the NPWS. The main rivers and streams in the study area were subjected to detailed ecological assessment including a River Corridor Habitat appraisal (using EA, 2003 methodology). Kick sampling assessments were undertaken on all the main watercourses following the EPA methodology (Toner *et al.*, 2005), while kick sampling from smaller streams followed the Small Streams Risk Score (Walsh, 2005). Terrestrial macroinvertebrates were sampled in selected areas using Rapid Biological Assessment (RBA) techniques. Surveys for Annex II terrestrial macroinvertebrates (i.e. whorl snails and marsh fritillary) were also undertaken.

Designated nature conservation sites within the study area were identified; where candidate Special Areas of Conservation (cSACs), Special Protection Areas (SPAs) and Natural Heritage Areas (NHAs) in proximity of the *Proposed Road Development* were assessed for the potential for impacts arising from the proposal. A Natura Impact Statement (Appendix 12.1, Volume 3 of the EIS) has been prepared for the *Proposed Road Development* to assess whether this proposal is likely to have a significant effect on the Natura 2000 site network. Effects upon the conservation objectives and qualifying interests (including habitats and species) within the affected designated areas are evaluated.

The *Proposed Road Development* does not cross or directly impact on any designated conservation site. However, there are hydrological connections between the watercourses crossed by the road corridor and three designated Natura 2000 conservation sites; the Unshin River cSAC and the Lough Arrow cSAC and SPA complex.

Additional areas of high biodiversity value within the study area are identified, some of which are considered to be of NHA quality (National Importance) but are currently not listed for designation. Sites identified as County Biodiversity Sites in the Sligo County Development Plan (2011-2017) are included within this category. These habitat areas, particularly wetland sites, include habitats which are identified as Annex I or priority Annex I Habitats. These areas include Annex I habitat complexes such as at Toberscanavan Loughs, Lackagh Fen, Boathole Lough & Lough Corran and Ardloy and Aghalenane Loughs. These areas are currently not formally designated as conservation sites, and have no restrictions imposed regarding agricultural activities. Further consultation with NPWS and national experts have resulted in the evaluation of Ardloy and

Aghalenane Loughs as being of 'International Importance'; taking account of the presence of the Annex II listed Marsh Fritillary butterfly and also the Whorl snail *Vertigo geyeri* associated with priority Annex I tufa forming springs and Annex I transition mire habitats. Lackagh fen is evaluated as 'Nationally Important', taking account of the presence of small areas of Annex I priority habitat (tufa spring formations) and Annex II Marsh Fritillary butterfly.

In terms of badgers, up to nine territorial ranges were identified during this survey with eight different social groups identified as active within the study area. One active main sett was identified within the line of the *Proposed Road Development*. Six active annex setts were identified within the study area, one of which was within the line of the proposed road corridor. A further nine inactive setts were recorded, three of which were in the line of the proposed road corridor. The mammal surveys undertaken for the *Proposed Road Development* over the period 2006-2013 have identified a significant decrease in badger activity within the study area, specifically in relation to setts and territories identified during the initial and follow-up non-volant mammal surveys of 2006, 2009, 2010, 2012 and most recently in 2013. It was found that a number of previously active and inactive dwellings forming communities along the *Proposed Road Development* were no longer in existence with a significant reduction in the number of dwellings. Other protected species which were recorded from within the study area include otter, Irish stoat, pine marten and Irish hare.

A bat survey was carried out to establish the value and significance of the corridor of the *Proposed Road Development* and its surroundings for bats. The main survey to inform this assessment was undertaken during an extensive year-long survey during 2005-2006. Follow up surveys were then undertaken during the late summer/autumn of 2010, autumn of 2012 and targeted surveys in the northern portion of the study area during 2013 to ensure that the original baseline surveys were still valid. This was considered to be a suitable approach with reference to the bat populations present in the study area. The survey incorporated preparatory desk research, roost and habitat surveys, and the use of bat detectors to record and count bats. An Anabat bat detector was used for this survey in conjunction with heterodyne bat detectors. Car-based surveys were also undertaken along the existing N4 road corridor and minor tertiary roads crossed by the *Proposed Road Development*.

