North-South 400 kV Interconnection Development

An Bord Pleanála Reference: PCI001

Environmental Impact Statement

Volume 3C – CMSA (DRAFT)

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EXPLANATION OF TECHNICAL TERMS AND ABBREVIATIONS

Term	Explanation
AA	An appropriate assessment (AA) is an obligation under Article 6(3) of the EU Habitats Directive 92/43/EEC: ―*Any plan or project not directly connected with or necessary to the management of the site [a Natura 2000 site] but likely to have a significant effect thereon, either individually or in combination with other plans or projects shall be subject to appropriate assessment of its implications for the site in view of the site‟s conservation objectives".*
AADT	Annual Average Daily Traffic
ABP (The Board)	An Bord Pleanála
AC	Alternating Current
ACA	Architectural Conservation Area: A place, area, group of structures or townscape that is of special architectural, historical, archaeological, technical, social, cultural, or scientific, interest, or that contributes to the appreciation of a Protected Structure.
ACGIH	American Conference of Governmental Industrial Hygienists
ACSR	Actual Cross Section of a Typical Conductor
AEOS	Agricultural Environmental Options Scheme
AHO	Archaeological Heritage Objectives
AIMD	Active Implantable Medical Device
AIS	Air Insulated Switchgear
ALS	Amyotrophic Lateral Sclerosis ALS
An Foras Taluntais	The Agricultural Institute
AOD	Above Ordnance Datum
AOD	Angle of Deviation
APG	Austrian Power Grid Company
AR5	The Inter Governmental Panel on Climate Change (IPCC) *Climate Change 2013 - Physical Science Basis,* referred to as the *Fifth Assessment Report (AR5)*.
ASI	Archaeological Survey of Ireland

Term	Explanation
ASSI	Areas of Special Scientific Interest
Bay	A bay is a connection point to a busbar, and comprises switchgear and measurement equipment.
BAP	Biodiversity Action Plan
BGL	Below Ground Level
Biodiversity	Word commonly used for biological diversity and defined as assemblage of living organisms from all habitats including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part.
Birds Directive	Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.
The Board	An Bord Pleanála (unless otherwise clarified)
BOD	Biological Oxygen Demand
BPA	Bonneville Power Administration
BS	British Standard
CA	Competent Authority
CAFE	Clean Air for Europe
CBSA	Cross Border Study Area
CDHS	California Department of Health Services
CDP	County Development Plan
CEMP	Construction and Environmental Management Plan
CENELEC	European Committee for Electrotechnical Standardization
CER	Commission for Energy Regulation
CEU	Council of Europe
CGS	County Geological Sites
CH4	Methane
CHS	Cultural Heritage Sites
Circuit	A line or cable, including associated switchgear, which carries electrical power.
CMSA	Cavan-Monaghan Study Area

Term	Explanation
CO	Carbon Monoxide
CO_2	Carbon Dioxide
Conductors	High capacity, high strength standard cable / wire
CIRIA	*Construction Industry Research and Information Association*
Constraint	A constraint can be described as any physical, environmental, topographical, socio-economic or other feature or condition that may affect the location, development or other aspect of a proposal.
Corine	Coordination of Information on the Environment: Dataset created from satellite imagery that represents different cover / land use classifications throughout Europe.
cSAC	candidate Special Area of Conservation
CRED	Carrickmacross Rural Electoral Division
CRED	Castleblayney Rural Electoral Division
CRFRAM	Catchment Flood Risk Assessment and Management Studies
CRTN	Calculation of Road Traffic Noise
CSO	Central Statistics Office
DAFM	Department of Agriculture, Food & the Marine
DAHG	Department of Arts Heritage and the Gaeltacht
DAS	Disadvantaged Areas Payment Scheme
dB	Decibel
DC	Direct Current
DCENR	Department of Communications, Energy and Natural Resources
DCMNR	Department of Communications, Marine and Natural Resources
DECC	UK Department of Energy and Climate Change
DED	District Electoral Division
Demand	Peak demand figures refer to the power that must be transported from grid connections generation substations to meet all customers' electricity requirements. These figures include transmission losses.
DETI	Northern Ireland Department of Enterprise, Trade and Investment

Term	Explanation
DMRB	Design Manual for Roads and Bridges
DoEHLG	Department of Environment, Heritage, & Local Government
DSO	Distribution System Operator
Earth / ground wire	Wire installed above the live conductors at the top of a tower to minimise the likelihood of direct lightning strikes to conductors.
EC	European Commission
EC	European Community
ECoW	Ecological Clerk of Works
EEC	European Economic Community
EFHRAN	European Health Risk Assessment Network on Electromagnetic Fields Exposure.
EHC	Environmental Health Criteria
EHS	Electromagnetic Hypersensitivity
EHV	Extra High Voltage, in this EIS means greater than 330 kV
EIA	Environmental Impact Assessment: An examination, analysis and evaluation carried out by the Board that shall identify, describe and assess in an appropriate manner, in accordance with Articles 4 to 11 of the Environmental Impact Assessment Directive, the direct and indirect effects of a proposed development. EIA is the process by which the anticipated effects on the environment of a proposed development or project are measured as required under Directive (85/337/EEC) as amended.
EIA Directive	Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (codification).
EirGrid	The statutory electricity Transmission System Operator (TSO)
EirGrid Roadmap	EirGrid's development framework for projects under the Grid25 strategy
EIS	Environmental Impact Statement: A statement of the effects, if any, which the proposed development, if carried out, would have on the environment and shall include the information specified in Annex IV of the EIA Directive.
ELF	Extremely Low Frequency

Term	Explanation
EMF	Electric & Magnetic Fields
EMI	Electromagnetic Interference
ENTSO-E	European Network of Transmission System Operators for Electricity
EP	European Parliament
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
EPUK	Environment Protection UK
ES	Environmental Statement (required pursuant to the laws of Northern Ireland)
ESB	Electricity Supply Board
ESBI	ESB International
ESBNG	ESB National Grid
ESBNL	ESB Networks Limited
ETS	Emission Trading Scheme
EU	European Union
European Site	European site: A candidate Site of Community Importance, a Site of Community Importance, a candidate Special Area of Conservation, a Special Area of Conservation, a Candidate Special Protection Area, and a Special Protection Area.
Fauna	All animal life occurring in the area
FDI	Foreign Direct Investment
Flora	All plant life occurring in the area
Franklin tip	Lightning rod
FRR	Final Re-evaluation Report
GAA	Gaelic Athletic Association
GDA	Greater Dublin Area (including County Meath)
GDSDS	*Greater Dublin Strategic Drainage Study*
Geo-directory Data	Dataset which provides spatial and attribute information of the location of all buildings in Ireland.

Term	Explanation
GHz	Gigahertz
GIL	Gas Insulated Transmission Lines
GIS	Gas Insulated Switchgear
GIS	Geographic Information System: A geographic information system which captures, stores, analyses, manages, and presents data that is linked to location.
GPS	Global Positioning System
Grid	A meshed network of high voltage lines, cables and substation nodes (400 kV, 220 kV and 110 kV) for the transmission of bulk electricity supplies around Ireland. The grid, electricity transmission network, and transmission system are used interchangeably in application documents.
GSI	Geological Survey of Ireland
Guarding Positions	Where a conductor is to be strung over roads, and possibly river locations, protection will be erected prior to the commencement of stringing locations. These ‗guarding‘ positions and the protection will be in the form of guard poles, scaffolding or a telescopic handler.
GWDTE	Groundwater Dependent Terrestrial Ecosystem
ha	Hectares (100m x 100m)
Habitat	A habitat is an ecological or environmental area that is inhabited by a particular animal and plant species. It is the natural environment in which an organism lives, or the physical environment that surrounds (influences and it utilised by) a species.
Habitats Directive	Council Directive 92/43/EC of 21 May 1992 on the conservation of natural habitats and wild fauna and flora.
HCN	Health Council of the Netherlands
HGV	Heavy Goods Vehicle
HPA	Health Protection Agency
HSA	Health & Safety Authority
HV	High Voltage, in this EIS means greater than 110kV
HVAC	High Voltage Alternating Current

Term	Explanation
HVDC	High Voltage Direct Current
Hz	Hertz, unit of frequency
IAA	Irish Aviation Authority
IARC	International Agency for Research on Cancer
ICD	Implantable Cardioverter Defibrillators
ICES	International Committee on Electromagnetic Safety
ICHEC	Irish Centre for High Engineering Computing
ICNIRP	International Commission on Non-Ionising Radiation Protection
IEC	International Expert Commission
IEEE	Institute of Electrical and Electronics Engineers
IEEM	Institute of Environmental & Ecological Management
IFA	Irish Farmers Association
IFC	Irish Folklore Commission
IFI	Inland Fisheries Ireland
IGH	Irish Geological Heritage
IGI	Institute of Geologists of Ireland
INP	Inertial Navigation System
IP	Implementation Programme
IPC	Infrastructure Planning Commission
IPPC	Irish Governmental Panel on Climate Change
ISLES	Irish-Scottish Links on Energy Study
ISO	International Organisation for Standardisation
I-WEBS	Irish Wetland Bird Survey
kHz	Kilohertz (one thousand hertz)
km	Kilometre (one thousand metres)
kV	Kilovolt (One thousand volts)
kV/m	Kilovolts Per Meter
LCA	Landscape Character Area

Term	Explanation
LCA	Landscape Character Assessment
LCC	Line Commutated Converters
LiDAR	Light Detection and Ranging: LiDAR is a remote sensing technology that uses laser scanning to collect height and elevation data.
Line Design	Location and design of transmission infrastructure (e.g. tower positions and types)
LV	Low Voltage, less than 1000 volts
$\mathbf{L_{Aeq}}$	The A-weighted equivalent continuous steady sound level during the measurement period and effectively represents an average ambient noise value.
$\mathbf{L_{Amax}}$	The maximum A-weighted sound level measured during the measurement period.
$\mathbf{L_{Amin}}$	The minimum A-weighted sound level measured during the measurement period.
$\mathbf{L_{A10}}$	The A-weighted sound level that is exceeded for 10% of the measurement period and is used to quantify road traffic noise.
$\mathbf{L_{A50}}$	The A-weighted sound level that is exceeded for 50% of the measurement period and in this evaluation is used to quantify noise from overhead power lines.
$\mathbf{L_{A90}}$	The A-weighted sound level that is exceeded for 90% of the measurement period and is used to quantify background noise level.
m	Metre
mbgl	Metres below ground level
mG	Milligauss, Gauss is the unit of measurement for magnetic field typically in use in North America. The corresponding unit of measurement used in Europe is tesla (T). One gauss is equal to 100 microtersla (μT).
MHz	Megahertz (one million hertz)
MLCA	Meath Landscape Character Assessment
MLCA	Monaghan Landscape Character Assessment
MPE	Maximum Permissible Exposures

Term	Explanation
MSA	Meath Study Area
MVA	Megavolt-Amperes
MW	Megawatt (One million Watts)
Natura 2000	Natura 2000 sites are part of a coherent European ecological network of special areas of conservation designated under Article 3 of the Habitats Directive (92/43/EEC) and includes Special Areas of Conservation (SAC) and Special Protection Areas (SPA).
NBDC	National Biodiversity Data Centre
NEEAP	National Energy Efficiency Action Plan
NGR	National Grid Reference
NH_3	Ammonia
Natural Habitat	Natural Habitats are terrestrial or aquatic areas distinguished by geographic, abiotic (i.e. inanimate) and biotic features, whether entirely natural or semi-natural.
Nature Reserves	Nature reserves are chosen from among the very best examples of our wildlife, habitats and geology. They contain a wide range of species, communities and geology their recognition by Ministerial order designation is a public recognition by the State Government of their importance.
NEPP	North East Pylon Pressure
NESA	North East Study Area
NGR	National Grid Reference
NHA	Natural Heritage Area: Natural Heritage Areas are designated by Ministerial order and include sites that may be significant in biological terms for species, communities and habitats or of interest for landforms, geological or geomorphological features or for their diversity of natural attributes. In Ireland the basic designation for wildlife is the Natural Heritage Area (NHA). This is an area considered important for the habitats present or which holds species of plants and animals whose habitat needs protection.
NHA	Natural Heritage Area
NI	Northern Ireland
NIAH	National Inventory of Architectural Heritage

Term	Explanation
NIAUR	Northern Ireland Authority for Utility Regulation
NIE	Northern Ireland Electricity
NIEA	Northern Ireland Environment Agency
NIS	Natura Impact Statement: Natura Impact Statement means a statement, for the purposes of Article 6 of the Habitats Directive, of the implications of a proposed development, on its own or in combination with other plans or projects, for one or more than one European site, in view of the conservation objectives of the site or sites. It is the output from the Appropriate Assessment process, required under the EU Habitats Directive 92/43/EEC.
NISRA	Northern Ireland Statistics & Research Agency
NITB	Northern Ireland Tourism Board
NMI	National Museum of Ireland
NMA	National Monuments Act
NMI	National Museum of Ireland
NMS	National Monuments Service
NNA	National Normative Aspects
NOx	Nitrous Oxide
NPWS	National Parks and Wildlife Service: The NPWS is part of the Department of Arts, Heritage and Gaeltacht and is charged with the conservation of a range of habitats and species in Ireland.
NRA	National Roads Authority
NREAP	National Renewable Energy Action Plan
NRPB	National Radiological Protection Board of Great Britain
NSL	Noise Survey Level
N-S Link	North-South Link
NTC	Net Transfer Capacity
NUI	National University of Ireland
NYPSC	New York Public Service Commission
OHL	Overhead Line

Term	Explanation
OPGW	Earth / ground wire or shield wire with embedded optical fibres
OPW	Office of Public Works
OSI	Ordnance Survey of Ireland
PAC	Planning Appeals Commission
PAH	Polycyclic Aromatic Hydrocarbons
PLS-CADD	Specialised computer aided design programme used for full 3-D design of overhead lines.
PM_5	Particulate Matter 5
PM_{10}	Particulate Matter 10
pNHA	Proposed Natural Heritage Area
Power Flow	The flow of ‗active' power is measured in Megawatts (MW). When combined with the flow of ‗reactive power', which is measured in Mvar, the resultant overall power flow is measured in MegaVolt-Amperes (MVA).
PPP	Public-Private Partnership
PRR	Preliminary Re-evaluation Report
PPSR	Preferred Project Solution Report
PPV	Peak Particle Velocity
Ramsar Convention/Site	The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The list of Ramsar sites in Ireland includes wetlands that are considered to be of international importance under the Ramsar Convention.
Raster	A data structure representing a generally rectangular grid of pixels, or points of colour, viewable via a monitor, paper, or other display medium.
RBD	River Basin District - Administrative area for coordinated water management, composed of multiple river basins (or catchments), designated pursuant to the requirements of the Water Framework Directive.
Receptor	Any element of the environment which is subject to impact.
RES	Renewable Energy Sources
RFC	Ration to Flow Capacity Value

Term	Explanation
RMP	Record of Monuments and Places
RPA	Registered Protected Areas
RPS	Record of Protected Structures
RSA	Road Safety Authority
SAC	Special Areas of Conservation: SACs are sites that have been designated by the Minister as a special area of conservation pursuant to Article 4, paragraph 4 of the European Habitats Directive (92/43/EEC). They have been designated because of a possible threat to the special habitats or species which they contain.
SCENIHR	Scientific Committee on Emerging and Newly Identified Health Risks
SEA	Strategic Environmental Assessment: Requirement for assessment of Plans the effects of certain Plans and Programmes on the environment (pursuant to the EU SEA Directive 2001/42/EC).
SEAI	Sustainable Energy Authority of Ireland
SEM	Single Electricity Market
SEMO	Single Electricity Market Operator
Sensitivity	The potential of a receptor to be significantly changed
SIA	Strategic Infrastructure Act
SID	Strategic Infrastructure Development: Section 182A of the *Planning and Development Act 2000* (as amended) defines strategic infrastructure development to include development comprising, or for the purposes of electricity transmission, including the transport of electricity by means of a high voltage line where the voltage would be 110 kilovolts or more, or an interconnector, requiring direct application for statutory approval to An Bord Pleanála.
SMR	Sites and Monuments Record (predecessor of RMP)
SO_2	Sulphur Dioxide
SONI	System Operator of Northern Ireland
SPA	Special Protection Area
SPS	Single Payment Scheme

Term	Explanation
SSM	Swedish Radiation Protection Authority
Stringing	The term used to describe the installation of electricity conductors or wires on the overhead line support structures. The conductors are ‗strung' from one structure to the next.
Substation	A substation is the location on the grid where equipment is placed in order to safely change the electricity from higher transmission voltages to lower voltages that are appropriate for use by end-customers. It does this by using equipment known as transformers. They ‗transform' the electricity from one voltage to another and they represent the means through which electricity is drawn from the transmission system. A substation also acts as a point of common connection of a ‗node' for several circuits. It is helpful to think of them like an intersection on a road network. Power comes in on one circuit (road) and can be redirected onto another circuit. This is achieved by using other equipment in the substation such as switches, circuit breakers and other apparatus.
SuDS	Sustainable Urban Drainage System
SUR	Standardised Unemployment Rate
SV	Scenic View
SVC	Static Var Compensator
Switchgear	A combination of electrical disconnects and / or circuit breakers used to isolate equipment in or near an electrical substation.
SWDTE	Surface Water Dependent Terrestrial Ecosystem
TAO	Transmission System Owner: The owner of the assets that form the transmission system.
TCD	Trinity College Dublin
TCS	Tourism Content System
TEPCO	Tokyo Electric Power Company of Japan
TOC	Table of Contents
Transformer	An item of equipment connecting other electrical equipment at two different nominal voltages.
Transposition	Describes the changing of the spatial arrangement of the conductors on a transmission line relative to each other for the purpose of improving the operating performance of the transmission line.

Term	Explanation
TRL	Transport Research Laboratory
TRM	Transmission Reliability Margin
TSO	Transmission System Operator
TTC	Total Transfer Capacity
TYNDP	Ten Year Network Development Plan
µT	Microtesla – where tesla (T) is the unit of measurement for magnetic field strength and 1T is equal to 1,000,000µT.
UAA	Utilisable Agricultural Areas
UCC	University College Cork
UCD	University College Dublin
UGC	Underground Cable
UK	United Kingdom
UNESCO	United Nations Educational Scientific and Cultural Organisation
VEM	Visual Envelope Map
VOM	Volatile Organic Map
V/m	Volt Per Meter
VSC	Voltage Sourced Converter
WFD	Water Framework Directive (2000/60/EEC): Water Framework Directive (WFD) is European legislation that promotes a new approach to water management through river basin planning. It covers inland surface waters, estuarine waters, coastal waters and groundwater.
WHO	World Health Organisation
Working Swathe	Working area required to install transmission lines particularly for underground construction methodologies.
WWTP	Waste Water Treatment Plant
XLPE	Cross Linked Polyethylene
ZTV	Zone of Theoretical Visibility
ZVI	Zone of Visual Influence

1 INTRODUCTION

1.1 INTRODUCTION

1 This volume (**Volume 3C**) of the Environmental Impact Statement (EIS) provides an evaluation of the potential for environmental impacts arising from the proposed North-South 400 kV Interconnection Development for the section of the proposed development which is located in the Cavan Monaghan Study Area (CMSA) as defined in Chapter 5, **Volume 3B** of the EIS. The contents of this volume are supported by two separate volumes: **Volume 3C Appendices** and **Volume 3C Figures** of the EIS.