In general, a relatively low diversity and abundance of bats was recorded in the study area. Bats recorded in the survey include soprano pipistrelle, common pipistrelle, natterer's bat, and daubenton's bat. Soprano pipistrelle was the most common species recorded during the current survey, followed by the common pipistrelle. Natterer's and daubenton's bats were recorded in restricted areas, principally along wooded river corridors, away from the proposed road corridor, while records of Leisler's bats were restricted to the northern end of the *Proposed Road Development*. The results of the detailed bat surveys found that the *Proposed Road Development*, in the main, does not significantly impact on commuting, foraging or roosting sites for bats. In addition the 2013 survey determined that bat activity has declined across the study area when compared to previous years' results.

The majority of the proposed route corridor is located in areas currently occupied by agricultural and wet grassland. These areas are of low value to the bat populations present; both in terms of habitat and insect prey production. No hibernation roosts were recorded during the current survey; however a number of derelict buildings and mature trees which were identified as potential Pipistrelle roost sites would be lost as a result of the *Proposed Road Development*.

The *Proposed Road Development* interfaces with a single river catchment; the Ballysadare River Catchment (OS Catchment No: 116). This catchment is located in EPA hydrometric Area 35. The Ballysadare Catchment includes the Ballysadare River and its tributaries the Owenmore and the Unshin. The Unshin River drains Lough Arrow and flows for 23km to join the Ballysadare River at Collooney, due north of the *Proposed Road Development*. Electrical fishing surveys were undertaken within the catchment for the current assessment. Salmon were present at both sites investigated on the Drumfin River and also at sites surveyed on the Turnalaydan Stream and the Markree Demesne Stream. Trout were present at all sites surveyed. Eels were present at all sites, except the Brickeen Stream. Sticklebacks were found to be common in the smaller watercourses. Brook lampreys (listed on Annex II of the EU Habitats Directive (1992) were recorded only from the Turnalaydan Stream. The Annex II listed White-clawed Crayfish were also recorded from the Turnalyadan Stream and from the Markree Demesne Stream.

Terrestrial invertebrate surveys were undertaken during 2005 and again in 2010. A screening survey for the Annex II listed Marsh Fritillary butterfly was undertaken during September 2010 and suitable habitat for this species was recorded within the study area, with larvae recorded from devil's bit scabious plants at Lackagh Fen and at Aghalenane Lough within the study area. Data recorded from these field surveys were compared with the results of the NPWS monitoring undertaken at Lackagh Fen.

A survey for whorl snails (*Vertigo* species) was undertaken during 2012, with a follow-up survey in 2013. The Annex II listed *Vertigo geyeri* was recorded at the Aghalenane / Ardloy Loughs Complex, away from the proposed alignment. Suitable habitat for this species was not found within the footprint of the *Proposed Road Development* and records of this species were limited to transition mire habitat at a distance from the road corridor.

#### 4.3.1.2 Likely Impacts

There will be no direct impact on any designated area. With the mitigation measures proposed indirect impacts on designated areas will also be avoided.

The *Proposed Road Development* will require the loss of small areas of habitats evaluated as being of local importance (higher value); however the scale of these effects are not evaluated as being significant in the local context, where the conservation status of these habitat areas will not be affected. The *Proposed Road Development* has been designed in consultation with the NPWS to avoid sensitive fen and transition mire habitats at Lackagh Fen, with a minimised footprint required at the southern extremity of this habitat complex. Similarly sensitive design has avoided any landtake within the Annex I habitats at the Aghalenane and Ardloy Loughs complex.

Direct loss of habitats within the footprint of the road with further impacts arising from site clearance and potential water quality impacts affecting aquatic habitats were identified. Potential impacts affecting habitats identified as key ecological receptors are identified as likely and potentially significant in the local context. Potential impacts affecting water quality and aquatic ecological interests are also evaluated as being likely, with the potential for significant negative effects on the main watercourses in the absence of mitigation.

Impacts affecting mammalian fauna identified as key ecological receptors are considered likely, limited to the local context and would be potentially significant in the absence of mitigation; particularly with regard to badger communities. Overall, the construction and operation of the *Proposed Road Development* is expected to have a slight negative impact on local bat populations in the short-term with an imperceptible negative impact in the medium to long-term. Impacts potentially affecting bat commuting routes and summer roost sites in the absence of mitigation are evaluated as being certain but limited to the local context and would not be significant.

The potential impacts affecting terrestrial macroinvertebrates are evaluated taking account of the design stage mitigation which has significantly reduced the direct land-take and indirect effects on groundwater dependant habitats which support the highest macroinvertebrate diversity; including both Annex II species Marsh Fritillary and *Vertigo geyeri*.

#### 4.3.1.3 Mitigation Measures

##### 4.3.1.3.1 *Construction Phase*

Mitigation measures set out generally relate to:

- Measures to protect water quality, as detailed in the Outline Erosion and Sediment Control Plan (Appendix 4.5 of Volume 4 of this EIS) and in the Hydrological and Hydrogeological Impact Assessment (Chapter 14 of the Main Report contained within volume 4);
- Compliance with Waste Management Legislation;
- Compensation through planting for the loss of the hedgerows and sections of woodland native tree and shrub species, as detailed in the Landscape and Visual Impact Assessment (EIS Chapter 10);
- Fencing off exclusion zones in sensitive sites;
- The creation of new wetland habitats as part of the proposed drainage design, incorporating constructed wetlands within the proposed attenuation ponds;
- In relation to badgers, mitigations such as pre-construction survey's, badger evacuation measures, protection of setts, provision of underpasses, badger resistant fencing, supervised sett destruction and creation of artificial setts are specified in the EIS;
- In terms of other mammals, it is expected that some of the mitigation measures for badgers would also be beneficial. In addition:

- For otters it is proposed to provide temporary fencing along the riparian margins of river corridors when construction work takes place to prevent otters accessing the site works;
- Should a breeding den for pine marten be recorded from within the proposed road route or within the impact zone (ca. 50m), a license to close the den will be required from the NPWS. If a den is found, no works will be carried out during the breeding season (this can range from February to August).

- Bat mitigation measures set out in the EIS include:
  - In order to avoid linear barriers along the proposed route it is proposed to plant native trees and shrubs such as oak, birch, rowan, willow, blackthorn, hawthorn, etc. Methods of reconnecting hedgerows where feasible to do so are set out in the proposed mitigation measures set out in the Landscape and Visual Impact Assessment (EIS Chapter 10);
  - In order to compensate for loss of roosts/potential roosts in trees and buildings, bat boxes are proposed;
  - Bridge and underpass structures proposed will be passable for bats, allowing for crossing below the alignment;
  - No heavy plant will be in operation in times of darkness. Tree-felling will be undertaken in the period late August to late October/early November when bats (young and old) are capable of flight but not yet in hibernation;
  - Artificial lighting along the route will be kept to the minimum required for safety (as proposed) and lighting will be directed away from all river crossings;
  - The felling of trees will be agreed in advance with NPWS and in accordance with a tree felling license. After felling, trees are not to be cut up immediately;
  - Buildings will be demolished immediately following a negative examination by the ecologist. Buildings which have been identified as bat roosts will not be demolished during the breeding period of late-May to mid-October.
- Specific mitigation measures are proposed to avoid the *Proposed Road Development* presenting a barrier to fish migration;
- Mitigation measures set out for bird species include:
  - Areas that have been identified as of potential importance for breeding birds will not be impacted during the breeding season (February-August inclusive, as per the Wildlife Acts);
  - No removal of semi-natural habitat, (hedgerows and scrub) will be permitted during the breeding season.
- Reptiles and Amphibian mitigations set out include:
  - Should any areas that could potentially be used by frogs for spawning require disturbance between the months of February to June, the area will be inspected by an ecologist to ensure that no spawn or tadpoles are present;
  - A derogation license from the NPWS will be required if frogs and/or frog spawn are to be interfered with and frogs will be relocated to a suitable habitat in the locality.
- Terrestrial macroinvertebrates mitigations include:
  - Areas to be removed or directly impacted upon will be examined by a suitably qualified ecologist for the presence of Marsh Fritillary butterfly larvae prior to the commencement of works and a translocation programme undertaken should Marsh Fritillary be recorded. This includes in particular the areas of marsh, fen and wet grassland within the direct footprint of the *Proposed Road Development*;
  - The construction works adjacent to the sensitive wetland habitats identified within the *Proposed Road Development* will require adequate fencing to avoid trampling and further impacts outside of the required land take;