2 The proposed development in the CMSA comprises a new single circuit 400 kV overhead transmission circuit supported by 134 towers (Tower 103 to Tower 236) extending generally southwards from a point at the jurisdictional border with Northern Ireland (in the townlands of Doohat or Crossreagh, County Armagh, and Lemgare, County Monaghan) to the townland of Clonturkan, County Cavan for a distance of approximately 46km. It includes lands traversed by the conductor from the jurisdictional border to Tower 103 and from Tower 103 to Tower 236 inclusive and lands traversed by the conductor strung from Tower 236 to Tower 237 (the first tower on the MSA section of the proposed development). The proposed development also includes an associated temporary construction materials storage yard to be located on a site of approximately 1.42ha in the townlands of Monaltyduff and Monaltybane, Carrickmacross, County Monaghan.

3 The portion of the overall proposed interconnector occurring within Ireland runs a linear distance of approximately 103.5 kilometres (km) between Lemgare in County Monaghan and Woodland in County Meath. However, for the purposes of presenting the information in this EIS, it has been subdivided into the CMSA (**Volume 3C**) and the Meath Study Area (MSA) (**Volume 3D**).

4 Chapter 1, **Volume 3B** of the EIS provides a comprehensive introduction to the proposed development which considers the following:

- Context of the proposed development;
- Requirements for Environmental Impact Assessment (EIA);
- Preparation of the Environmental Impact Statement (EIS);
- Structure and content of the EIS; and
- Technical difficulties encountered during preparation of the EIS.

5 The CMSA section of the transmission circuit is illustrated in **Figure 1.1**.

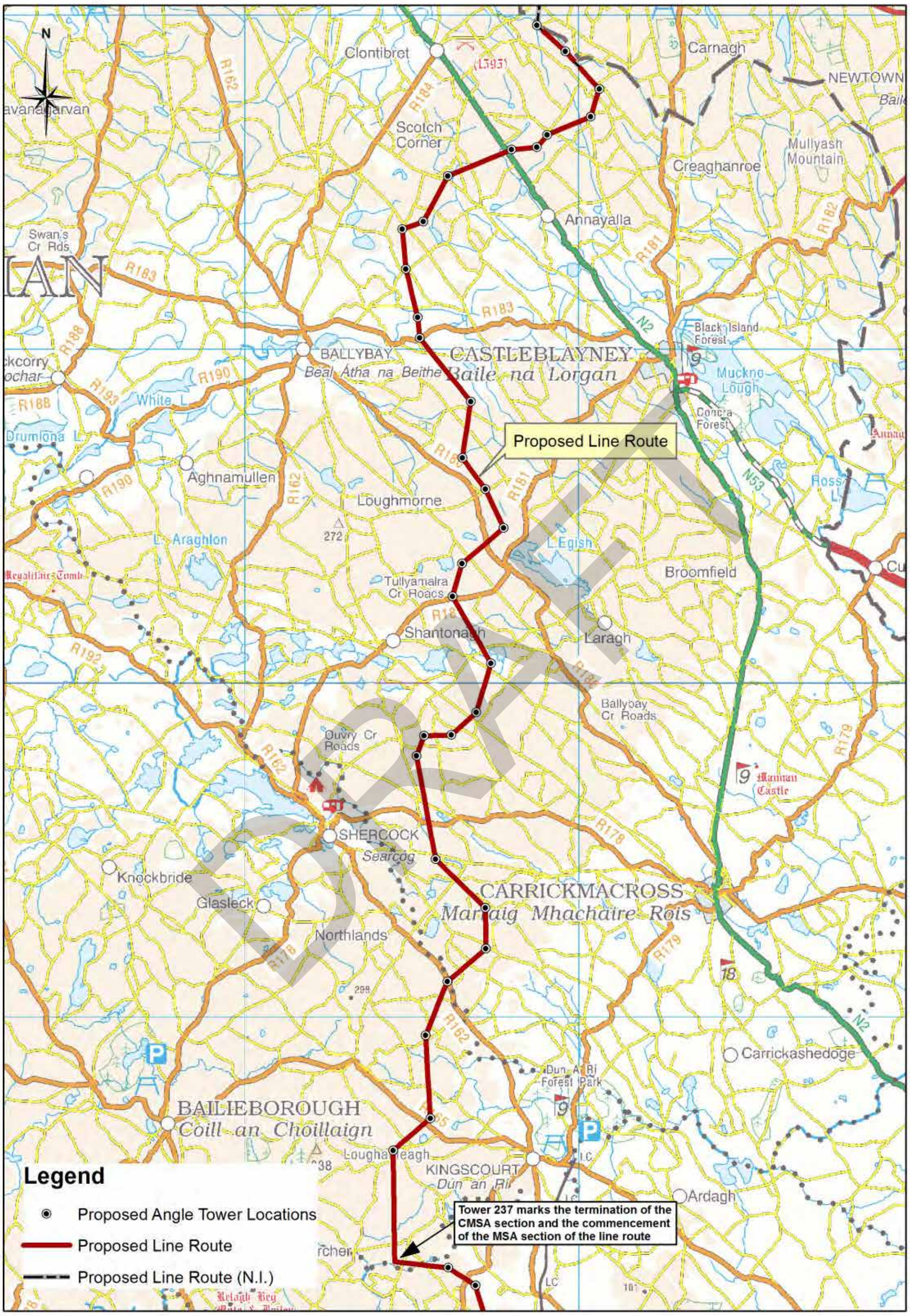


Figure 1.1: CMSA Section of Transmission Circuit

6 This volume of the EIS provides the following:

- A description of the potential effects of the proposed development on the environment in relation to specific environmental headings;
- A description of the data required to identify and the forecasting methods used to evaluate the potential effects in relation to the environmental headings;
- A description of the measures envisaged to avoid, reduce and, where possible, remedy significant adverse effects on the environment;
- A description of the residual impacts, if any; and
- A description of the interrelationships between environmental factors.

7 **Volume 3B** of the EIS provides an evaluation of the potential for transboundary impacts. It also provides an evaluation of the potential for cumulative impacts as well as an evaluation of the interrelationships between the environmental topics in **Volumes 3C** and **3D** of the EIS.

8 A Non-Technical Summary (NTS) of the EIS is provided in **Volume 3A** of the EIS.

9 In addition to the consideration of transboundary effects in **Volume 3B** of the EIS, **Volume 4** of the application documentation comprises a *Joint Environmental Report.* This report has been prepared by EirGrid and System Operator Northern Ireland Ltd (SONI) (the respective applicants)[1] to provide an overview of the impacts as presented in the separate EIS / Environmental Statement (ES) documents. The report also provides an overview of transboundary impacts in a manner consistent with a suggested approach of recent European Commission guidance, *Guidance on the Application of the Environmental Impact Assessment Procedure for Large-scale Transboundary Projects* (May 2013).

1.2 EIS FORMAT

10 This volume of the EIS follows a grouped format structure. Using this structure, this volume of the EIS is prepared in a framework which examines each environmental topic (as prescribed by

[1] The planning of that portion of the proposed interconnector within Northern Ireland was originally undertaken by Northern Ireland Electricity (NIE). However, NIE was obligated by the European Commission to transfer its investment planning function (the “Planning Function”) to SONI. The SONI transmission system operator licence (the “Licence”) was amended on 28th March 2014 to take account of the transfer of the Planning Function following a consultation process by the Northern Ireland Authority for Utility Regulation (NIAUR). The Licence amendments took effect on 30th April 2014. Accordingly, responsibility for the pursuance of the planning application in respect of the proposed interconnector within Northern Ireland has been transferred from NIE to SONI.

the EIA Directive and Irish national regulations) in a separate section. These sections include reference to:

- The characteristics of the proposed development;
- The existing (receiving) environment;
- Potential impacts;
- Mitigation measures;
- Residual impacts (where applicable);
- Interrelationships between environmental factors; and
- Conclusions.

2 HUMAN BEINGS – POPULATION & ECONOMIC

2.1 INTRODUCTION

1 This chapter of the Environmental Impact Statement (EIS) presents an evaluation of the proposed development as set out in Chapter 6, **Volume 3B** of the EIS, in relation to population and socio-economic issues. The information contained within this relates to the Cavan Monaghan Study Area (CMSA) as described in Chapter 5, **Volume 3B** of the EIS.

2 Chapter 6, **Volume 3B** of the EIS describes the full nature and extent of the proposed development, including elements of the overhead line (OHL) design and the towers. It provides a factual description, on a section by section basis, of the entire line route. The proposed line route is described in that chapter using townlands and tower numbers as a reference. The principal construction works proposed as part of the development are set out in Chapter 7, **Volume 3B** of the EIS.

2.2 METHODOLOGY

2.2.1 Scope of the Evaluation

3 This section of the EIS has been prepared in accordance with relevant EU and Irish legislation and guidance, including the requirements of Annex IV of the EIA Directive (which requires a description of the aspects of the environment likely to be significantly affected, including population) and in accordance with Schedule 6 of the *Planning and Development Regulations, 2001* (as amended) and conforms to the relevant requirements as specified therein. The scope of the evaluation is based on a review of legislation, guidance documents, other EISs, feedback from public consultation, consultation with prescribed bodies, consultation with An Bord Pleanála (the Board), and on a consideration of the likelihood for significant impacts arising, having regard to the nature of the receiving environment and the nature and extent of the proposed development.

4 The scoping opinion received from the Board (refer to Appendix 1.3, **Volume 3B Appendices** of the EIS) identified the following issues as being relevant to this chapter of the EIS:

- The identification of potential impacts on settlement patterns along the route, including the identification of existing dwellings, community facilities or other public buildings such as schools, healthcare facilities, etc. and any extant planning permissions for such development;

- An assessment of the likely impacts on the linguistic or cultural heritage of the Gaeltacht area through which the route passes, or on the promotion of Irish as the community language;

- Any implications for, or impacts on, the local regional or national economy; and

- An assessment of the likely effects on the amenity / tourism value of the area, including designated tourist routes (e.g. the Monaghan Way) and possible impacts on fishing and fisheries tourism.

5 Therefore, this chapter concentrates on the population aspects of the existing environment and the potential for impacts on population, settlement, employment and economic opportunities as a result of the proposed development in the CMSA.

6 An evaluation of tourism and amenity issues in the CMSA is described in **Chapter 4** of this volume of the EIS.

7 Indirect impacts to employment locations may occur during the construction phase arising mainly from temporary traffic disruptions. These impacts have been considered and mitigation measures, where required, are outlined in **Chapter 13** of this volume of the EIS. Impacts from maintenance traffic during operation will be negligible and further consideration of these impacts with regard to employment locations has therefore been scoped out of this evaluation.

8 The evaluation primarily concentrates on the preferred corridor as identified in the *Final Re-evaluation Report (FRR) (April 2013)* (refer to Appendix 1.1, **Volume 3B Appendices** of the EIS) within which the proposed OHL is situated but does take account of the wider socio-economic environment outside of this corridor.

2.2.2 Information Sources

9 The information sources used to prepare this chapter include the following:

- Census and employment information published by the Central Statistics Office (CSO 2002-2014);

- Census information published by the Northern Ireland Statistics and Research Agency (NISRA) 2002-2014;

- Ordnance Survey Ireland (OSI) mapping and aerial photography;

- National and Regional Development Plans;

- *Cavan County Development Plan 2014–2020;*
- *Monaghan County Development Plan 2013–2019*;
- Local information and relevant websites (e.g. Monaghan and Cavan County Councils, Border Regional Authority, OSI);
- Information provided as a result of project consultation and scoping; and
- Site visits to the CMSA.

2.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

10 The proposed development primarily involves the erection of an overhead electricity line on lattice steel support structures. The types of issues which OHL developments of this nature typically raise in relation to this environmental topic include the potential for impacts on population, settlement, employment and economic opportunities. In that regard, the evaluation considers the construction, operational and decommissioning aspects of the proposed development.

2.4 EXISTING ENVIRONMENT

2.4.1 Population

2.4.1.1 Population Structure and Change

11 In terms of the county, region and the state, population structure and change is more strongly influenced by migration and emigration rates than by birth and death rates. The mid to late 1980s in Ireland was a period of heavy population outflow, mainly due to the poor economic and employment situation in the country at that time. Since 1990 there has been significant migration into the country with resulting population growth, mainly due to the improved economic performance of the Irish economy. **Table 2.1** provides an analysis of population change for the island of Ireland and at national, regional and local levels since 2002.

Table 2.1: Population Structure and Change at National, Regional and Local Level

Area	2002	2006	% Change 2002 -2006	2011	% Change 2006-2011
Ireland (incl. NI)	5,603,030	5,984,925	6.8	6,399,152	6.9
Ireland	3,917,203	4,239,848	8.2	4,588,252	8.2
Border Region	432,534	467,327	8.0	514,891	10.1
County Monaghan	52,593	55,816	6.4	60,483	8.0
County Cavan	56,546	64,003	13.2	73,183	14.3

(Source: Census of Population Ireland, 2002, 2006, 2011 and NI Census 2001 and 2011)

12 The population statistics in **Table 2.1** show significant increases in population between 2002 and 2011. The most recent population estimates (April 2014) published by the CSO[2] and the NISRA indicate that despite continuing high levels of emigration, population is still increasing in both Ireland and Northern Ireland, although at a lower rate than previously. Population projections for Ireland up to 2046 anticipate a population of approximately five million under the most pessimistic scenario and over 6.7 million under the most optimistic scenario. Population projections for Northern Ireland up to 2034 anticipate a population of approximately two million[3].

13 As detailed in **Table 2.1**, the Border Region (which includes counties Donegal, Sligo, Leitrim, Cavan, Monaghan and Louth) shows population growth between 2002 and 2011 which is broadly in line with population growth at national levels. Significant population pressures have been exerted on certain parts of the region such as the southern parts of counties Louth and Monaghan and east County Cavan by external influences, such as the Greater Dublin Area (GDA) (which includes Dublin City and County as well as counties Meath, Wicklow and Kildare). In the case of the Border Region, population levels specified in the *Border Regional Authority Planning Guidelines 2012–2022* are projected to be approximately 595,000 by the year 2022.

14 Within counties Monaghan and Cavan an analysis of the population data indicates that population trends are as follows:

- Substantial growth has occurred in rural areas around the main towns;
- Population growth in the urban areas has been slight or negative; and
- Rural areas most removed from the main towns have experienced limited or negative population growth.

15 The *Monaghan County Development Plan 2013–2019* (the Monaghan CDP) forecasts a population increase for County Monaghan to 71,400 by 2022. The *Cavan County Development Plan 2014–2020* forecasts a population increase for County Cavan to 83,300 by 2022.

16 It is evident from population statistics published by the CSO and from county development plans that counties Monaghan and Cavan have experienced significant population growth since 2002, and are forecasting further but more limited growth up to 2022. It is also evident that significant growth has taken place in rural areas in close proximity to the main towns of both counties.

[2] www.cso.ie/en/media/csoie/releasespublications/documents/population/2013/poplabfor2016_2046.pdf.
[3] www.nisra.gov.uk/archive/demography/population/projections/Northern%20Ireland%20Population%20Projections%202010%20-%20Statistics%20Press%20Notice.pdf.

2.4.1.2 Settlement Patterns

17 Monaghan and Cavan towns are the largest urban settlements in the counties of the CMSA; however they lie outside the immediate vicinity of the CMSA where the proposed development is located.

18 Of most relevance to the proposed development are the population numbers and structure relating to settlements in counties Monaghan and Cavan in the vicinity of the proposed development. The main urban settlements that lie within the local and wider vicinities of the proposed development are profiled below. Urban settlements generally include a range of residential, commercial and community facilities. Smaller villages typically include a school, church, local shops as well as other community and recreational facilities.

19 As significant population growth has occurred outside the main urban areas in both counties, a number of smaller settlements are also identified.

20 Outside of identified settlements, it is recognised that other more dispersed settlements, often comprising groups of individual dwellings occur frequently in the vicinity of the proposed development.

21 Single (one-off) dwellings outside established settlements are also a significant feature of settlement patterns in both counties. These are both dispersed, and in clustered or linear patterns, throughout the receiving environment of the proposed development.

Carrickmacross (located approximately 7km east of the line route)

22 Carrickmacross is situated on the R179 (the reclassified N2 Dublin / Derry Road) in central County Monaghan. In the CSO data for 2011 it was recorded that the town had a population of almost 2,000 people, with a much larger population of approximately 12,500 additional people living in the surrounding Carrickmacross Rural Electoral Division (CRED) - the CRED includes the District Electoral Divisions (DEDs) of Carrickmacross Rural Area, Ballymackney, Bellatrain, Bocks, Broomfield, Carrickmacross Rural, Corracharra, Crossalare, Donaghmoyne, Brumboory, Drumcarrow, Drumgurra, Enagh, Inniskeen, Kilmurry, Kittybegs, Laragh, Loughfea and Raferagh. These figures represent an 11% increase for the CRED between 2006 and 2011. The town is identified as a Tier 2 town in the Monaghan CDP hierarchy of settlements, with the potential for further population growth. It provides an extensive range of services including health, education, and sport, community, financial and retail for surrounding areas. It is an important employment centre in the county, on account of its long established identity as a market town and is identified as a settlement where growth is required.

23 Of the DEDs referred to above, the line route passes through the DEDs of Laragh, Bellatrain, Raferagh, Drumgurra and Drumcarrow.

Castleblayney (located approximately 6km east of the line route)

24 Castleblayney is situated north of Carrickmacross on the R183 (the reclassified N2). In the CSO data for 2011 it was recorded that the town and its environs had a population of approximately 1,750 people, with a much larger population of over 11,000 additional people living in the surrounding Castleblayney Rural Electoral Division (CRED) - the CRED includes the DEDs of Castleblayney Rural Area, Annyalla, Anny, Ballybay Rural, Ballybay Urban, Carrickaslane, Carrickatee, Castleblayney Rural (part), Church Hill, Clontibret, Cormeen, Creeve, Cremartin, Greagh (Cremorne By), Mullyash and Tullycorbet. These figures represent a 12% increase for the CRED between 2006 and 2011. The town is identified as a Tier 2 town in the Monaghan CDP hierarchy of settlements, with the potential for further population growth. The service sector is the main source of employment in the town, while the agricultural sector, including farming, is the main source of industry and employment in the surrounding area. It functions as a service and retail centre for the surrounding hinterland. One of the main tourist attractions in County Monaghan is Lough Muckno, which is located in Castleblayney.