- Monitoring for the presence of Marsh Fritillary and control of the contractor's works on site within these sites will be managed by an ecologist appointed under the terms of the Contractors Environmental Operating Plan and in direct consultation with the NPWS;
- Design-stage mitigation measures required for the protection of the hydrological and hydrogeological regime at Aghalenane and Ardloy Loughs are set out in Section 4.8.5.1. of the Main Report (Volume 2 of this EIS) and include the provision of a drainage layer at the base of the road embankment and vertical hydraulic barriers to stop groundwater from flowing along the embankment. These requirements are specified to avoid impacts affecting the calcareous spring habitats at this location which support *Vertigo geyeri*. The protection of these spring habitats will effectively protect the population of this protected species with regard to the *Proposed Road Development*. Management of the Annex I habitats and Annex II species within the Aghalenane and Ardloy Loughs complex will be undertaken by local NPWS staff following confirmation of landowner agreement.

#### 4.3.1.4 Residual Impacts

Following the implementation of the proposed mitigation measures, residual impacts affecting habitats identified as key ecological receptors within the zone of influence are evaluated as being below significant levels in the local context; where the conservation status of these habitats will not be significantly affected.

Residual impacts post-mitigation for fauna identified as key ecological receptors are generally evaluated as being below significant levels. Badger communities were assessed as being affected in the short term in the local context, however, these impacts will not be significant, that is, not affecting the conservation status of badgers in the local context. Long term impacts affecting the conservation interests of this species will not be significant in the local context. Residual impacts affecting the remaining fauna within the zone of influence were assessed as being below significant levels in the local context with no significant long term impacts affecting fauna species in the wider context. With the mitigation measures proposed, disruption to some established bat commuting routes along the corridor of the proposed road will be reduced to below significant levels. The scale of the predicted impacts will be within a local context only and will not be significant.

With the mitigation measures proposed, predicted impacts during construction affecting watercourses and aquatic ecological interests will not be significant. The provisions for water quality protection set out in the Outline Erosion and Sediment Control Plan will effectively reduce the potential for negative effects on fish species within the zone of influence to below significant levels. The drainage design for the *Proposed Road Development*, as specified in Chapter 4 of the Main Report (Volume 2 of this EIS), includes for surface water treatment and attenuation systems which will adequately protect the watercourses within the study area during the operational phase of the *Proposed Road Development*. This would lead to improvements in water quality and subsequently fisheries value resulting in positive effects, with reference to the existing N4 road corridor.

With the proposed road, there would be a slight reduction in habitat for terrestrial macroinvertebrates. The most ecologically significant habitats affected with regard to terrestrial macroinvertebrates are fen/peatlands, wet grassland and woodland; however, the loss of these habitats would be proportionally small considering the availability of these habitats in the vicinity of the *Proposed Road Development* and the wider study area. The predicted impact on terrestrial macroinvertebrates will not be significant in the local context, with the implementation of the mitigation measures proposed. Two Annex II listed terrestrial invertebrates were recorded within the study area; the Marsh fritillary butterfly and the whorl snail *Vertigo geyeri*. The dispersed nature of the Marsh fritillary population within the study area, in addition to the limited footprint of the *Proposed Road Development* affecting habitats supporting this species and mitigation measures proposed results in the evaluation that residual impacts affecting this species arising from the *Proposed Road Development* will not be significant.

The predicted impacts with regard to *Vertigo geyeri*, taking account of the aforementioned design stage mitigations and the impact evaluation set out in the Hydrology and Hydrogeology Chapter of the Main Report (Volume 2 of this EIS), are evaluated as not being significant.

## 4.3.2 **Geology**

### 4.3.2.1 Existing Environment

The *Proposed Road Development* and study area is underlain by predominantly deep well-drained mineral soil, shale/ sandstone till (subsoil) and karstified limestone bedrock. The karstified limestone bedrock is characterised by shallow groundwater flow in an epikarstic or highly weathered layer of bedrock and by surface karst features such as dolines, springs and turlough or turlough-like lakes and swallow hole complexes. The road also passes over pockets of soft peaty or organic clay soil material, which are generally considered unsuitable for road construction purposes.

### 4.3.2.2 Likely Impacts

The removal of existing soil, subsoil and rock material from along the *Proposed Road Development* and at the proposed road cuts is an inevitable part of road construction. The placement and compaction of soil and subsoil material for the proposed permanent works including identified spoil repositories is likely to change the soil structure. The exposure of soil and subsoil material during construction is likely to temporarily increase the potential for soil contamination by leakages or spillages. The removal of existing soil and subsoil material is likely to reduce the level of protection afforded to the underlying groundwater aquifer. The exposure of contaminated soil material may cause the leaching of contaminants into groundwater or into runoff and watercourses (appropriate mitigations are described in the Outline Erosion and Sediment Control Plan and in Chapter 14 of the EIS). The excavation of road cuts and soft ground may induce local increases of water input into the subsurface and may cause a collapse of identified or unidentified subsurface karst features. The change to land use is an inevitable part of road construction.

### 4.3.2.3 Mitigation Measures

The design includes options for the appropriate re-use of suitable soil and subsoil material in construction works and the appropriate management of spoil material. Contaminated soil material is to be characterised and disposed of off-site in accordance with Waste Acts. Appropriate procedures are to be implemented for soil handling, in particular for peat material with regards to structure and potential for reduction to surface water quality. Appropriate fuel and equipment storage is to be implemented for the protection of soil chemistry and runoff receiving watercourses. Any further collapse to identified or unidentified karst features is to be excavated and in-filled with graded inert material. No impacts on the geological environment are anticipated as a result of the road operation phase; therefore no mitigation measures are required during this phase.

### 4.3.2.4 Residual Impacts

The removal of soil, subsoil and rock material from the *Proposed Road Development* and the change in land use are an inevitable part of road construction. The significance of these impacts is rated slight adverse for soil geology, moderate adverse for subsoil geology and bedrock geology and moderate/ slight adverse for land use. The change in soil structure following mitigation can be rated as slight adverse for soil and subsoil geology.

## 4.3.3 **Hydrology & Hydrogeology**

### 4.3.3.1 Existing Environment

The *Proposed Road Development* and study area is underlain by predominantly deep well-drained mineral soil, shale and sandstone till subsoil and karstified limestone bedrock. The karstified limestone bedrock is characterised by shallow groundwater flow in an epikarstic or highly weathered layer of bedrock and by surface karst features such as dolines, springs and turlough complexes.

The *Proposed Road Development* passes through the surface catchment areas of two (2 no.) designated wetland habitats, Unshin River and Lough Arrow, both of which are designated Special Areas of Conservation (SAC).

#### 4.3.3.2 Likely Impacts

The proposed road cuts generally extend into saturated clay subsoil in which the likely impact is the localised lowering of the water table. One proposed road cut extends into saturated karstified bedrock in which the likely impact is the potential interception of shallow groundwater flow.
The *Proposed Road Development* passes through two (2 no.) surface and groundwater catchments to designated wetland habitats in which the likely impact is the increased volume and rate of surface runoff into these receiving streams and wetland habitats, the reduction in volume of effective rainfall reaching groundwater as recharge and the reduction in groundwater contributions to wetland habitats.
The impact of the road construction phase is likely to be a temporary reduction in water quality within the Unshin River, Lough Arrow, Turnalaydan Stream, Drumfin River, Springfield Stream, Lissycoyne Stream and Drumderry Stream surface catchments and associated wetland habitats.

#### 4.3.3.3 Mitigation Measures

Numerous water quality mitigation measures are set out including the provision of the drainage system which is an integral part of the *Proposed Road Development* design and includes treatment and containment for accidental spillages and petrol interceptors. The drainage system is designed, in so far as is possible so that surface runoff remains in the same surface catchment area as under pre-construction conditions, that surface runoff flows through suitable attenuation infrastructure where necessary before flowing into catchments or streams and that surface runoff flows in closed drainage for the section of the *Proposed Road Development* that crosses or encounters any active karst conduits. Swales or grassed surface channels are to be sealed at outfall locations where the bedrock aquifer is extremely vulnerable with less than 3m of subsoil. Groundwater level, surface water flows and hydrochemistry monitoring is to be conducted prior to and during construction. During the Construction Phase the implementation of the Erosion and Sediment Control Plan will reduce any risks to surface and ground water.