25 Of the DEDs referred to above, the line route passes through the DEDs of Clontibret, Annayalla, Tullycorbet, Cremartin, Greagh (Cremorne By) and Carrickatee.

Ballybay (located approximately 3.4km west of the line route)

26 Ballybay is situated on the R183 in the south of County Monaghan. In the CSO data for 2011 it was recorded that the Ballybay Urban Area had a population of approximately 298 people with a larger population of over 1,500 people living in the surrounding Ballybay Rural Area. The town is identified as a Tier 3 town in the Monaghan CDP hierarchy of settlements, with the potential for further population growth. It has a similar profile of local employment and services to Castleblayney, while being a smaller town. The town was originally founded on the linen industry; it is now prominent as a base for angling in the region.

Kingscourt (located approximately 3.3km east of the line route)

27 Kingscourt is situated on the R162 in south-east of County Cavan close to the Meath / Monaghan border. It is identified in the Cavan CDP as a Tier 2 large town which recorded a population of 2,326 in Census 2011. The town does have an extensive rural hinterland. Like other large towns it offers a variety of services such as health, education, professional, as well as providing retail and employment for a wide hinterland. Tier 2 towns have an important function in terms of balanced county level growth and are regionally important as part of an overall strategy for balanced regional growth in the county. These towns are regarded as

development centres and the emphasis is on the consolidation of town cores and strengthening of town core retail and service functions. The headquarters of Kingspan (a major manufacturer of building construction materials) is located just outside the town. Gypsum Industries have a major production facility also just outside the town. Local attractions in and around Kingscourt include Cabra Castle Hotel, Dun a Ri Forest Park, and Lough an Leagh mountain and recreation area, which is the highest point in the surrounding area.

28 In this area the line route passes through the DEDs of Lisagoan, Enniskean and Kingscourt.

Shercock (located approximately 3km west of the line route)

29 Shercock is located in east County Cavan at the intersection of the R162 and R178 regional roads. It is identified in the Cavan CDP as a Tier 4 small town, which recorded a population of 531 in Census 2011. The town has an extensive rural hinterland. Tier 4 towns are identified as having important urban support roles. It is not anticipated that they will be strong centres of population growth or that they will develop in a significant way in the future. However, they have an important role to play as service and basic retail providers for their rural hinterlands. Similarly to Ballybay, the town was originally founded on the linen industry but it is now also prominent as a base for angling in the region.

Other Settlements

30 Smaller settlements identified as Tier 6 dispersed rural communities in the Monaghan CDP settlement hierarchy which lie within 5km of the line route include Annyalla, Clontibret, Corduff and Doohamlet. This is the smallest type of settlement identified in the statutory development plans. The character of these settlement areas mirror the rural countryside but have scattered individual houses with some clustering around one or more focal points. Focal points may include existing development around a crossroads, a shop, church and post office. Tier 6 settlements provide basic services to the community such as convenience goods and petrol stations. Post offices and schools are provided in some of these centres which serve an important community purpose. There are no lower order settlements identified in the Cavan CDP within 5km of the line route.

31 In considering individual dwellings, one of the design criteria for routing transmission infrastructure is to seek to maximise the distance from the OHL to such dwellings in so far as is practicable. An analysis of the dwellings along the route of the proposed OHL shows that, notwithstanding the extent of existing scattered one-off housing within the area of the proposed development, there are 39 dwellings (including one permitted but as yet unbuilt dwelling) within 100 metres (m) of the centre of the proposed CMSA line route. The locations of these dwellings are shown on the planning drawings included in **Volume 1** of the planning application documentation.

32 Community facilities, such as schools, churches and sports clubs, where large numbers of people frequently visit, are often found outside of the smaller settlements referred to previously. Similarly to dwellings, an additional design criterion seeks to maximise the distance to such facilities. In this regard the nearest community facilities which are located within 1km of the OHL are; Drumhowan Gaelic Athletic Association (GAA) club (approximately 330m east of Tower 150), Laragh National School and Church (approximately 410m east of Tower 230), Corcreeghagh National School (approximately 640m west of Tower 195), Ballintra Church (approximately 750m south-west of Tower 142) and Ballaghnagearn National School (approximately 820m south-east of Tower 207).

33 Other sections of this volume of the EIS evaluate the potential for specific environmental impacts on dwellings and community facilities arising from the construction and operation of the proposed OHL.

Conclusions

34 An increase in population has been experienced at a national and local level and in the towns and villages listed in this section. The predominance of scattered and clustered one-off housing in the CMSA has ultimately influenced the positioning of the line route, due to the aim of maximising separation distances between the proposed line and existing houses.

2.4.2 Employment and Economic Activity

2.4.2.1 Employment Profile

35 The economic base in counties Monaghan and Cavan has traditionally focussed on the following sectors; manufacturing, agriculture and food production, service industry (including education, health, professional services and retail), rural development and tourism. A significant portion of the productive output in both counties is based on high volume and low margins. While there are some internationally traded services located in the region, inward investment levels have to date been relatively low.

36 While employment and economic activity is dispersed throughout both counties, it is concentrated in the main urban settlements, with the exception of farm based employment. Given the limited employment base in both counties relative to the GDA, a significant proportion of the population commutes for work to areas outside the counties, primarily to the GDA.

37 The economic condition of Ireland has dramatically changed in the last five years, with unemployment at its highest for many years, but recently according to a variety of CSO economic indicators and data sources the economy is beginning to show signs of improvement. While the economic downturn has resulted in an increase in unemployment throughout the

country, border counties tend to have suffered more than areas which have a more diverse economic base. **Table 2.2** presents an economic status profile for both counties.

Table 2.2: Persons Aged 15 Years + Classified by Principal Economic Status, 2011

	Monaghan		Cavan		National
Economic Status	**Persons**	**%**	**Persons**	**%**	**%**
Pop. aged 15+	46,993	-	55,951	-	-
Pop. aged 15+ in Labour Force	28,987	-	34,640	-	-
Employed	23,005	49.0	27,309	48.9	50.1
Looking for first job	471	1.0	559	1.0	1.0
Unemployed	5,511	11.7	6,772	12.1	10.8
Student	5,076	10.8	5,477	9.8	11.3
Home duties	4,569	9.7	5,989	10.7	9.4
Retired	5,973	12.7	7,241	12.9	12.7
Unable to work	2,192	4.7	2,385	4.2	4.4
Other	196	0.4	219	0.4	0.4

(Source: Census 2011 Profile 3 Employment, Occupations and Industry)

38 **Table 2.2** shows that unemployment rates for counties Monaghan and Cavan in 2011 were in excess of the national average.

39 More recent CSO data in relation to unemployment rates is available from the CSO live register data which is published monthly. Live register figures published in September 2014 by the CSO indicate that the standardised unemployment rate (SUR) in the State was 11.1% compared to 14.3% in December 2011. The downward trend in unemployment is reflected in live register data for counties Monaghan and Cavan.

2.4.2.2 Economic Activity

40 Diversity of employment and economic activity is measured, by the CSO, by analysing employment sectors. The diversity of employment within both counties is illustrated in **Table 2.3.**

Table 2.3: Persons Aged 15+ Classified by Employment Sector, 2011

	Monaghan		Cavan		National
Occupation	**Persons**	**%**	**Persons**	**%**	**%**
Total persons in labour force	23,005	-	27,309	-	-
Agriculture, forestry and fishing	2,818	12.3	3,348	12.2	5.2
Building and construction	1,508	6.6	1,565	5.7	5.0
Manufacturing and industry	3,206	13.9	3,787	13.8	10.7
Mining and quarrying	71	0.3	121	0.4	0.3
Wholesale and retail	3,612	15.7	3,679	13.5	14.7
Electricity, gas and water supply	248	1.1	298	1.2	0.7
Hotels and restaurants	1,053	4.6	1,418	5.4	5.7
Transport, storage and communications	1,152	5.0	1,293	4.8	5.4
Banking and financial services	512	2.2	943	3.6	5.2
Real estate, renting and business activities	1,308	5.7	1,608	5.9	10.2
Public service and community service	6,381	27.8	7,568	27.8	31.3
Others	1,121	4.9	1,517	5.7	5.6

(Source: Census 2011 Profile 3 Employment, Occupations and Industry)

41 A breakdown of those working within the broad employment groups, as outlined in **Table 2.3**, illustrates that although agriculture remains important, it is not the primary employer. In 2011 approximately 12% of the working population in both Cavan and Monaghan were directly employed in the agriculture, forestry and fishing sector; this is significantly higher than the national average. The manufacturing sector is also a significant employer, employing almost 14% of the population in both Cavan and Monaghan, again in excess of the national average. The service sector (including wholesale and retail, hotels and restaurants, transport, storage and communications, banking and financial services, real estate, renting and business activities and public service and community) was the most important employer in both counties accounting for over 60% of the total working population; this is lower than the national average of 72%.

42 Employment trends anticipate a continued contraction in the traditional sectors of the economy. It is therefore the aim of both counties to diversify and increase employment and economic activity across a wide range of sectors including agri-food, internationally traded services,

renewable energy, life sciences, tourism, natural resource, creative, caring and retail. An improved economy will assist in achieving these aims.

43 The Monaghan CDP and the Cavan CDP both reflect the need to deliver regional investment and to create jobs and growth. The plans acknowledge the need for improved infrastructure, including telecoms, energy and water, in order to attract Foreign Direct Investment (FDI) to the region and it is an objective of both plans to co-operate with the relevant bodies to ensure a co-ordinated approach to the provision of necessary infrastructure and services to support industrial development.

2.5 POTENTIAL IMPACTS

2.5.1 Do Nothing

44 Population demographics will continue to change in future years irrespective of whether this proposed development proceeds. The proposed development will have no noticeable impact on population demographics as they are influenced by wider social and economic factors.

45 In terms of employment and economic activity, in order to continue to attract future investment (both domestic and foreign) to both Ireland and Northern Ireland, it is essential that the electricity grid is maintained and improved. For example, in the *Government Policy Statement on the Strategic Importance of Transmission and Other Energy Infrastructure* published by the Department of Communications, Energy and Natural Resources (DCENR) on the 17th July, 2012 it is stated that:

> *"Our ability to rebuild the economy, deliver regional development, create jobs and growth and ensure the wellbeing of everyone as well as realising the economic potential of Ireland"s own renewable energy resources requires significant energy infrastructure."*

46 Doing nothing may eventually lead to a situation where an inadequate electricity grid becomes a barrier to further significant investment in employment generating and economic activities.

2.5.2 Construction Phase

47 The construction phase of the proposed development will not have any significant impacts on population demographics.

48 In economic terms, the capital value of the proposed interconnector is estimated to be in the region of €286 million. The project will involve the provision of direct and indirect jobs both on and off site, over the construction period. Employment will be created by the construction of the proposed development. Like other major construction projects, this project will be put out for

competitive tender. Therefore, it is not possible to state what volume construction materials, services etc. will be purchased locally. Materials such as concrete and other standard materials may be sourced locally, where possible. Other more specialised electrical materials such as steel towers, conductors, insulators and other line hardware will be sourced outside the CMSA. Indirect employment and economic activity in local shops, restaurants and hotels is likely to be sustained as a result of the construction project and its employees being located in the CMSA.

49 Therefore, during the construction phase of the proposed development there are likely to be some local positive economic benefits in the study area.

2.5.3 Operational Phase

50 In order to provide for future forecasted population growth on the island of Ireland, it is essential that the electricity grid is maintained and improved. When operational, the proposed development will contribute towards ensuring that the electricity grid is adequate to meet the needs of future forecast population levels throughout the island of Ireland.

51 When operational, the proposed development will contribute towards ensuring that the electricity grid is not a barrier to further significant investment in employment generating activities.

2.5.4 Decommissioning

52 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration.

2.6 MITIGATION MEASURES

53 As the proposed development will have no noticeable impact on population demographics, no mitigation measures are required.

54 In terms of minimising the potential for impacts on the amenities of existing and future populations, the principal mitigation measure has been to maximise the distance between the proposed development and larger urban settlements, local villages, clustered settlements, individual one-off dwellings, schools, churches and community facilities.

55 Specific mitigation measures are included in other chapters of this EIS to mitigate potential adverse impacts which could arise during the construction and operational stage on human beings, arising from other environmental pathways.

2.7 RESIDUAL IMPACTS

56 Once the proposed development is operational, no significant residual impacts on population demographics and local economic activity are anticipated.

2.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS

57 This chapter should be read in conjunction with other chapters of this volume of the EIS including; **Chapter 3** Human Beings – Land Use, **Chapter 4** Human Beings – Tourism and Amenity, **Chapter 5** Human Beings – EMF, **Chapter 9** Air – Noise and Vibration, **Chapter 10** Air – Quality and Climate, **Chapter 11** Landscape, **Chapter 12** Material Assets – General and **Chapter 13** Material Assets – Traffic, for a full understanding of the main interrelationships between these environmental topics.

58 Impacts to population are inherently interrelated to the various environmental topics evaluated in the EIS. All likely significant impacts in relation to population have been considered throughout the relevant chapters which detail the environmental topics. The main impacts on population arise from the following interrelationships:

- **Chapter 4** - Tourism and Amenity - There may be a slight reduction in tourism spend and associated economic activity in the immediate areas where the proposed development will be located.
- **Chapter 9** - Air – Noise & Vibration - There is the potential for noise impact to population in the form of impact to sensitive receptors such as private dwellings etc. in the construction phase and the operational phase. In the operational phase corona noise has the potential to cause noise impact during inclement weather conditions. These impacts are addressed in the EIS and are not deemed to be significant.
- **Chapter 11** - Landscape - There is a negative impact for dwellings that are located in close proximity to the proposed development which arises from the visual impacts.

2.9 CONCLUSIONS

59 An evaluation of the impact on community amenity has been undertaken through the identification of community facilities within 1km of the proposed development. The closest community facility is located approximately 400m from the proposed development. In total there are six community facilities within 1km of the proposed development; Drumhowan GAA

club, Laragh National School and Church, Corcreeghagh National School, Ballintra Church and Ballaghnagearn National School. Additionally, there are 39 dwellings (including one permitted but as yet unbuilt dwelling) within 100m of the centre of the proposed CMSA line route.

60 The likely impacts during both the construction and operational phases have been evaluated. The significance of these impacts is evaluated within the various specialist chapters of this EIS. Impacts to residential amenity are inherently interrelated to the various environmental topics evaluated in this EIS. All likely significant impacts in relation to residential amenity have been considered throughout these topics. The main impact on residential amenity which is likely to be significant arises from the visual impacts, where dwellings are located in close proximity to the proposed development. The extent and significance of such visual impacts is detailed in **Chapter 11** of this volume of the EIS.

61 It is considered that the landscape and visual resources of the wider CMSA will not deteriorate to a significant degree and the overall impact upon population and residential amenity in general is therefore restricted to those receptors / areas within close proximity to the towers and OHL. The routing of the proposed OHL is considered to present the best overall option amongst the many alternatives considered throughout the development process.

62 There will be wider economic benefits arising from the improvements to the electricity grid in the island of Ireland, these will be experienced in both jurisdictions.

3 HUMAN BEINGS – LAND USE

3.1 INTRODUCTION

1 This chapter of the Environmental Impact Statement (EIS) presents an evaluation of the proposed development as set out in Chapter 6, **Volume 3B** of the EIS, in relation to Human Beings – Land Use. The information contained within this chapter considers the land use of the Cavan Monaghan Study Area (CMSA) as defined in Chapter 5, **Volume 3B** of the EIS. In that regard, the evaluation considers the construction, operational and decommissioning aspects of the proposed development in the CMSA.

2 This chapter sets out the methodology followed in this evaluation (refer to **Section 3.2**), describes the characteristics of the proposed development (refer to **Section 3.3**), describes the existing land use environment (refer to **Section 3.4**), evaluates potential impacts, (refer to **Section 3.5**), sets out mitigation measures proposed (refer to **Section 3.6)** and describes anticipated residual impacts (refer to **Section 3.7**). Potential transboundary impacts are addressed in Chapter 9, **Volume 3B** of the EIS. Potential cumulative impacts and potential interrelationships between environmental factors are dealt with in Chapter 10, **Volume 3B** of the EIS.

3.2 METHODOLOGY

3.2.1 Scope of the Evaluation

3 The scope of the evaluation of this chapter of the EIS has been confined to agriculture, forestry and horticulture. The 2006 Corine Land Cover data indicates that, within a 1km corridor of the proposed project alignment, 98.4% of the land is classified as agricultural, 0.1% is classified as forestry and woodland and 1.5% is classified as peatland. As detailed in **Chapter 2** of this volume of the EIS and also in Chapter 1, of **Volume 3B** of the EIS, the proposed development has avoided the largest settlements in the CMSA, and is located in an area where the land use is primarily agricultural, with associated secondary land uses including food processing as well as rural settlements, enterprises and tourism.

4 The scoping opinion received from An Bord Pleanála (the Board) (refer to Appendix 1.3, **Volume 3B Appendices** of the EIS) identified the following issues as being relevant to this chapter of the EIS:

- Assess the likely land use impact, including restrictions on existing uses such as agriculture or commercial forestry.

5 The following guidelines were referred to while preparing and writing this appraisal:

- Environmental Protection Agency (EPA) (2002). *Guidelines on the Information to be contained in Environmental Impact Statements*;
- EPA (2003). *Advice Notes on Current Practice (in the preparation of Environmental Impact Statements*); and
- Design Manual for Roads and Bridges (UK) *Vol 11, Section 2 Part 5, Determining Significance of Environmental Effects* (2008), published by the UK Highway Authority.

3.2.2 Information Sources

6 The following data sources were used to inform the appraisal:

- Landowner interviews and discussions;
- Road side surveys in August 2011 and August - September 2013;
- Examination of aerial mapping information;
- Land Registry boundary data;
- Ordnance Survey field mapping;
- Central Statistics Office (CSO) data from the 2010 Census of Agriculture;
- Other sources of information referred to include;
  - *Soils & Subsoils Class* digital data downloaded from the EPA website in September 2013;
  - Corine Land Cover Map of Ireland (2006);
  - Health and Safety Authority Ireland (2013). Farm Safety Action Plan 2013-2015;
  - Health and Safety Authority Ireland (2010). Guidelines for Safe Working near Overhead Electricity Lines in Agriculture, (http://www.hsa.ie/eng/Publications_and_Forms/Publications/Agriculture_and_Forestry);
  - Electricity Supply Board (ESB) and Irish Farmers Association (IFA) (October 1985). *Code of Practice for Survey, Construction and Maintenance of Overhead Lines in Relation to the Rights of Landowners;*
  - ESB and IFA (September 1992). *Agreement on Compensation for Loss of Tree Planting Rights;*

- ESB Networks. *Farm Well, Farm Safely* (http://www.esb.ie/esbnetworks/en/safety-environment/safety_farm.jsp)*;* and
- *National Forestry Inventory* (2007) (Republic of Ireland) published by the Forestry Service, Department of Agriculture, Fisheries and Food.

7 The evaluation methodology involves three stages:

- A baseline appraisal was carried out. The type and size of land parcels[4] and their character is described in **Section 3.4**. The methodology of evaluation of sensitivity is explained in **Section 3.2.3**.
- An appraisal of potential impacts during construction, operation and decommissioning phases was carried out. The magnitude of potential impacts is evaluated based on criteria as set out in **Section 3.2.4**.
- The significance of impact is provided by evaluating the sensitivity of the land parcel and magnitude of impact and is based on the criteria set out in **Section 3.2.5**.

3.2.3 Evaluation of Baseline

8 The land use appraisal for the CMSA includes land parcels along the proposed development and along temporary access routes. The existing agricultural, horticultural and forestry environment is evaluated by interviewing landowners (where possible), roadside surveys and by examination of aerial photography and land registry mapping data. The 2010 *Census of Agriculture* provides comprehensive information on agricultural and horticultural farms in counties Cavan and Monaghan. The character of the agricultural environment is categorised by evaluating the sensitivity of each land parcel along the proposed development.

3.2.3.1 Sensitivity

9 In this evaluation, the main criterion in determining the sensitivity of a land parcel is the enterprise type. Land quality and farming intensity are also considered. The range of sensitivity values range from very low, low, medium, high and very high. The criteria for categorisation of sensitivity are shown in **Table 3.1**.

[4] A land parcel is land owned as determined from the land registry mapping. The land parcel may not be the entire holding of a landowner.

Table 3.1: Criteria for Categorisation of Sensitivity

Sensitivity Category	Enterprise Type	Characteristics
Very High	Experimental Husbandry Farms. Stud Farms (large scale equine, breeding regionally and nationally important horses). Race Horse Training Enterprises. Intensive Livestock enterprises (pigs and poultry), Commercial tree plantations and Mushroom Farms. Intensive Horticultural Enterprises. Commercial Forestry Plantations	Rare and important on a regional or national basis. There is limited potential for substitution due to specific facilities and internal farm layout. Very high potential for change if a tower or overhead line is located on these enterprises. In the case of pig and poultry farms there is a limited potential for substitution due to difficulty in obtaining suitable alternative sites. Very high potential for change within a 74m wide corridor of the overhead line (OHL).
High	Dairy Farms. Equine enterprises (significant enterprise on the farm but not including intensive Stud Farms).	Any impact that restricts the movement of livestock to and from the farm hub will have a high potential to cause change. These farms generally have a specific grazing paddock layout to allow access to the farm yard – which is difficult to substitute.
Medium	Beef Farms, Sheep Farms. Equine Enterprises (not a significant enterprise on the farm). Tillage and field cropping, grass cropping farms (hay or silage)	The potential for change is lower than dairy farms because livestock generally do not have to be moved on a daily basis and the grazing layout requirement is less rigid than on dairy farms. Crops and cropping programmes are less sensitive to change in the longer term. There is less restriction on substituting the land in these enterprises.
Low	Rough Grazing and Commonage, Low Stocking rate.	The potential for change is low because the scale or intensity of enterprise is so low that there is a low response to impacts.
Very Low	Little or no agricultural activity e.g. Woodland, Bog.	The potential for change is very low because the scale of enterprise or intensity of enterprise is so low that there is a very low response to impacts.

(Source: Table 3.1 is based on the EPA guidelines 2002 and the Design Manual for Roads and Bridges (DMRB) 2008. The EPA guidelines 2002 define sensitivity as the ―*Potential of a receptor to be significantly changed*". The concepts of Importance, Rarity and Potential for Substitution are introduced in Table 2.1 Volume 2, Section 2, and part 5 of DMRB 2008).

10 Sensitivity may vary from indicated values due to professional judgement and depending on site specific factors. Examples of such site specific factors include:

- The presence of specialised facilities on affected land parcels e.g. dog training tracks and horse race / training tracks; and
- Where land parcels have livestock or crops which have a value or importance which is above the normal for this type of farm, the sensitivity value may be increased. Possible examples are experimental sites and rare breeds.

3.2.4 Evaluation of Magnitude of Impacts

11 The elements of the proposed development which will cause potential impacts on the agronomy environment are identified in **Section 3.5**. The magnitude of the impact is the scale of impact due to the proposed development and are assigned values ranging from very low to very high. The probability and duration of occurrence is also considered. The criteria and methodology for evaluation of impact magnitude are set out in **Table 3.2**.

Table 3.2: Criteria and Methodology for Evaluation of Impact Magnitude

Magnitude	Determining Criteria
Very High	A permanent restriction on the operation of a land parcel or site where the location of towers or OHL permanently restricts a vital operational aspect of an enterprise. For example a permanent change in land or forest area of approximately 15% (or more) or the removal of critical buildings or the restriction of access to an intensive enterprise (e.g. pigs, poultry, horticulture).
High	A permanent restriction on the operation of a land parcel or site where the location of towers or OHL permanently restricts an important operational aspect of an enterprise. For example a permanent change in land or forest area of approximately 10-15% or the removal of standard cattle or sheep buildings in a conventional farmyard. Construction phase impacts without mitigation could in rare situations have a high magnitude of impact (e.g. significant damage to land drainage, allowing livestock to stray onto public roads).
Medium	A permanent restriction on the operation of a land parcel or site or where for example a permanent change in land or forest area of approximately 5-10%. Where access to land or farmyard is restricted but there is alternative access. Where the development of, or expansion of, a farmyard is restricted but there is alternative land available for this development. Construction phase impacts without mitigation will generally result in medium magnitude impacts (for example poor re-instatement of fences of land, rutting along access tracks not being reinstated or levelled).
Low	A permanent change in land or forest area of approximately 1-5%. The presence of multiple tower sites and a central alignment of the OHL will tend to give a low impact.

Magnitude	Determining Criteria
Very Low	A permanent change in land or forest area of approximately 1% (or less). The presence of one tower site in an average sized land parcel and an alignment of the OHL at the edge of the farm will tend to give a very low impact.

(Source: Based on author's experience in assessing magnitude and significance of impacts.)

12 The criteria in **Table 3.2** are indicative and are subject to a qualitative evaluation of impact based on professional judgement. Consideration is also made as to the likelihood, frequency and probability of an impact occurring.

3.2.5 Evaluation of Significance of Impact

13 The significance of the impact is the importance of the outcome of the impact or the consequences of the change. The EPA *Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)* (September 2003) contain guidelines for describing the significance of impacts. The significance of impact is determined by evaluating the magnitude of the impact and the sensitivity of the affected land parcel. **Figure 3.1** gives a guide for determining the level of significance of impact.

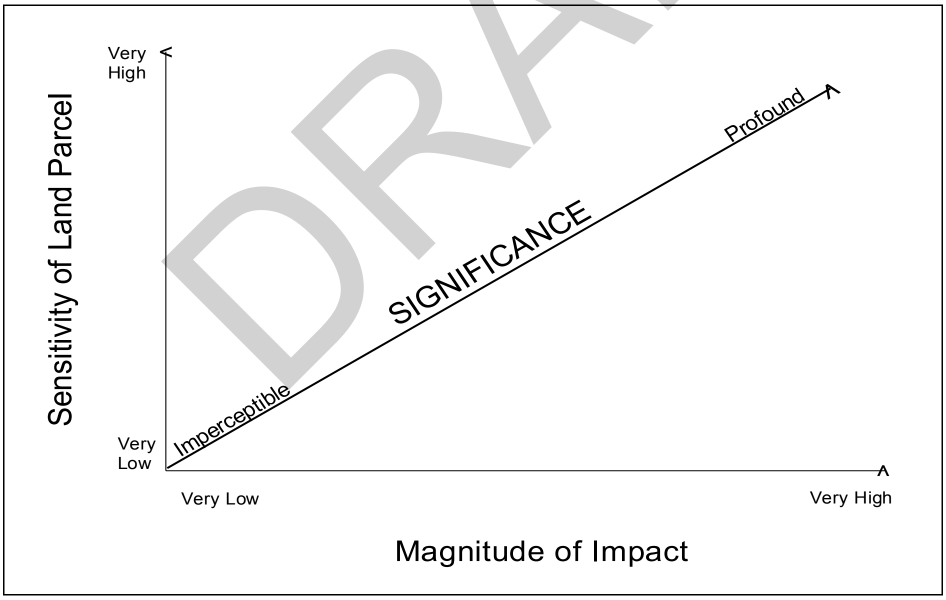


Figure 3.1: Significance of Land Parcel Impacts[5]

[5] Based on Design Manual for Roads and Bridges (UK) Vol 11, Section 2 part 5, Determining Significance of Environmental Effects (2008, published by the UK Highway Authority).

14 The significance of the impacts is described as follows:

- An ‗Imperceptible‘ impact is either an impact so small that it cannot be measured or is capable of measurement but without noticeable consequences;
- A ‗Slight Adverse‘ impact causes noticeable changes in the operation of an enterprise on a land parcel in a minor or slight way;
- A ‗Moderate Adverse‘ impact changes a land parcel causing operational difficulties that require moderate changes in the management and operational resources;
- A ‗Major Adverse‘ impact changes a land parcel so that the enterprise cannot be continued, or if continued will require major changes in management and operational resources; and
- A ‗Profound Impact‘ changes the land parcel in a way that it obliterates the land parcel enterprise.

3.2.6 Consultation

15 The Department of Agriculture, Food and the Marine (DAFM) and ESB were consulted in relation to the proposed development. In addition all landowners along the proposed route alignment were written to and offered an agricultural assessment. (Refer to the *Public and Landowner Consultation Report* in **Volume 2B** of the application documentation and Chapter 3, **Volume 3B** of the EIS for details on scoping and statutory consultation).

3.2.7 Difficulties Encountered

16 These issues are dealt with in **Volume 2B**, *Public and Landowner Consultation Report*, of the application documentation and Chapter 3, **Volume 3B** of the EIS for details on scoping and statutory consultation. The majority of the landowners along the proposed alignment chose not to engage with the agronomist which presents the following difficulties for the assessment.

Difficulty Confirming the Full Extent of Landowner's Farms

17 Land registry mapping is available for all of the proposed alignment and along the proposed temporary access routes. Reliance on land registry mapping as the only source of information on land ownership will lead to both an overestimation of the number of farmers affected and an underestimation of the area farmed (e.g. some of the land farmed may be registered in a spouse‘s name or in a relative‘s name). The magnitude of impact in this EIS is partly based on the percentage of the land parcel restricted under the towers, at working sites and along temporary access routes. The consequence of underestimating areas of land farmed is that the

magnitude of impact tends to be overestimated. This is an acceptable consequence in the context of this proposed development where the impacts are generally low.

Difficulty Confirming Enterprise Types

18 The standard practice in land use assessments is to categorise the baseline sensitivity. Farm enterprise is an important criteria in this categorisation. This information is generally obtained from a combination of landowner interviews, roadside surveys and examination of aerial photography. The consequence of incorrectly identifying a high sensitive farm as medium sensitive is that the significance of impact would be underestimated (refer to **Figure 3.1**). However the author is satisfied that the evaluation of land parcel sensitivity is adequate based on the following reasons:

- Roadside surveys and examination of aerial photography have accurately identified very high sensitive land parcels (e.g. commercial forests, stud farms, poultry farms, Teagasc experimental husbandry farms and intensive horticultural enterprises with glass houses & poly tunnels).
- The main difficulty encountered is determining whether grass enterprises were medium sensitivity (beef and or sheep) or high sensitivity (dairy and equine) in situations where livestock were not seen on the land parcel. In order to assess sensitivity in these situations other aspects of the land parcel were examined such as, presence of a farm yard, presence of stables, presence of milking facilities, presence of access suitable for a milk lorry, access into adjoining land parcels (if any) and a well-developed farm paddock system.
- An evaluation was conducted for each land parcel.
- The 2010 National Census of Agriculture is referred to, which provides an accurate description of the baseline environment and therefore the expected enterprise mix along the proposed alignment.

Difficulty in Specifying Land Use Mitigation Measures for Inclusion in the Design, Construction and Operation of the Proposed Development

19 The nature of the proposed development is different from road infrastructural projects because farms are not divided and access is not significantly affected. The land utilisation under the OHLs will not change significantly. The impacts are lower than for road infrastructural projects and there is no requirement for constructed accommodation works for land use purposes. In common with other infrastructural projects, this proposed development reduces overall impact by minimising the overall length, minimising the number of towers and avoiding farm yards. Therefore, although engagement with landowners is desirable, the design of the proposed

alignment is not as reliant on landowner engagement as road projects. For this development if landowners engaged with the project team then additional land use mitigation could have been provided (e.g. placing towers on some field boundaries) and alternative locations for temporary access routes could be specified. While this may result in outcomes that are more satisfactory for landowners, it would result in a lower impact in a very small number of cases. Therefore the consequence due to limited landowner engagement on the design of the proposed development is not significant from a land use point of view. The construction and operation mitigation measures are informed by the author‘s own experience as an agricultural consultant and reference is made to the ESB / IFA agreement. There is no significant consequence due to limited landowner engagement on construction and operation mitigation measures.

3.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

20 The characteristics of the proposed development which have the potential to create impacts on land uses arise from the specific locations of towers and the OHL on lands.

21 During the construction phase, the construction sites around the towers, guarding locations, the stringing sites and the temporary access routes have the potential to cause adverse, albeit largely temporary effects. There will be potential disturbance where trees are located within their falling distance from the OHL infrastructure, and where these need to be felled. Forestry plantations within a maximum 74m wide corridor will be cleared. A detailed description of the proposed development and how it will be constructed is presented in Chapters 6 and 7 of **Volume 3B** of the EIS.

3.4 EXISTING ENVIRONMENT

3.4.1 Land Use Along the Proposed Alignment

22 The CMSA is shown in Figures 3.2 - 3.9, **Volume 3C Figures** of the EIS. **Table 3.3** presents and compares the CSO 2010 Agricultural Census (hereinafter referred to as the 2010 Census) statistics and data from the agricultural evaluation.

Table 3.3: Agricultural and Forestry Statistics for County Cavan, County Monaghan, the State and Land Parcels evaluated along the Proposed Alignment

	Typical Sensitivity	Statistics for County Cavan	Statistics for County Monaghan	State Statistics	Evaluated Land parcels
Average size (ha)	-	26.4	23.3	32.7	10.8
Number of land parcels / farm	-	3.5	3.6	3.8	-
Dairy Farms (% of total number)	High	11.2%	13%	11%	97.5[6]
Beef, sheep, silage & hay farms, rough grazing (% of total number)	Medium	86.5%	81.5%	83%	
Tillage farms (% of total number)	Medium	0.1%	0.5%	3%	0%
Mixed crops and livestock farms (% of total number)	Medium	0.2%	0.3%	2%	0%
Other enterprises (e.g. pigs, poultry, horticultural cropping, equestrian as the main enterprises) (% of total number)	High	2%	4.7%	1%	2.5%
Forestry (% of total land area)	Very High	8%	5%	10%	0%
Horticultural area (vegetable crops, fruit, nursery, other crops – table 7D of 2010 census) (% of total area)	High - Very high	0.05%	0.02%	0.2%	0%

(Source: The data in the last column is based on the author's evaluation of land parcels along the proposed development. Data in the remaining columns is based on the *National Forestry Inventory* (2007) (Republic of Ireland) published by the Forestry Service, Department of Agriculture, Fisheries and Food and 2010 Census of Agriculture (CSO)).

[6] Excluding forestry and based on visual inspections of land parcels along the proposed development and contact with landowners – 7% are dairy, 53.5% are beef and / or sheep and 37% are unconfirmed grass enterprises (of which 1.5% are scrub and bog land parcels).

23 The 2010 census data for County Monaghan gives a good indication of the agricultural and horticultural holdings along the proposed development within County Monaghan.

- Farms in County Monaghan are smaller than the average farm in the state (23.3ha vs 32.7ha) and, on average, farms in County Monaghan will have 3.6 separate land parcels per farm (Tables 1 and 28 of 2010 census).

- The standardised economic output per farm (Table 3 of 2010 census) is €45,500 in County Monaghan compared to the state average of €30,700 (and €41,953 for surrounding counties). The relatively high output per farm (considering the smaller than average size) can be explained by a higher proportion of other enterprises (pigs, poultry and mushroom).

- There are 1.2 standard work units employed on County Monaghan farms which is the same as the average standard work unit per farm in the state (Table 38 of 2010 census). Farming is the sole or major occupation of two thirds of County Monaghan farmers which is similar to the state (Table 36 of 2010 census).

- Compared to the statistics for the state as a whole, there are a significantly higher proportion of other type enterprises, slightly higher proportion of dairy enterprises, slightly lower proportion of beef, sheep and grass cropping farms and a lower proportion of tillage farms. The percentage of land in forestry is less than the state average. The percentage of total area sown to horticultural crops in County Monaghan is less than the average for the state and the area sown to potatoes is very low (5ha-Table 7D of the 2010 census). Table 8D of the 2010 census indicates that 5% of farms in County Monaghan will have brood mares with an average of approximately three mares per farm (this is similar to the state average).

24 The 2010 census data for County Cavan will give a good indication of the agricultural and horticultural holdings along the proposed development within County Cavan.

- Farms in County Cavan are smaller than the average farm in the state (26.4ha vs 32.7ha) and on average farms in County Cavan will have 3.5 separate land parcels per farm (Tables 1 and 28 of 2010 census).

- The standardised economic output per farm (Table 3 of 2010 census) is €34,500 in County Cavan compared to the state average of €30,700 (€30,636 for surrounding counties).

- There are 1.2 standard work units employed in County Cavan farms which is the same as the average standard work unit per farm in the state (Table 38 of 2010 census). Farming is the sole or major occupation of two thirds of County Cavan farmers which is similar to the state (Table 36 of 2010 census).

- The farm types in County Cavan are similar to those of the state except for slightly higher proportion of beef, sheep and grass cropping farms and a lower proportion of tillage farms. The percentage of total area sown to horticultural crops in County Cavan is less than the average for the state and the area sown to potatoes is very low (7ha - Table 7D of the 2010 census). Table 8D of the 2010 census indicates that 3% of farms in County Cavan will have brood mares with an average of approximately three mares per farm (this is similar to the state average).