#### 4.3.3.4 Residual Impacts

Some permanent interception of shallow groundwater flow is anticipated to occur in sections of the *Proposed Road Development*, particularly in the vicinity of road cuts. Some permanent reductions to groundwater recharge as a result of increased impervious areas and increased surface runoff and to groundwater contributions to wetland habitats are anticipated to occur in sections of the *Proposed Road Development*. The collapse of unidentified subsurface karst features is considered unlikely; however there always remains a possibility of encountering such features during excavation work.

## 4.4 Material Assets

### 4.4.1 **Archaeology, Architectural and Cultural Heritage**

The desktop section of the report was compiled using the following sources: The Records of Monuments and Places of the Archaeological Survey of Ireland; the Sligo County Development Plan (Record of Protected Structures RPS); the National Inventory of Architectural Heritage (NIAH); the topographical files of the National Museum of Ireland; the Excavations Bulletin; historic maps; aerial photographs; place names and historic books and journals.
Field inspection of the proposed route, involving a walkover of a 200m wide corridor was carried out at various times between 2005 and 2013 as the design progressed. During these inspections the topography of each area was noted and any observations of an archaeological, architectural or cultural heritage nature were recorded.

#### 4.4.1.1 Existing Environment

The built heritage inventory contains details of all Recorded Monuments within 100m of the *Proposed Road Development* and features of archaeological potential within the *Proposed Road Development* or up to a 50m distance from it. In all a total of 101 Cultural Heritage Constraints (CHCs) were recorded along the *Proposed Road Development*.

#### 4.4.1.2 Likely Impacts, Mitigation Measures and Residual Impacts

Care was taken during the design stage of the project to avoid all known archaeological monuments. Accordingly there will be no direct impacts on any National Monuments and only one direct impact on a Recorded Monument, a levelled ploughed out possible enclosure in Toberbride Td (CHC4).

It is predicted that there will be a slight visual impact on two National Monuments including Castlebaldwin Castle (CHC 99/ Nat. Mon. No. 373) and Carrowkeel Passage tomb cemetery (Nat. Mon. No. 318). It is considered that the carefully designed hedge and feature planting at the junction and embankments in Castlebaldwin as outlined in Chapter 10 of the Main Report (Volume 2 of this EIS) should substantially lessen any minor visual impact that the *Proposed Road Development* may cause. There are six Recorded Monuments that are less than 100m from the edge of the road take. None of these recorded monuments are being directly impacted on by the *Proposed Road Development* and the impacts are restricted to indirect ones or no predicted impact. Targeted test trenching shall be carried out along those parts of the proposed route closest to these monuments so as to identify any associated archaeological features that may be present. Any features discovered shall be subject to archaeological excavation if they cannot be preserved in situ.

Other sites of potential archaeological significance include three possible enclosures noted from aerial photographs and/or field inspection. The *Proposed Road Development* also traverses 13 areas identified as bog or wetland which are deemed to be areas of archaeological potential. Targeted archaeological test trenching and, where appropriate geophysical survey, is proposed at all these locations, to determine what archaeological features may be present, if any. Any features discovered shall be subject to archaeological excavation if they cannot be preserved in situ. The proposed route also crosses a number of watercourses (as townland boundaries) which are deemed to be areas of potential archaeological significance. Wade surveys shall be carried out at these locations with test trenching on the adjacent banks to determine whether archaeological remains may be present.

Regarding Architectural Heritage, the proposed route will not directly impact on any structure listed on the Record of Protected Structures (RPS) or the National Inventory of Architectural Heritage (NIAH). There are two Protected Structures adjacent to the proposed route including: Castlebaldwin former national school building and Toberscanavan House, which will not be affected by the *Proposed Road Development*. There shall be an indirect visual impact on the NIAH listed (and also RMP and National Monument) 17$^{th}$ century fortified house at Castlebaldwin (CHC 99).