25 The construction material storage yard is a 1.42ha grass field adjoining the N2 south of Carrickmacross. This field will be returned to agricultural production after the construction is completed. A total of 220[7] land parcels are evaluated for impacts along the proposed development. The potential impacts on these land parcels are summarised in **Appendix 3.1, Volume 3C Appendices** of the EIS. The land parcel enterprises evaluated along the proposed alignment are as follows:

- 118 are beef and or sheep enterprises;
- 15 are dairy enterprises;
- 81 are grass land parcels where the farm enterprise is unconfirmed, four of which are bog and scrub plots;
- Five equine enterprises (Ref No LCT- 091, 107, 149, 223A and 232); and
- One intensive agriculture enterprises (LCT- 011, 012 and 013).

3.4.2 Soils Types in Land Parcels along the Proposed Alignment

26 In this section reference is made to *Soils & Subsoils Class* digital data downloaded from the EPA website in September 2013[8]. The main soil types of land parcels along the proposed development in the CMSA are:

- Approximately 50% of soil in land parcels along the proposed alignment in counties Monaghan and Cavan is a mineral soil EPA Code 3. This is categorised as a deep heavy soil which generally has poor drainage characteristics. However this soil can be drained and the drumlin hilly topography can aid drainage. While this soil can be good

[7] One additional farm, LMC-168, is partly within the CSMA and MSA – the appraisal for this farm is included in Chapter 3, **Volume 3D** of the EIS.
[8] Prepared by the Teagasc Spatial Analysis Group at Kinsealy Research Centre (in collaboration with EPA, Department of the Enviro nment, Heritage and Local Government, Forest Service and GSI).

quality from an agricultural point of view it tends to be heavy with restricted drainage. The soil type is evenly distributed in land parcels along the proposed development.

- Approximately 20% of land in affected parcels in the CMSA is a mineral soil EPA Code 1. This is categorised as a deep well drained good quality soil. The soil type is evenly distributed in land parcels along the proposed development.

- Approximately 20% of land in affected parcels in counties Monaghan and Cavan is a mineral soil EPA Code 2. This is categorised as a shallow well drained soil. The quality of this soil is variable with some areas having shallow rocky soils. The distribution of this soil type is widespread but it occurs as the dominant soil in land parcels in Lemgare, Lisdrumgormly and Annaglough.

- Approximately 10% of land in land parcels in the CMSA is bog and wet peaty type soils EPA Code 6 (poor quality from an agricultural point of view). These soils occur mainly in low lying areas adjoining lakes.

27 The visual evaluation of land parcels along the proposed development in counties Monaghan and Cavan suggests that land quality is mixed but the majority is reasonably good quality, heavy land. The topography is hilly (drumlin belt). Artificial land drainage systems are a feature of the land along the line route.

3.4.3 Categorisation of Land Parcels

28 The results of the evaluation and categorisation of agricultural land parcels along the proposed development in the CMSA are shown in **Appendix 3.1, Volume 3C Appendices** of the EIS. These land parcels are categorised based on the criteria described in **Section 3.2.3**. The sensitivity of land parcels along the proposed development is as follows:

- 1% (2 No.) are categorised as very high sensitive with one stud farm (Ref. No. LCT-091) and one intensive agriculture (pigs and / or poultry) enterprises (Ref. No. LCT-011, 012 and 013).

- 9.5% (21 No.) are categorised as high sensitive with 14 dairy enterprises, four equine enterprises (Ref. No. LCT-107, 149, 223A and 232) one beef and forestry enterprise (Ref No. LCT-225 and two unconfirmed grass enterprises (Ref No LCT- 089, 146A and 147A).

- 87% (191 No.) are categorised as medium sensitivity (including the construction material storage yard). These are beef cattle and / or sheep and unconfirmed grass enterprises which are land parcels where livestock were not seen but were evaluated as medium sensitive - in many cases these were meadows.

- 2.5% (6 No.) are categorised as low or very low sensitivity. These are four poor quality land parcels (Ref No LCT- 025, 109 and 235A), and two small land parcels (Ref No LCT-122 and LCT-177).

3.5 POTENTIAL IMPACTS

3.5.1 Do Nothing

29 In the case of the ‗Do Nothing Scenario‘ there would be no impacts on the environment and there would be no change to the existing environment.

3.5.2 Construction Phase

30 The construction phase impacts are those impacts that may potentially affect land parcels during the projected 36 month period of the construction programme. Chapter 7 of **Volume 3B** of the EIS describes the five stages of the construction programme for the OHL. The stages are summarised here:

- Stage 1 – Preparatory Site Work (1 – 7 days);
- Stage 2 – Tower Foundations (3 – 10 days);
- Stage 3 – Tower Assembly and Erection (3 – 4 days);
- Stage 4 – Conductor / Insulator Installation (7 days); and
- Stage 5 – Reinstatement of Land (1 – 5 days).

31 Taking the maximum duration of works figures for Stages 1 – 5 above, the construction work at one tower should be completed within 32 days or 1 month. However, because the contractor will be working on several tower locations at one time, the construction work will be spread over a six to eight week period at each tower site, up to Stage 3. After Stage 3 there will be a period of inactivity until Stage 4 and Stage 5 works are completed at a later date.

3.5.2.1 Construction Traffic

32 The construction vehicles required for Stages 1 – 3 are described in Chapter 7, **Volume 3B** of the EIS). Typical vehicles accessing agricultural land are; 4x4 jeep, 360˚ tracked excavator (up to 22 tons), wheeled dumper or track dumper (up to 8 tons), transit van, cement lorry (up to 38 tons) or dumper if ground conditions and terrain are not suitable, goods lorries and tractor and trailer.

3.5.2.2 Construction Impacts

33 The potential impacts during the construction phase are:

- Wheel rutting and compaction along temporary access routes and at construction and winching sites, will cause damage to soil at all stages of the construction programme. Rutting will restrict machinery operations, such as fertiliser spreading, spraying and harvesting. The damage will be dependent on ground conditions and weather. Damage would be worst at tower construction sites.

- There is potential for general disturbance to farm enterprises at all stages of the construction programme. Construction activities and traffic could interfere with users of existing and temporary access routes and could generate noise and dust. The movement of construction traffic could disturb livestock. Grazing livestock are generally familiar with the landowner and his machinery and may be disturbed when different machinery and personnel are introduced on to a farm, particularly horses, young cattle and suckler cows. As well as the land lost to arable crops and grassland, temporary access routes and construction sites may cause temporary separation or unavailability of land. For example, access for dairy cows to a milking parlour or access for livestock to water sources could potentially be interfered with. In the unlikely event that rock breaking or piling is required the resulting loud sudden noise could cause a ‗fight or flight' response in livestock. There is an increased risk of livestock escaping via new temporary access points or due to gates being left open or failure to make fences stock-proof. Farming operations may be interrupted or take longer to complete as a result of the construction activity. Landowners may have to spend additional time organising their farm enterprise.

- At construction Stage 1, disturbance may occur as a result of the preparation of the tower construction areas and temporary access routes.

- There is an increased risk of spreading animal and crop diseases (soil borne crop diseases) due to personnel and machinery moving between farms at all stages of the construction programme. Construction machinery using existing tracks / roads or accessing land through farm yards increases the risk of spreading farm diseases, because the construction machinery may encounter accumulations of animal manure. Construction machinery may inadvertently spread soil borne diseases particularly in potato and vegetable cropped fields.

- The construction of the proposed development may have direct impacts on Area Based Farm Payments (e.g. Single Payment Scheme (SPS), Disadvantaged Areas Payment Scheme (DAS) , 2015 Basic Payment Scheme and 2015 Greening Payment Scheme). These payments are dependent on the Utilisable Agricultural Area (UAA) which in certain situations will be reduced due to temporary access tracks and construction sites. The implementation of Nitrates Regulations on farms is sensitive to reductions in UAA. The payments of other farm schemes such as the Agricultural Environmental Options Scheme (AEOS) and Green, Low-carbon Agri-environmental Scheme (GLAS) are also based on the UAA. Certain Agri-Environmental Options may be affected by the location of temporary access tracks and construction sites (e.g. Species Rich Grassland Option and Traditional Hay Meadow Option). In the case of Area Based Payment schemes and Nitrates Regulations the reduction in UAA due to the proposed development is generally less than 1-2% of the area farmed and the larger area reductions are generally temporary (e.g. at tower construction sites). In relation to Agri Environmental Schemes, the DAFM will review individual cases on a case by case basis.

- Tree felling in forestry plantations would have a very low to very high impact depending on the proportion of the plantation felled. Opening up the plantation may increase windfalls. Besides the provision of stock proof fencing, the only mitigation is compensation. The cleared land can in certain situations be sown with grass.

- At construction Stages 1 and 3, there is the potential for land drains to be disturbed during excavation.

- At the tower construction sites, any spillages of fuel oil could contaminate soil and surface water.

- In construction Stage 2, spillages of concrete may occur which could contaminate soil and surface water.

- Any potential surface water run-off from soil excavations into water courses could temporarily contaminate drinking sources for cattle.

34 Where the mitigation measures identified in this EIS are implemented, the significance of these construction phase impacts in **Appendix 3.1, Volume 3C Appendices** of the EIS may be summarised as:

- 191 land parcels along the proposed development within the CMSA are predicted to have an imperceptible impact – 87% of total number;

- 28 land parcels along the proposed development within the CMSA are predicted to have a slight adverse impact – 12.7% of total number;

- There is one moderate adverse impact (0.3% of total number) at the construction materials storage yard; and

- There are no major adverse or profound construction impacts.

35 The evaluated significance is relatively low and is dependent on the temporary nature of construction impacts. In line with EPA guidance, temporary impacts have a lower significance than permanent impacts. Without mitigation the impacts would be longer term in nature and therefore the significance would increase dramatically. Construction traffic will have to use existing private farm tracks to access working areas. The impact on land parcels along these tracks is evaluated to be imperceptible.

3.5.2.3 Construction Materials Storage Yard

36 The land use for where the construction materials storage yard is proposed is agricultural. The top soil at the construction compound will be stripped back and replaced with a hard core surface. There will be long term soil compaction at the site due to machinery and storage of materials. There is the potential for soil and water contamination due to spillages of fuels or materials. These issues will be addressed in the CEMP. Following completion of the construction the site will be re-instated and can be used for agriculture again.

3.5.3 Operational Phase

37 The potential impacts are during the operational phase are outlined below.

3.5.3.1 Noise Impacts

38 Noise sources from the OHLs are described in detail in **Chapter 9** of this volume of the EIS. These noise sources include operational noise sources from the OHLs and noise generated during maintenance works.

3.5.3.2 Permanent Disturbance

39 Permanent disturbances as a result of the proposed development are:

- Maintenance works will cause infrequent disturbance during the operational phase (Chapter 7, **Volume 3B** of the EIS). Emergency patrol crews may have to access land, particularly after extreme weather events. Routine maintenance work involves foot patrols to examine OHLs and towers every five years, tower painting at approximately 35 to 40 years and replacement of 25% of shield wire and 5% of insulators at approximately 30 years. Routine maintenance work, as carried out on the existing OHL network, may result in very low levels of disturbance.

- The towers will be a physical obstacle to farm machinery operations. In grassland fields the bases of the towers may be grazed but it will not be possible to reseed or manage them to their full potential. Silage will not be harvested from the area directly under the tower and there will be small inaccessible areas around the tower where silage may not be harvested. In tillage fields there will be uncropped areas under and around the towers.

- The area under the towers may act as reservoir for weeds species, some of which are referred to in the *Noxious Weeds Act* and therefore place an extra responsibility on landowners to control them.

- The construction activity at the tower, guarding and stringing sites and traffic along temporary access routes will cause soil damage which will be evident in the medium term during the operational phase. A higher level of damage can be expected at the construction materials storage yard where the effects will be longer term due to the intensity of vehicular activity at this site.

- The presence of the towers and OHLs will have direct impacts on the operation of farm schemes during the operational phase. Area Based Payments are dependent on the UAA which in certain situations will be reduced due to the presence of towers. The implementation of Nitrates Regulations on farms is sensitive to reductions in UAA. The payments of other farm schemes such as the AEOS and GLAS are also based on the UAA. Certain Agri Environmental Options may be affected by the location of towers (e.g. Species Rich Grassland Option and Traditional Hay Meadow Option) and tree planting options may be affected under the OHLs. In relation to Agri Environmental Schemes, the DAFM will review individual circumstances on a case by case basis and if possible alternative sites on the farm will be agreed with the landowner (e.g. for tree planting options).

3.5.3.3 Farmyard Development

40 The presence of the OHL may restrict construction of some agricultural and horticultural buildings.

3.5.3.4 Impact on Commercial Forestry

41 There are no impacts on commercial forests along the CSMA alignment.

3.5.3.5 Health and Safety Risks

42 The minimum clearance for the proposed OHLs will be 9m. In general, most farm machinery activities can take place safely under these electricity lines (e.g. fertilising, low trajectory slurry spreading, spraying, crop harvesting) but there may be unacceptable risks associated with transporting exceptionally high loads (e.g. bales), irrigating crops with rain guns, high trajectory spreading of slurry and using machinery with loader attachments under the electricity lines.

3.5.3.6 Electric and Magnetic Fields

43 Electric and Magnetic Fields (EMF) are described in **Chapter 5** of this volume of the EIS. There are no known adverse effects on livestock or crops as a result of EMF.

3.5.4 Decommissioning

44 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration.

3.6 MITIGATION MEASURES

3.6.1 Construction Phase

45 During the design phase, impacts have been mitigated by minimising the number of towers having regard to requirements imposed by technical and environmental constraints and constructing an OHL development that is structurally sound and safe.

46 Tower sites have been located away from farm yards, where possible and reasonable efforts made to involve landowners in discussions regarding location of towers.

47 Prior to commencement of work, the construction contractors will prepare method statements and work programmes that show detailed phasing of work. A wayleave agent will be appointed by the contractor to liaise with the landowners along the line route and ensure that their requirements for entry are met, so far as is possible and that landowners are made aware of the schedule of works to be carried out on their land.

48 All employees and contractors involved in the construction phase will receive adequate training in particular in relation to issues relating to livestock safety and bio security on farms.

49 Landowners will be notified in advance of the commencement of construction.

50 The contractor will ensure that landowners have reasonable access to all parts of their farm during the construction phase.

51 Disease protocols will be adhered to. As referenced in the ESB / IFA agreement, the contractor will comply with any DAFM regulation pertaining to crops and livestock diseases.

52 Where required, fencing will be erected to exclude livestock from construction sites.

53 In most situations, mitigation measures for noise will not be required during the construction phase. This is because livestock will quickly adapt to changes in their noise environment. In the unlikely event that rock-breaking or piling are required, owners of livestock in adjoining fields will be notified in advance.

54 It will be construction policy to minimise non tracked vehicular access to sites in wet weather. Temporary aluminium or panel tracks will be used in certain situations to prevent damage to soil (see Chapter 7, **Volume 3B** of the EIS).

55 Excavations will be minimised. The locally excavated material will be reinstated surrounding the tower base following construction. All unused excavated fill will be removed from site and disposed of at a licensed waste facility.

56 Affected land drains will be redirected in a manner that maintains existing land drainage.

57 Where top soil is stripped back it will be replaced. All disturbed field surfaces will be reinstated.

58 Any losses or additional costs incurred by the landowner which are directly attributed to the proposed development, during the construction phase or the operational phase, including additional necessary remedial works and including losses and or additional costs arising from Area Based Payment Schemes, Nitrates Regulations and Agri Environmental Schemes will be paid to the landowner as per the ESB / IFA agreement.

59 Mitigation relating to potential effects on water quality and soil contamination due to fuel or concrete spillages are detailed in **Chapters 7** and **8** of this volume of the EIS.

60 Mitigation measures outlined in the CEMP in relation to land use will be implemented as part of the construction management A summary of all mitigation measure are detailed in Chapter 11, **Volume 3B** of the EIS.

3.6.2 Operational Phase

61 The OHL infrastructure will be inspected and maintained as set out in Chapter 7, **Volume 3B** of the EIS.

62 Disease protocols will be adhered to during maintenance works.

63 ESB will provide safety information directly to all affected landowners e.g. HSA *Guidelines for Safe Working near Overhead Electricity Lines in Agriculture* and ESB Networks *Code of Practice for Avoiding Danger from Overhead Electricity Lines in Agriculture*. These publications will enable farmers to fulfil their statutory requirements under Health and Safety Regulations.

64 For general operational noise, there is no practical mitigation (refer to **Chapter 9** of this volume of the EIS) but the potential impacts on agricultural activities from noise are negligible. During maintenance works, mitigation will involve notification to landowners in advance of any construction activity.

65 Helicopter inspections will be announced in local newspapers and the Farmer's Journal.

66 Other damage and disturbance impacts which cannot be mitigated directly by the contractor will be addressed in the statutory compensation process. For example the land at construction sites and along temporary access tracks may require subsoiling, ploughing and reseeding a few years after the construction period, if crop reestablishment is not satisfactory. Annual payments will be paid to landowners for the interference caused by the towers on their land.

3.7 RESIDUAL IMPACTS

67 Agronomy residual impacts are discussed under three headings:

- Residual impacts at a national and regional level;
- Residual impacts along the alignment in the CMSA; and
- Residual impacts on individual land parcels.

3.7.1 Residual Impacts at a National and Regional Level

68 The area of agricultural land (excluding commonage) in County Cavan is 139,374ha and in County Monaghan is 106,288ha (2010 census data). The combined area of both counties is approximately 5.5% of the national agricultural area.

- The area of land beneath the towers in County Cavan (within the CMSA) will be approximately 0.52ha. There will be short to medium term impacts due to damage to soil on approximately 8ha at construction sites and along temporary access routes. The impact is imperceptible based on the low percentage of total area affected.

- The area of land beneath the towers in County Monaghan will be approximately 2.2ha. There will be short to medium term impacts due to damage to soil on approximately 38.5ha at construction and stringing sites, at guarding locations and along access tracks. There will be more long term damage to approximately 2ha of land at the construction compound. The impact is imperceptible based on the low percentage of total area affected.

- There will be no significant change in land use due to the location of the proposed OHLs.

69 Overall the significance of residual impact on a regional or national level will be imperceptible.

3.7.2 Residual Impacts along the Proposed Development within the CMSA

70 The impact on the study area (approximately 2,380ha) within the CSMA, which consists of all the land parcels (No. 220) along the proposed development, is evaluated to be imperceptible based on:

- The total area (within CMSA) of land beneath the towers is approximately 2.7ha which is 0.1% of the area of land parcels along the proposed development within the CMSA;

- There will be damage to soil on approximately 40ha (38.5ha short – medium term and 2ha long term) which is 1.7% of the area of land parcels along the proposed development within the CMSA; and

- There will be no significant change in land use under the OHLs on land parcels along the proposed development.

3.7.3 Residual Impacts on Individual Land Parcels

71 The land parcel impacts in the operational phase are due to land use restrictions at tower sites, short to medium term damage caused to land during the construction phase, long term inconvenience and additional safety risk caused by presence of the electricity lines and towers and potential impacts caused to farm yards. Disturbance due to maintenance works will also contribute to land parcel impacts. Construction phase disturbance impacts are general short term (1 – 3 years) and with mitigation there should be no residual impact. Impacts due to damage to soil are short to medium term (5 – 15 years; based on author‘s experience) and with mitigation, lands can be restored to pre-construction condition. Impacts due to loss of land beneath the towers and impacts due to OHLs are permanent (>60 years). Intermittent disturbance due to maintenance works during the operational phase is a permanent impact (>60 years). Helicopter inspections will generally cause a ‗fight or flight‘ reaction in livestock, particularly with sensitive animals such as thoroughbred horses and young livestock. The potential impact could be high. Given the rare occurrence of injury from ‗fight or flight‘ events

the magnitude of impact with mitigation is low. The towers and OHLs will be an additional safety risk on farms, however the magnitude of impact is generally evaluated to be very low based on the existence of similar OHL infrastructure throughout Ireland. Overall magnitude of impacts on individual land parcels tend to be low or very low and the sensitivity of land parcels is medium in the majority of cases (90%). The magnitude and significance of the impact on each land parcel along the proposed development is shown in **Appendix 3.1, Volume 3C Appendices** of the EIS:

- There will be imperceptible impacts on 115 land parcels – 52.5% of total number;
- There will be slight adverse impacts on 91 land parcels – 41% of total number;
- There will be moderate adverse impacts on 14 land parcels – 6.5% of total number; and
- There will be no significant adverse or profound impacts.

72 The moderate adverse impacts on land parcels (reference numbers LCT- 051, 064, 076 and 076B, 089, 118, 129, 136, 141, 150, 174, 174A, 181, 214, and 226) arise where the OHLs oversail the land parcel in a manner that may impact on potential farm yard development. There is one moderate adverse impact on the construction materials storage yard due to long term damage caused to soil.

3.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS

73 The main interrelationships between environmental factors include the following:

- **Chapter 6** - Flora and Fauna - Many farmers participate in Environmental Schemes funded by the Department of Agriculture, Food and the Marine, for example the Agricultural Environmental Options Scheme (AEOS). Environmental Options such as Species Rich Grass, Traditional Hay Meadows and Tree Planting may be affected by the placement of the OHLs and the towers. Therefore there is a potential impact on biodiversity on farms. In addition, if trees are cleared in the vicinity of OHLs there is a potential impact on shelter. Overall, the impact from the proposed development on the biodiversity on farms and the availability of shelter is imperceptible.
- **Chapter 7** - Soils, Geology and Hydrogeology - Soil quality will be affected by the construction works and there is a potential effect on land drainage. Both of these consequences of construction will have a negative impact on crop growth. With appropriate mitigation the overall impact is assessed to be negligible.

- **Chapter 8** - Water – During construction there is a potential effect on water quality due to surface run-off and this could impact on water sources for livestock. With appropriate mitigation this impact is negligible.

- **Chapter 9** - Air – Noise and Vibration - During the construction and operational periods noise may impact on livestock. Dust may be generated at construction sites and along access tracks which may affect quality of crops. Maintenance works and helicopter inspections will cause noise that may have an effect on livestock. With appropriate mitigation this impact is imperceptible.

- **Chapter 10** - Air – Quality and Climate - Construction activity may cause dust to be deposited on agricultural land which can affect grazing livestock.

74 After evaluating these interrelationships there are no significant additional impacts.

3.9 CONCLUSIONS

75 The low level of landowner engagement presented some difficulties for the evaluation of the baseline environment, particularly with the identification of grass based enterprises where livestock were not seen. Despite these difficulties, a detailed evaluation was carried out on land use along the development in the CMSA using roadside surveying and examination of aerial photography. The proposed electricity development within the CMSA will have an imperceptible impact on land use arising from the construction of 134 towers on 2.7ha of land and 40ha of soil damage caused by construction activity. The residual impacts are either imperceptible or slight adverse on 94% of the land parcels along the proposed alignment within the CMSA. Thirteen (6%) moderate adverse impacts are due to potential restriction of farm yard development and one (0.5%) moderate adverse impact at the construction materials storage yard is due to damage to soil.

4 HUMAN BEINGS – TOURISM AND AMENITY

4.1 INTRODUCTION

1 This chapter presents an evaluation of the proposed development as set out in Chapter 6, **Volume 3B** of the Environmental Impact Statement (EIS), in relation to tourism and amenity considerations. The information contained within this chapter is concerned with tourism and amenity in the Cavan Monaghan Study Area (CMSA) as defined in Chapter 5, **Volume 3B** of the EIS. It should be read in conjunction with other chapters of this volume of the EIS, particularly **Chapter 2** for a full understanding of the potential for population and economic impacts associated with the proposed development.

2 Chapter 6, **Volume 3B** of the EIS describes the full nature and extent of the proposed development, including elements of the overhead line (OHL) design and the towers. It provides a factual description, on a section by section basis, of the entire line route. The proposed line route is described in that chapter, using townlands and tower numbers as a reference. The principal construction works proposed as part of the proposed development are set out in Chapter 7, **Volume 3B** of the EIS.

4.2 METHODOLOGY

4.2.1 Scope of the Evaluation

3 This chapter of the EIS has been prepared in accordance with relevant EU and Irish legislation and guidance, including the requirements of Annex IV of the EIA Directive and in accordance with Schedule 6 of the *Planning and Development Regulations, 2001* (as amended) and conforms to the relevant requirements as specified therein. The scope of the evaluation is based on a review of legislation, guidance documents, other EISs, feedback from public consultation, consultation with prescribed authorities, consultation with An Bord Pleanála (the Board), and on a consideration of the likelihood for significant impacts arising, having regard to the nature of the receiving environment and the nature and extent of the proposed development.

4 The scoping opinion received from the Board (refer to Appendix 1.3, **Volume 3B Appendices** of the EIS) identified the following tourism and amenity related considerations as being relevant to this chapter of the EIS:

- Fáilte Ireland as a prescribed body has stated that, from a preliminary analysis of the *Preferred Project Solution Report (PPSR)* (July 2013) (refer to Appendix 1.2, **Volume 3B Appendices** of the EIS), it considers that the main tourism asset in the vicinity of the proposed development in the CMSA is the Monaghan Way. It is further submitted that additional tourism amenities and assets in the area which may be potentially impacted upon should also be identified and this identification can be undertaken in consultation with Fáilte Ireland by reviewing data from their Tourism Content System (TCS).

- Monaghan County Council has stated that it has nothing to add to the elements identified in Chapter 6 (Matters to be Addressed in the EIS) of the PPSR. It is considered that the issues raised in the submission from Fáilte Ireland broadly reflect tourism related issues raised previously by Monaghan County Council during pre-planning consultations.

- Cavan County Council advised that Lough an Leagh and Muff crossroads should be considered in the visual appraisal.

5 This chapter concentrates on the tourism and amenity aspects of the existing environment and the potential for impacts on the tourism and amenity value of the area as a result of the proposed development in counties Monaghan and Cavan.

6 In reaching conclusions in this evaluation, consideration has been given to those locations and activities that are identified in publications and which have been identified during the public consultation process as well as through site visits to the CMSA. The purpose of the evaluation is to identify those impacts that are likely to be significant and to propose mitigation measures where feasible and necessary.

7 An evaluation of other economic activities and employment in the CMSA is described in **Chapter 2** of this volume of the EIS.

8 Indirect temporary impacts to tourism locations may occur during the construction phase arising mainly from visibility of construction activities and temporary traffic disruptions. These potential impacts have been evaluated and mitigation measures, where required, are outlined in **Chapters 11** and **13** of this volume of the EIS. Impacts from maintenance traffic during operation will be negligible and further consideration of these impacts with regard to tourism locations has therefore been scoped out of this evaluation.

9 The evaluation primarily concentrates on the preferred corridor as identified in the *Final Re-evaluation Report (FRR)* (April 2013) (refer to Appendix 1.1, **Volume 3B Appendices** of the EIS) within which the proposed OHL is situated but it does take account of the wider environment outside of this corridor in an area within at least 5km from the outer edge of the corridor.

4.2.2 Information Sources

10 The information sources used to prepare this chapter include the following:

- Tourism information published by Fáilte Ireland;
- *Guidelines on the treatment of tourism in an EIS*, provided by Fáilte Ireland as part of their submission to the Board, referred to in **Section 4.2.1**;
- Tourism information published by the Northern Ireland Tourist Board (NITB);
- Local tourism information publications and websites including Monaghan Tourism (www.monaghantourism.com), Cavan Tourism (www.thisiscavan.ie) and the Blackwater Region (www.visitblackwaterregion.com);
- Other websites related to specific tourist attractions or facilities (e.g. Irish Trails for information about the Monaghan Way, Lough an Leagh Environmental Group website, local accommodation and attraction websites);
- National and Regional Development Plans;
- *Cavan County Development Plan 2014 – 2020*;
- *Monaghan County Development Plan 2013 – 2019*;
- Ordnance Survey Ireland (OSI) mapping and aerial photography;
- Information provided as a result of project consultation and scoping; and
- Site visits to the CMSA.

4.2.3 Fáilte Ireland Guidelines on the Treatment of Tourism in an EIS

11 Fáilte Ireland has developed these guidelines to facilitate its evaluation of projects on the potential for impacts on tourism and amenities and it is considered that these guidelines are the most appropriate evaluation methodology to use for this EIS. The guidelines differentiate between tourism projects and impacts of other projects affecting tourism (e.g. the quality of a destination or a tourism activity).

12 The guidelines suggest that in the area likely to be affected by the proposed development, the attributes of tourism, or the resources that sustain tourism, should be described under the headings of context, character, significance and sensitivity. They further note that the detailed description and analysis will usually be covered in the section dealing with the relevant

environmental topic – such as ‗*Landscape*'. Only the relevant findings as to the likely significance to, or effect on, tourism needs to be summarised in the tourism section.

13 In interpreting these guidelines, the following approach has been used:

- Characteristics of the Proposed Development: The nature and extent of the proposed development in terms of being a linear development;
- Existing Environment: This addresses the context, character, significance and sensitivity of the tourism assets of the area by providing a profile of the tourism base of the area;
- Potential Impacts: Consideration of the likely impacts to the tourism and amenity assets of the area as a result of the proposed development;
- Mitigation Measures: Description of mitigation measures; and
- Residual Impacts: Potential impacts following mitigation measures.

4.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

14 The proposed development primarily involves the erection of an overhead electricity line on lattice steel support structures. The types of issues which OHL developments of this nature typically raise in relation to this topic include; the potential for impacts on the attractiveness and amenity value of an area and the associated impact on tourist numbers and revenue to the area. In that regard, the evaluation considers the construction, operational and decommissioning phases of the proposed development.

4.4 EXISTING ENVIRONMENT

4.4.1 Description of Key Tourism Attractions and Amenities in the Area

15 There are number of tourist attractions and amenities in counties Monaghan and Cavan, offering a variety of tourist experiences primarily based around the themes of culture, sightseeing, ecology and outdoor activities. While the majority of tourist attractions and amenities in proximity to the line route are located in County Monaghan, Lough an Leagh Gap and Mountain, which is located in County Cavan, lies approximately 2.1km to the west of the proposed development.

16 Figure 4.1, **Volume 3C Figures** of the EIS provides a detailed map of accommodation, attractions and activities focusing on those within 5km of the OHL. The material is sourced from information provided in October 2014 by Fáilte Ireland. It is representative of what Fáilte Ireland has in its Tourism Content System database at a point in time, and should not be construed as representing all tourism businesses in any particular area. It does not include, for example, tourism accommodation providers that are not registered with Fáilte Ireland. It is also representative of tourist attractions and activities in counties Monaghan, Cavan and Meath, as identified in publications compiled by the local tourist organisations, Monaghan Tourism and Cavan Tourism. The relevant tourist attractions and activities which are described in this EIS are confined to those main tourism assets that are proximate and relevant to the CMSA section of the proposed development.

17 From the information provided, the most significant visitor attractions identified by Fáilte Ireland in counties Cavan and Monaghan are as follows:

- Lough Muckno in County Monaghan (located approximately 6.6km east of the OHL);
- The Monaghan Way (intersected by the OHL);
- Lough an Leagh in County Cavan (located approximately 2.1km west of the OHL); and
- Dun a Rí Forest Park in County Cavan (located approximately 3.8km east of the OHL).

4.4.1.1 Lough Muckno (located approximately 6.6km east of the OHL)

18 Fáilte Ireland and Monaghan Tourism have stated during consultations that they view Lough Muckno Forest Park as the most significant tourist attraction in County Monaghan. **Figure 4.2** shows a view of Lough Muckno.

Figure 4.2: View of Lough Muckno

19 Lough Muckno Forest Park is designated as an area of primary amenity value in the *Monaghan County Development Plan 2013–2019* (the Monaghan CDP). It is Monaghan's largest lake and a significant amenity in the Monaghan and Armagh areas. It is located east of the N2, on the eastern boundary of Castleblayney town. The lake covers an area of approximately 325ha. There are a number of well-established fishing locations on the lake. Lough Muckno holds large stocks of fish including Bream, Rudd, Roach, Hybrids, Tench, Perch and Pike. Course angling, game angling and pike angling are popular tourist activities around the lake. The lake is a centre for water sports while the forest is an important recreational area for visitors. Hope Castle, a historic property, now used as a hotel, is located in the vicinity of Lough Muckno.

20 There are no statistics available for visitor numbers to Lough Muckno but it is recognised by the tourism agencies as one of the most significant attractions in Monaghan and South Armagh areas. It is identified by tourism agencies as a location with tourism development potential.

4.4.1.2 The Monaghan Way (intersected by the OHL between Towers 109 and 110)

21 The Monaghan Way is a 64km linear walking route that starts at Monaghan town and ends at the village of Iniskeen, which is the birthplace of poet and novelist Patrick Kavanagh. **Figure 4.3** shows an illustrative map of the Monaghan Way.

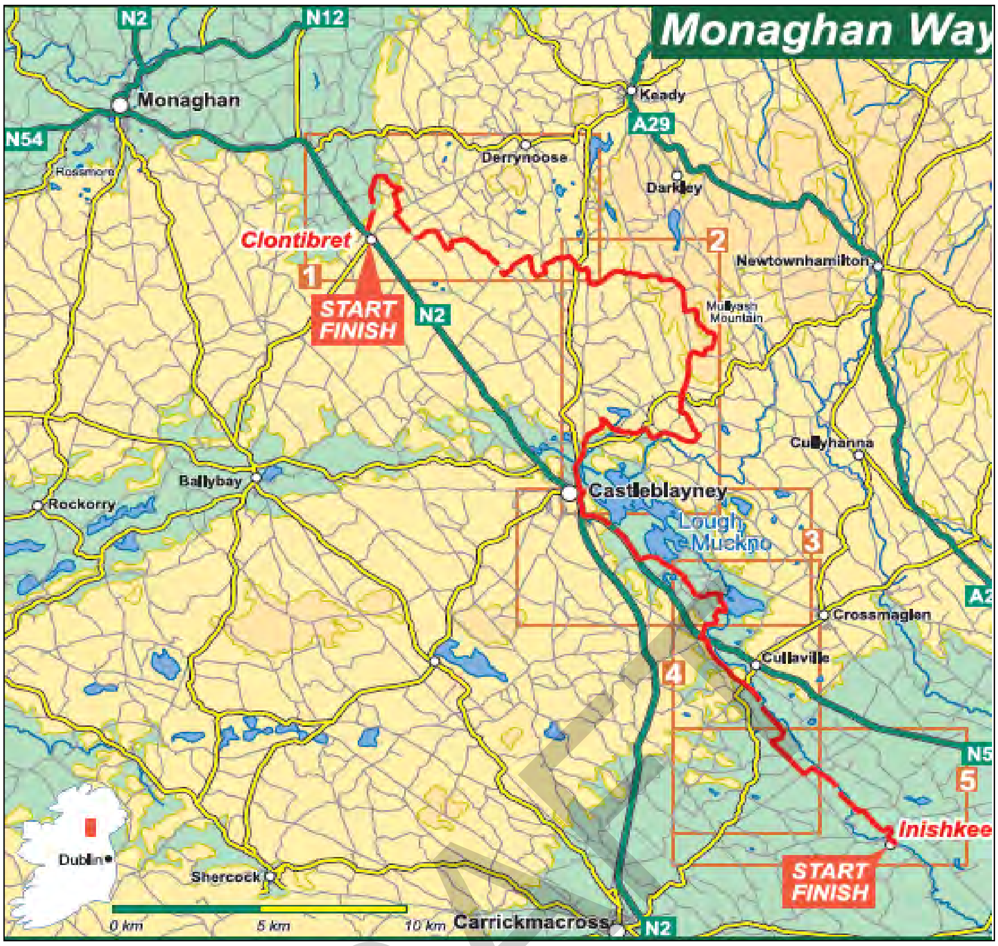


Figure 4.3: Map of the Monaghan Way

(Source: www.irishtrails.ie)

22 The northern section of the Monaghan Way, running south from the starting point, consists mainly of 44km of trail on side roads and approximately 9km on main roads, but there are some short woodland path and field sections. The remainder of the route passes through a variety of terrain, including side roads, short lakeside stretches, along the River Fane and along an old disused railway line. No visitor numbers are available for the Monaghan Way but it is listed as one of 44 national way marked walking trails in Ireland and has been identified by Fáilte Ireland as one of the main tourist assets in the study area.

4.4.1.3 Lough an Leagh Mountain (located approximately 2.1km west of the OHL)

23 Lough an Leagh is identified in the *Cavan County Development Plan 2014–2020* (the Cavan CDP), as an area of high landscape and environmental value. It is situated in south-east Cavan between the towns of Bailieborough and Kingscourt, and covers an area of approximately 3km in length by up to 1km wide and rises to a height of 344 metres. As the highest point in south-east Cavan it is an important local tourist attraction, particularly on account of the extensive views in all directions. **Figure 4.4** shows the type of views available from Lough an Leagh.

Figure 4.4: Views from Lough an Leagh

24 It is also the location of a number of radio and communications masts due to its height. The surrounding upland areas are the locations of a number of wind farms which are visible from this area. Parking is available at the top of the mountain near the picnic area and Mass Rock, with a fairy fort located to the right of the mass rock. There are a number of walking trails and viewing points around Lough an Leagh. The area is used for hill walking, cycling and general recreation and is identified by Cavan Tourism as an attraction in the south-east Cavan area.