A small number of 19$^{th}$ century ruined structures shall be directly impacted upon by the *Proposed Road Development* and several other probable 19$^{th}$/20$^{th}$ century structures located adjacent to or along the proposed route will have indirect, slight or no predicted impacts. Any standing structures impacted directly by the *Proposed Road Development* shall be fully recorded as part of mitigation measures in advance of construction.

There are also several sites of probable 19$^{th}$ century structures which have been demolished in proximity to the *Proposed Road Development* and these sites will be directly impacted upon by the construction of the road. These sites of structures now destroyed shall be subject to targeted archaeological test trenching in advance of construction to determine if any sub-surface remains survive.

The proposed route passes through various townland boundaries which take the form of hedgerows with earthen banks and/or ditches. These boundaries are considered to be of cultural heritage merit and of potential archaeological significance. Various other cultural heritage features including a stone structure/gateway, a historic laneway and old field boundaries depicted on early mapping shall be directly impacted. All townland boundaries and all other cultural heritage features impacted directly by the *Proposed Road Development* shall be recorded as part of mitigation in advance of construction.

Most of the Constructed Wetlands/Attenuation Ponds and Spoil Repositories/Borrow Pits are located in areas of dryland/wetland interface. Due to the levels of preservation in wetland areas there is always a potential that archaeological features may be present. Thus it is proposed that archaeological testing be carried out before the removal of any material from each of these areas in order to allow for the identification and recording of any such features. In the event that ground conditions do not allow for advanced testing, then monitoring of earthmoving works will be required.

As well as the targeted test trenching of heritage features and locations described above, all other lands within the CPO shall be subject to systematic archaeological test trenching in advance of construction. Any archaeological discoveries shall then, subject to agreement with the statutory authorities, be subject to full

archaeological excavation. All mitigation measures proposed shall be carried out under Ministerial Directions as issued by the Department of Arts, Heritage, Gaeltacht and the Islands.

# 5 Consultations

## 5.1 Consultations

### 5.1.1 **Public Consultation**

#### 5.1.1.1 Public Consultation to date

Public Consultation commenced during the Constraints Study Phase with the invitation for submissions in August 2000. This progressed during route selection with a Public Consultation presenting the five initial route options during the period 14th May 2001 to 15th June 2001 and subsequently in March 2002 when the Preferred Route was presented to the public.

#### 5.1.1.2 Additional Consultations

Project Liaison has been ongoing and continuous through the interaction of the Project Liaison Officer with landowners who are affected by the route and through the EIS coordinators (and various environmental specialists) interaction with various statutory bodies. These liaisons have in instances aided in the design process and influenced some decisions relating to farm accommodation tracks and the environmental design considerations described in section 2.1.3.2 of this Non Technical Summary.

In recognition of the *ad-hoc* nature of these consultations, the time lapse since the original statutory public consultation and the design changes which have been applied during the EIA/design process, a Project Information evening was held in November 2013; this allowed for the consideration of final modifications to be made to the design prior to the publication of statutory documents.

# 6 What Happens Next

## 6.1 Viewing and Purchasing the EIS

Copies of the Environmental Impact Statement will be available for examination and for purchase in digital (CD/DVD) or hard copy formats at the locations detailed in the published newspaper notices.

## 6.2 Next Steps

Construction of the project is dependent on An Bord Pleanála approval and funding being available from the National Roads Authority.

Written submissions relating to the environmental effects of the *Proposed Road Development* may be made to An Bord Pleanála as per the date specified in the published newspaper notices. All submissions should be sent to the Board at the following address:

An Bord Pleanála,

64 Marlborough Street,

Dublin 1.

An Bord Pleanála, at its discretion, may hold an Oral Hearing.

The written submission, together with any representations made at the Oral Hearing will be considered by An Bord Pleanála before making their decision on whether or not to approve the *Proposed Road Development* (with or without modifications).

The Board's decision shall be published in one or more newspapers circulating in the area, including, where appropriate, particulars of any modifications to the *Proposed Road Development*.

# 7 Appendix A: Figures