4.4.1.4 Dun a Rí Forest Park (approximately 3.8km east of the OHL)

25 Dun a Rí Forest Park, which lies approximately 1km north of Kingscourt, forms part of what was formerly the Cabra Estate. The woodland is owned by Coillte and it contains a variety of flora and fauna. There are a number of marked walks and trails in the park with accompanying visitor facilities.

4.4.1.5 Towns and Villages

26 The many smaller towns and villages around counties Monaghan and Cavan have a number of local attractions and amenities for the surrounding population. The following are those which are located in the CMSA in close proximity to the proposed development.

- Clontibret is a small village in north-east County Monaghan. It is associated with the larger site of a battle which was fought between Hugh O'Neill and the Marshal of Queen Elizabeth I Sir Henry Bagenal in 1595, referred to historically as the Battle of Clontibret.

There is a monument and information board which marks the battle site. The Wildlife Education Centre close to Clontibret provides a learning environment as well as a cafeteria and picnic facilities. **Chapter 14** of this volume of the EIS describes the history of the Battle of Clontibret in detail.

- Donaghmoyne, sign posted off the Carrickmacross to Castleblayney road, is the location of the Mannan Castle 18-hole Parkland Golf Course. The ruins of Mannan Castle, with its motte and bailey, are still visible.

4.4.2 Description of Visitor and Recreational Activities and Events

27 There are a number of visitor activities available in counties Cavan and Monaghan as indicated in Figure 4.1, **Volume 3C Figures** of the EIS and in local tourist publications. While many indoor activities are located in towns and villages, there a variety of outdoor activities available at different locations throughout both counties. This section focuses on those outdoor activities which are proximate to proposed line route.

4.4.2.1 Angling and Shooting

28 Counties Monaghan and Cavan have many lakes, rivers and streams which are well renowned for angling of all types but particularly coarse angling. The main fishing lakes and rivers in the vicinity of the proposed development include loughs Muckno, Egish, Fea, Descart, Rahans, Creevy, Morne and their tributaries. There are a number of well-established angling centres in both counties and a variety of fishing venues which cater to the needs of all anglers. The main centres are Ballybay, Carrickmacross, Castleblayney, Clones and Monaghan but there are also a number of smaller towns and villages that are also used as bases for angling in the area.

29 There are a number of gun clubs throughout the both counties, many of which are associated with angling clubs. Lough Egish Rod and Gun Club is the largest club in the area where the proposed development is located. Clay pigeon shooting takes place at Mourne Clay pigeon shooting close to Lough Mourne.

4.4.2.2 Equestrian

30 There are a number of equestrian centres and stables throughout counties Monaghan and Cavan. Shenandoah Stables is located in close proximity to the proposed development. Additionally, equestrian activities and horse riding take place in many rural areas throughout the counties and are likely to occur in other areas in the general vicinity of the proposed development.

4.4.2.3 Walking, Cycling and Other Recreational Activities

31 As previously stated the Monaghan Way is a waymarked trail which is located adjacent to the proposed development. In addition to this specific waymarked trail, walking, cycling, local gatherings and other recreational activities take place along quieter country roads and in settlements throughout the area. The nearest community recreational facilities which are located within 1km of the OHL are Drumhowan Geraldines GAA Club (located approximately 330m east of Tower 150).

4.4.2.4 Muff Fair

32 This is a traditional horse fair which takes place on 12th of August every year. It is believed that it dates back to 1608 and possibly previously. Muff is a cross roads located approximately 3.8km west of Kingscourt, County Cavan. As a traditional horse fair, the main activity is trading horses and related activities. While no specific visitor numbers are available, it is apparent that the fair attracts many hundreds of visitors throughout the day on which it takes place.

4.4.2.5 The Gathering 2013 and Other Events

33 Throughout 2013 Fáilte Ireland promoted a national tourism initiative referred to as the ‗The Gathering‘. Recently published figures by Fáilte Ireland for this initiative indicate that it has resulted in additional overseas visitors to the country and may provide a basis for future tourism growth.

34 There also are a number of other annual local festivals which take place in towns and villages in the study area.

4.4.3 Description of Accommodation Providers

35 There are a wide variety of accommodation types throughout counties Cavan and Monaghan, with the majority of accommodation located in or on the outskirts of the main towns. Fáilte Ireland has provided details of all registered accommodation which has been mapped, see Figure 4.1, **Volume 3C Figures** of the EIS.

36 The nearest registered accommodation providers to the proposed development are Drumhowan Country House and Open Farm (located approximately 330m east of Tower 222) and Alices Loft, consisting of three self-catering cottages (located approximately 3km east of Tower 236). The Nuremore Hotel is located approximately 250m south-west of the construction material storage yard and approximately 8.5km east of Tower 207.

4.4.4 Value of Tourism to the Area

37 The value of overseas tourism for each county in Ireland is available from statistics published by Fáilte Ireland for the period 2012. The latest available figures for 2012 for Monaghan and Cavan are presented in the context of highest and lowest in **Table 4.1** in order to give an indication of the value of tourism to the area within a wider context.

Table 4.1: Overseas Visitor Number and Value 2012

County	Overseas Visitors (‘000)	Associated Revenue (€m)
Cavan	80	22
Monaghan	46	11
Dublin (Highest)	3,641	1,267
Longford (Lowest)	20	6

(Source: www.failteireland.ie)

38 Figures for domestic tourism for each county are not available as statistics are only collected in relation to overseas visitors. However, the importance of domestic tourism is highlighted by the fact that Fáilte Ireland estimated that domestic visitors took almost nine million trips and generated expenditure of almost €1.7 billion in 2013.

39 In 2007, Monaghan Tourism published *An Audit of Tourism Development Opportunities in County Monaghan 2007 – 2013*, in which development opportunities were identified. Flagship projects include development of; the Ulster Canal, a canoe water sports centre on the Dromore River system, a regional outdoor recreational centre at Lough Muckno and an all weather activity / adventure centre. Beyond flagship projects other opportunities were identified around the following; the walking product, the soft adventure product, the equestrian product, the angling product, heritage, environment and other attractions, the arts and culture product and festivals and events.

40 Development of tourism and leisure is identified as an important area of diversification for agricultural enterprises in the Cavan and Monaghan CDPs. Tourist publications such as the *Lonely Planet Guidebook for Ireland 2010* comment on the attractiveness of the area, in terms of the “*refreshing lack of tourists and the quieter pace of life*”.

41 There are no flagship project locations proximate to the proposed development. Many of the other opportunities are centred on the further development of existing facilities. With the exception of the walking and the angling products, the majority of facilities identified for future development lie outside the area where the proposed development is located.

42 Despite the attractions that counties Cavan and Monaghan have to offer and good transport connections to Dublin and Northern Ireland, the number of visitors to the eastern part of Monaghan and south-east Cavan area is low by comparison with other counties in Ireland. County Monaghan has the second lowest number of visitors in the north-west region. In addition, revenue from these visitors is also low, in comparison with other counties. Notwithstanding the statistics published by Fáilte Ireland in terms of visitor numbers and revenue; tourism revenue is an important source of income to local areas where it is earned and is likely to become more important as rural tourism products develop in the future.

4.5 POTENTIAL IMPACTS

4.5.1 Do Nothing

43 Tourism and amenity development is likely to evolve and develop in line with national trends, the location of visitor attractions and amenities and with local strategies. Doing nothing will have no effect on tourism and amenity in the CMSA.

4.5.2 Construction Phase

44 Construction of the proposed development will be visible to tourists for the duration of the construction period, although as noted in Chapter 7, **Volume 3B** of the EIS, the linear nature of the proposed development will mean that the construction of the proposed development will be of short duration in any one locality. An outline Construction and Environmental Management Plan (CEMP) is included in this EIS as part of Appendix 7.1, **Volume 3B Appendices** of the EIS. The visual impact of the proposed development during construction is addressed in **Chapter 11** of this volume of the EIS. This will be a temporary slight impact and will not have any significant long term impacts on tourism and amenity. There may be some periodic disruption along local roads in the area during construction but this will be managed in accordance with a traffic management plan as detailed in **Chapter 13** of this volume of the EIS.

45 The construction material storage yard is a temporary element of the proposed development. Potential impacts arising from the existence of and operations in the material storage yard are considered in the other chapters of this EIS. Having regard to its location and to the evaluations in other chapters of this EIS, negative impacts on tourism and amenity are not anticipated.

4.5.3 Operational Phase

46 The Fáilte Ireland guidelines advise that the predicted impacts section should describe the location, type, significance, magnitude / extent of the tourism activities or assets that are likely to be affected.

47 The key tourist assets identified by Fáilte Ireland in counties Cavan and Monaghan have been considered and the tourism profile of the area shows that the majority of visitor attractions and amenities are distant from the proposed development, including Lough Muckno located over 6.6km to the east and Dun na Rí Forest Park located over 3.8km to the east of the line route. Avoidance of the majority of the key tourism assets has been the objective during the route selection stage, thereby avoiding significant adverse impacts.

48 The context, character, significance and sensitivity of the tourism and amenity resource of the existing area have been described previously. The description concluded that the main tourism asset in the vicinity of the proposed development is the Monaghan Way. At a local level, Lough an Leagh Mountain, Dun a Rí Forest Park and the smaller towns and villages are also locations for tourist and visitor activities and amenities for the local population. The main activity which attracts tourists to the area where the project is located is angling, with other activities such as equestrian, walking, cycling, shooting and water sports attracting smaller numbers. These activities have the potential to be impacted by the proposed development.

49 While there are other tourist attractions and local amenities outside the key tourism assets, these are less sensitive to change when compared to the key assets. While tourism is important to particular areas of each county, overall visitor numbers to counties Monaghan and Cavan are relatively low by comparison with other counties in Ireland. Outside of significant tourist attractions tourism revenue can be an important source of income to local areas where it is earned, particularly in rural areas.

50 While there is future potential for the development of tourism in rural areas where the proposed development is located, this potential is generally based on further development of existing activities and products, such as angling, water based activities, walking and cycling. The landscape and land use of the area is an important factor in the development of tourism as it provides a setting for the activities which take place in the area.

51 While the surrounding landscape is an important setting for activities, angling, which is a significant tourist activity throughout County Monaghan, is not likely to suffer significant adverse impacts, as the attractiveness of the area for this activity is more dependent on water quality and fish stocks. Appropriate route selection has avoided direct impacts on lakes and rivers by routing the line away from these areas. There could be potential for indirect impacts to angling at the construction phase of the project, if adequate mitigations measures are not implemented. The potential for water pollution has been addressed in **Chapter 8** of this volume of the EIS, where mitigation measures to address the potential impacts are described.

52 The proposed development will not directly inhibit any tourist and amenity activities along its route, however the reduction in the visual amenity of a local area may be perceived as reducing the attractiveness of an area used for tourist and amenity related activities. There will be a direct, though localised, visual impact over a short section of the Monaghan Way, as the line route will be intermittently visible from the walking route along approximately a 2km section. Views will generally be at distances from 0m to 400m, but longer distance intermittent views would be possible for distances up to 1.5km from the line. The line will be visible where it crosses the route between Towers 109 and 110. While the OHL will be visible from Lough an Leagh, the intervening distance (approximately 2.1km), as well as the landscape features and topographical profile, will reduce the potential for visual impacts. This is detailed in **Chapter 11** of this volume of the EIS. There are some angling lakes close to the proposed development, and other outdoor amenity areas and activities, including the Monaghan Way and the location of Muff Fair in close proximity to the location of the proposed development. While localised sections of the OHL will be visible from these areas, and there may be a reduction in the visual amenity of these areas, it is unlikely to prohibit activities continuing at these locations.

53 As the proposed development will pass through some areas of localised landscape and ecological sensitivity, in particular short sections of the Monaghan Way, close to the location of Muff Fair and close to Lough Morne, it may have slight to moderate indirect impacts on the attractiveness and associated tourism and amenity value of these and other areas. The degree to which the line route could potentially affect the ecological and visual amenities of these areas is evaluated in **Chapters 6** and **11** of this volume of the EIS.

54 As the most significant tourist accommodations, attractions and activities, as identified by Fáilte Ireland and local tourism agencies, are being avoided, with the exception of the Monaghan Way and activities can continue in the vicinity of the proposed development, it is reasonable to conclude that overall, there may be slight to moderate localised impacts on tourism and recreational amenities and associated economic activity arising directly as a result of the proposed development.

4.5.4 Decommissioning

55 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration.

4.6 MITIGATION MEASURES

56 Route selection has been the main mitigation measure used to reduce the potential for adverse impacts on tourism and amenity as a result of the operation of the proposed development, and the potential for adverse impacts is classified as localised slight to moderate. Other than locating the line route to a different area, which may create more significant impacts in that area, no further mitigation measures can be employed. The route alternatives are considered in Chapter 5, **Volume 3B** of the EIS.

4.7 RESIDUAL IMPACTS

57 Once the proposed development is operational, slight to moderate localised residual impacts on tourism and amenity may arise.

4.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS

58 This chapter should be read in conjunction with other chapters of this volume of the EIS including; **Chapter 2** Human Beings – Population and Economic, **Chapter 3** Human Beings – Land Use, **Chapter 6** Flora and Fauna and **Chapter 11** Landscape for a full understanding of the main interrelationships between these environmental topics.

59 The main potential interrelationships arise from the following:

- **Chapter 2** - Human Beings – Population and Economic – There may be a slight reduction in tourism spend and associated economic activity in the immediate areas where the proposed development will be located.
- **Chapter 11** - Landscape – The OHL will be visible from some short sections of the Monaghan Way. This may be perceived as reducing the attractiveness of this area for tourism and amenity purposes.

4.9 CONCLUSION

60 Impacts to tourism and amenity will not be direct impacts, as no tourist sites will be physically impacted by the proposed development. Potential negative impacts on tourism and amenity are anticipated to be limited to indirect localised visual impacts on the landscape in close proximity to the OHL, primarily at a localised short section of the Monaghan Way.

5 HUMAN BEINGS – ELECTRIC AND MAGNETIC FIELDS

5.1 INTRODUCTION

1 This chapter of the Environmental Impact Statement (EIS) presents an evaluation of the proposed development as set out in Chapter 6, **Volume 3B** of the EIS in relation to Electric and Magnetic Fields (EMF). The information contained within this chapter relates to the Cavan Monaghan Study Area (CMSA) as described in Chapter 5, **Volume 3B** of the EIS.

2 Chapter 6, **Volume 3B** of the EIS describes the full nature and extent of the proposed development, including elements of the OHL design and the towers. It provides a factual description, on a section by section basis, of the entire line route. The proposed line route is described in that chapter using townlands and tower numbers as a reference.

3 In particular Chapter 8, **Volume 3B** of the EIS describes those aspects of the evaluation of EMF which are common to both the CMSA and the MSA (Meath Study Area). That chapter should be read prior to this volume for a full understanding of the environmental topic. Chapter 8, **Volume 3B** of the EIS describes the following:

- An overview of EMF:
    - Electromagnetic spectrum; and
    - Extremely Low Frequency (ELF) EMF sources and exposure considerations.
- EMF from the proposed development;
- Compliance with Exposure Guidelines;
- ELF EMF Health Research;
- The Precautionary Principle and EMF;
- Technical Calculations and Results - EMF Associated with the proposed development; and
- Summary and Conclusions.

4 This chapter provides an analysis of the EMF associated with the proposed OHL, as it pertains to the line route in the CMSA.

5.2 METHODOLOGY

5 Calculations of EMF were performed to a distance of 150m either side of the centre of the OHL.

6 As discussed in Chapter 8, **Volume 3B** of the EIS the vast majority of the proposed electricity line will be supported by single circuit lattice towers. Though the proposed development is divided into the CMSA and MSA portions for ease of description of other aspects of the proposed development, the EMF from the proposed electricity line are determined by the particular configuration and tower type used in different portions of the route rather than by reference to a particular study area. The discussion of the EMF from the proposed electricity line therefore is divided into these separate sections of the proposed line with different electricity line tower configurations.

7 Over the vast majority of the proposed route the proposed OHL will be of a single circuit configuration supported on lattice towers. In short sections elsewhere along the route, the electricity line is proposed to be built in two different configurations; single circuit supported on transposition towers in the CMSA section of the route and by utilising existing double circuit lattice towers in the MSA section of the route. **Figure 5.1** shows the location of the different sections of the electricity line route with different circuit configurations.

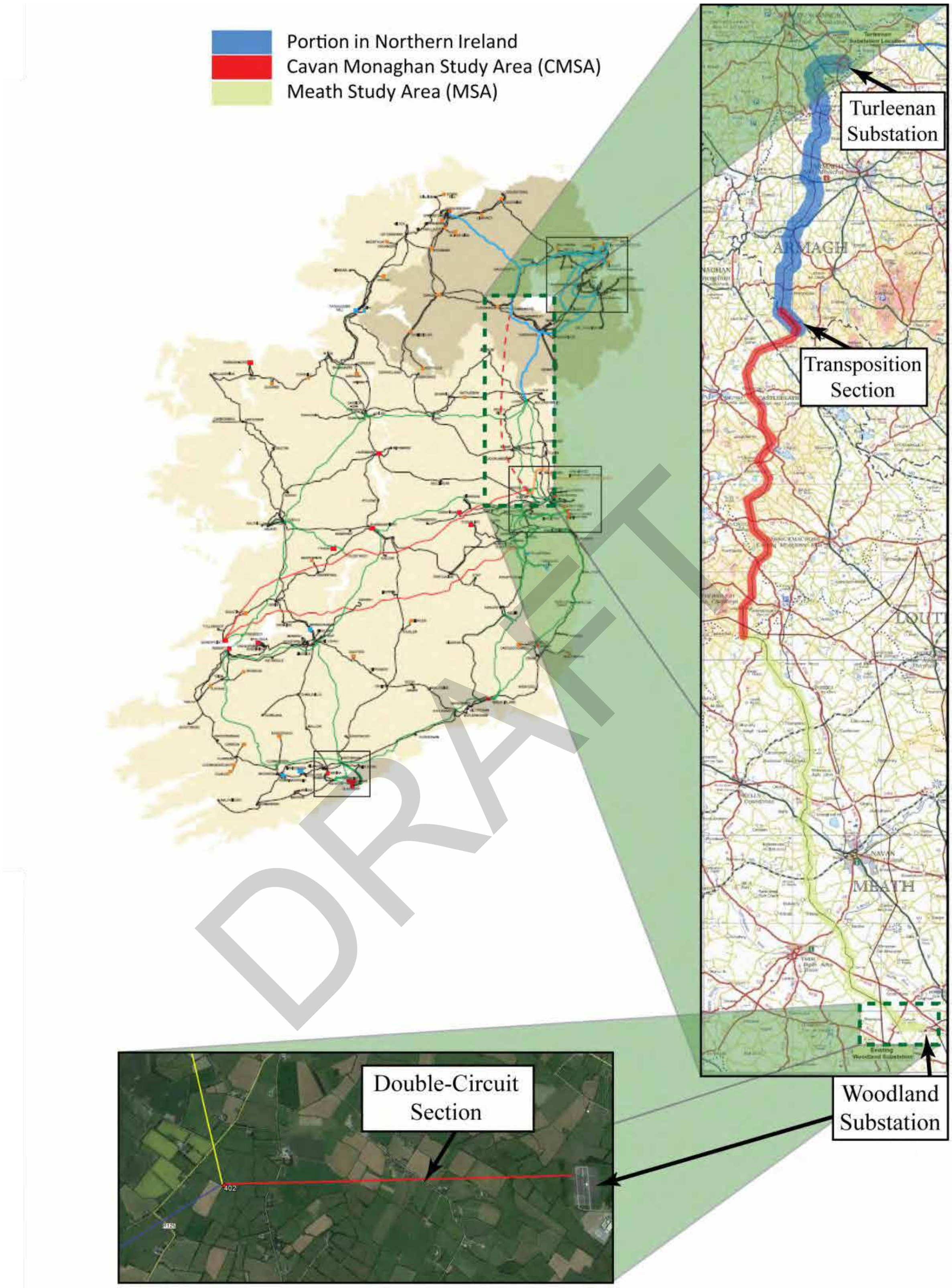


Figure 5.1: Map of the Proposed Interconnector Showing the Proposed Electricity Line Route

8 Over a short distance (approximately 765m between Towers 118 to 121) in the northern section of the CMSA, EirGrid is proposing to perform a phase transposition requiring two transposition towers (towers are shown in more detail in **Figure 5.2**). The EMF from the electricity line on this short segment of the route will differ from the EMF from the electricity line on the non transposition towers and therefore is considered as a separate case. A map of this portion of the proposed development, indicating the approximate location of the transposition towers is shown in more detail in **Figure 5.2**.

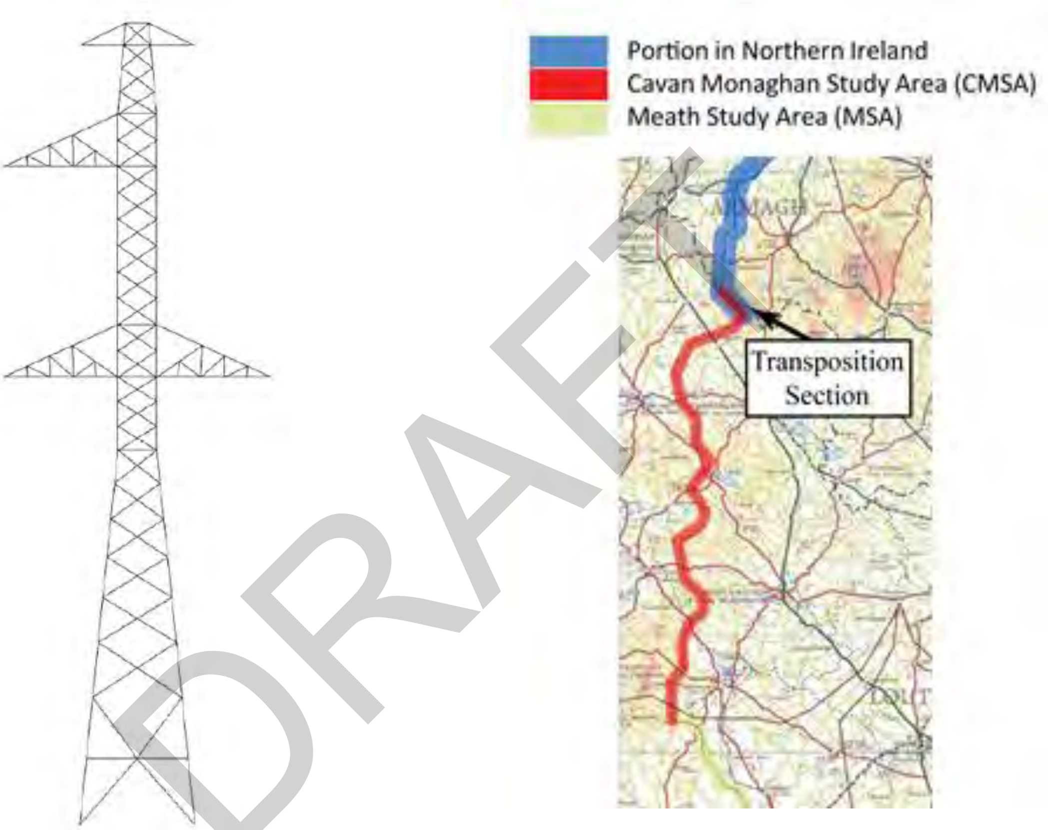


Figure 5.2: (a) Proposed Transposition Lattice Tower (b) Map of the Proposed Development Showing the Approximate Location of the Transposition Section

5.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

9 The proposed development involves the erection of an OHL, supported by steel lattice towers over a distance of approximately 46km. Electric and magnetic fields are associated with OHLs.

5.4 EXISTING ENVIRONMENT

10 Chapter 8, **Volume 3B** of the EIS discusses the existing environment in relation to EMF in detail. It discuss the scientific background to EMF, gives information on the sources and levels of background EMF which are typically found in the existing environment, reviews information in relation to ELF EMF health research, and provides information in relation to how EirGrid complies with exposure guidelines. Finally, Chapter 8, Section 8.7, **Volume 3B** of the EIS (Technical Calculations) provides the methodology for, and the calculations of EMF associated with each proposed electricity line tower configuration.

5.5 POTENTIAL IMPACTS

5.5.1 Do Nothing

11 EMF background levels from existing EMF sources will be unchanged. EirGrid will continue to comply with exposure limits set out in relevant exposure guidelines.

5.5.2 Construction Phase

12 EMF only occurs when an OHL becomes operational. There will be no EMF from the OHL during the construction stage of the proposed development.

5.5.3 Operational Phase

13 EMF levels were calculated at 1m above ground, in accordance with IEC Std. 61786 (1998), using algorithms developed by the Bonneville Power Authority (BPA) of the U.S. Department of Energy (BPA, 1991). Calculated values are reported as the root-mean-square resultant quantities of the field ellipse at each location along a transect perpendicular to the electricity line centre line at distances out to 150m.[9] Data for the proposed electricity line‘s geometrical configurations, conductor type, and loading were provided to Exponent[10] by EirGrid.

[9] The BPA algorithms employed assume that conductors are at the midspan conductor height and infinite in extent. Near the Transposition Towers where the phase transposition takes place, the assumption of conductors of infinite extent is not satisfied, but field levels in these locations would be lower than those presented in calculations for midspan conductor heights.

[10] Exponent is the specialist consultant responsible for the preparation of the EMF aspects of this EIS.

5.5.3.1 Magnetic Fields Associated with Single Circuit Lattice Tower Sections

14 The magnetic field associated with the single circuit lattice tower sections of the electricity line supported on a combination of intermediate and angle towers is shown in **Figure 5.3** for both average and peak loading. Two views of the same graph are shown in each figure. Both have the same X-axis range of 0 to 150 metres from the center line of the route alignment. The uppermost graph has a Y-axis range of 0 to 100 microtesla (μT)[11] and can be used to visually determine the calculated magnetic field levels at locations within 50 m of the center line relative to the International Commission on Non Ionising Radiation Protection (ICNIRP) Reference Level. The lowermost graph has a Y-axis range of 0 to 2μT and can be used to visually determine the calculated magnetic field levels at locations beyond 50m from the center line which are indiscernible on the uppermost graph.

15 The maximum magnetic field level at average loading is calculated to be directly beneath the lines and will be approximately 16 μT. The magnetic field intensity diminishes with distance, to about 1.0μT at a distance of 50m and to approximately 0.25μT at a distance of 100m from the centre line, a reduction by a factor of 64. The maximum magnetic field levels, as well as field levels at 50m and 100m from the centre line, are shown in Tables 8.5 and 8.6, **Volume 3B** of the EIS for average and peak loading respectively.

[11] The magnetic field level of 100μT equates to the ICNIRP (1998) Reference Level; refer to Table 8.2 of Chapter 8 ,**Volume 3B** of the EIS.

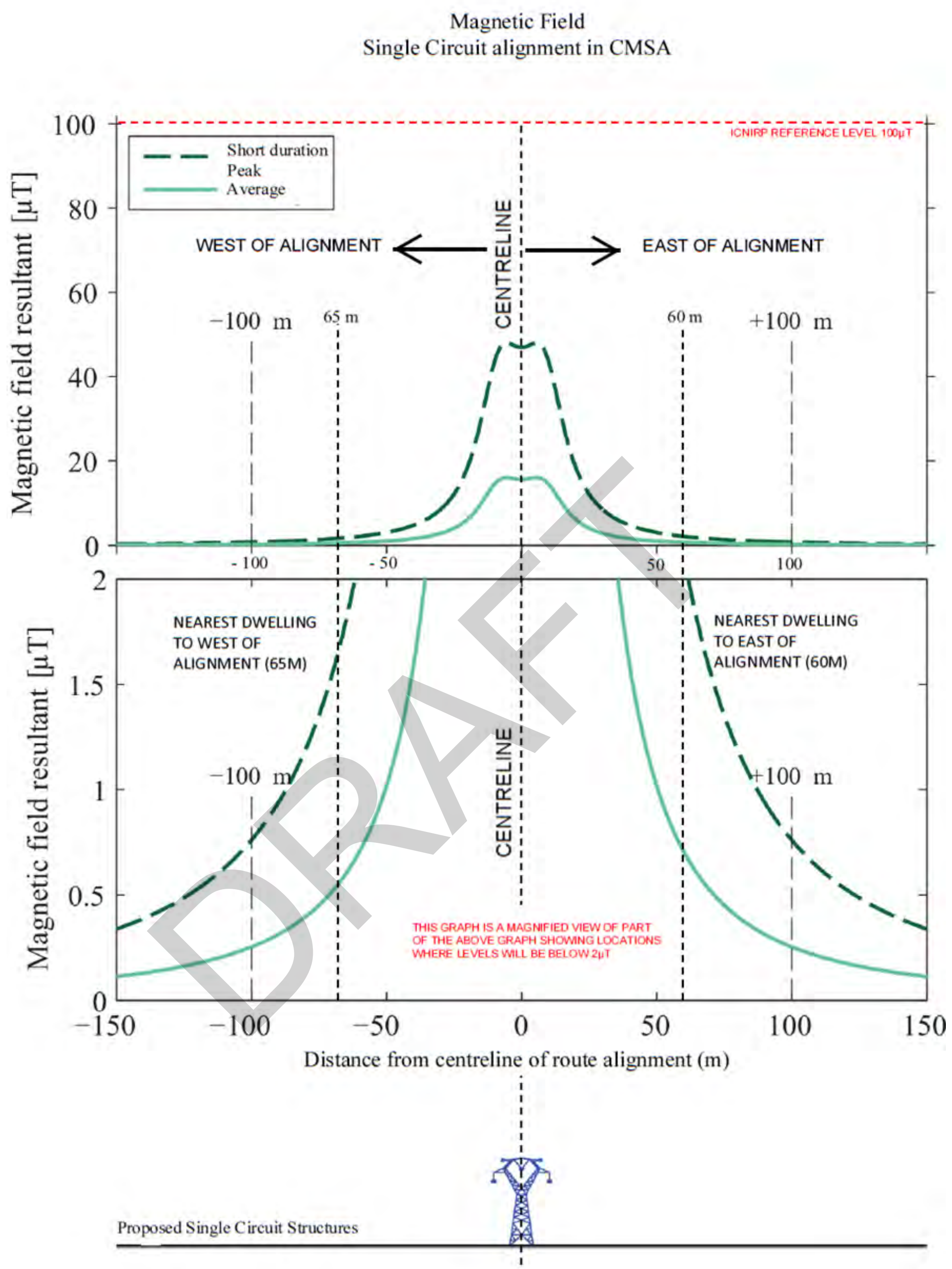


Figure 5.3: Calculated Magnetic Field Profile for the Proposed Single Circuit Lattice Tower Configuration for Short Duration Peak and Average Load

5.5.3.2 Electric Fields Associated with Single Circuit Lattice Tower Configuration

16 The electric field level associated with the single circuit lattice towers is shown in **Figure 5.4**. Two views of the same graph are shown in each figure. Both have the same X-axis range of 0 to 150 metres from centre line of the route alignment. The uppermost graph has a Y-axis range of 0 to 15kV/m and can be used to visually determine the calculated electric field levels at locations within 50m of the centre line relative to the ICNIRP Basic Restriction Level of 9kV/m[12]. The lowermost graph has a Y-axis range of 0 to 2kV/m and can be used to visually determine the calculated electric field levels at locations from 50m to 150m from the centre line which are indiscernible on the uppermost graph.

17 The maximum electric field levels beneath the electricity line is calculated to be approximately 7.9 kV/m, and decreases to below 1 kV/m beyond approximately 25m from the electricity line centre line. The highest calculated electric field levels, as well as field levels at 50m and 100m from the centre line, are shown in Table 8.7, **Volume 3B** of the EIS.

[12] Refer to Table 8.2 of Chapter 8, **Volume 3B** of the EIS.

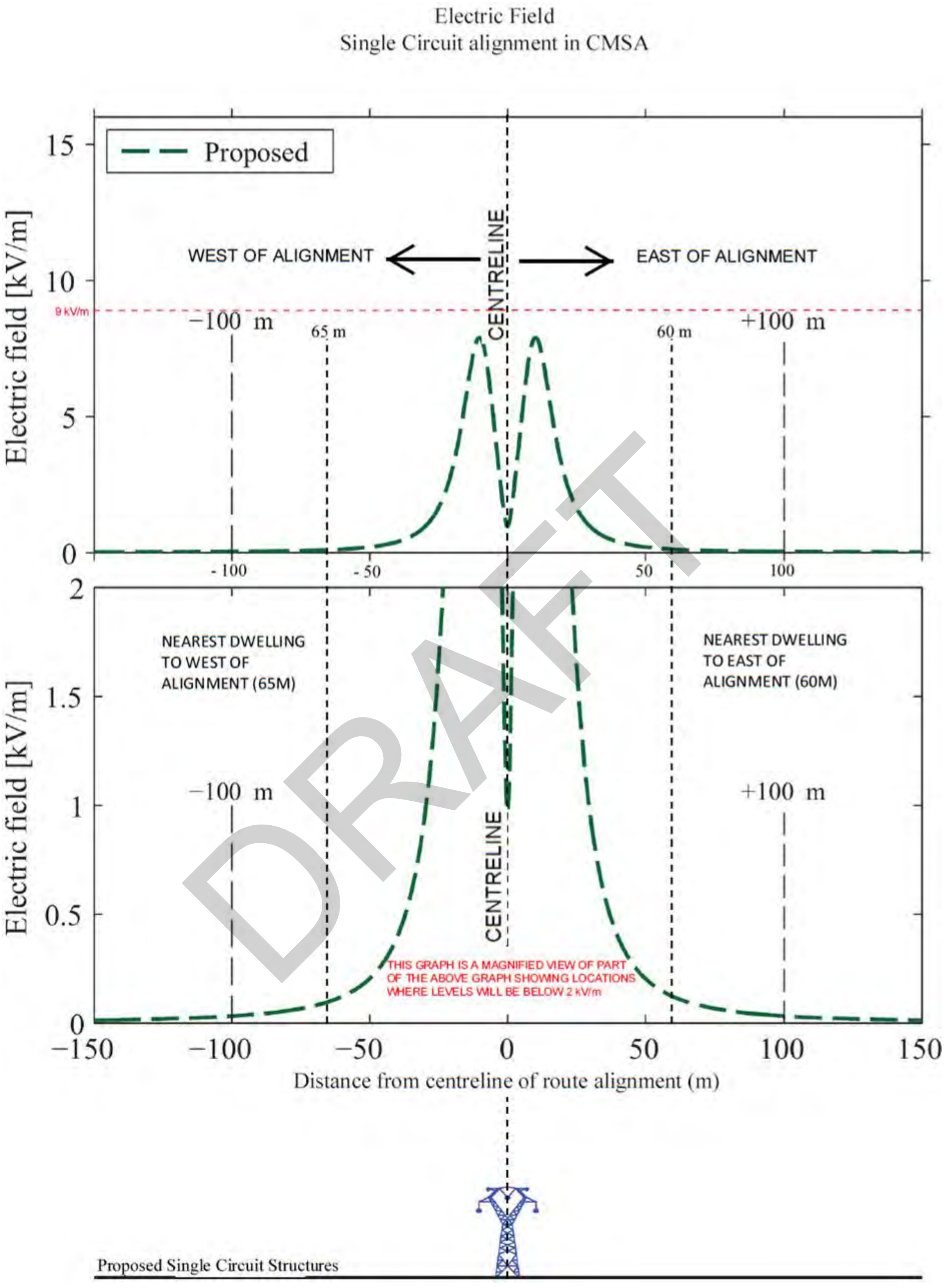


Figure 5.4: Calculated Electric Field Profile for the Proposed Single Circuit Lattice Tower Configuration

5.5.3.3 Magnetic Fields Associated with Transposition Lattice Tower Configuration

18 The magnetic field associated with the electricity line supported by transposition lattice towers is shown in **Figure 5.5** and is similar to that from the single circuit lattice towers described in Chapter 8, **Volume 3B** of the EIS. Two views of the same graph are shown in each figure. Both have the same X-axis range of 0 to 150m from centre line of the route alignment. The uppermost graph has a Y-axis range of 0 to 100µT[13] and can be used to visually determine the calculated magnetic field levels at locations within 50m of the centre line relative to the ICNIRP Reference Level. The lowermost graph has a Y-axis range of 0 to 2µT and can be used to visually determine the calculated magnetic field levels at locations from 50m to 150m from the centre line which are indiscernible on the uppermost graph.

19 The magnetic field is calculated to be highest beneath the electricity line conductors and decreases rapidly with distance. The maximum magnetic field beneath the electricity line for the transposition lattice tower configuration is calculated to be approximately 16µT. The magnetic field intensity diminishes with distance to about 1.0µT at a distance of 50m and to approximately 0.25µT at a distance of 100m from the centre line, a reduction by a factor of 64. The highest calculated magnetic field levels, as well as field levels at 50m and 100m from the centre line, are shown in Table 8.5, **Volume 3B** of the EIS. Peak magnetic fields that might only occur for a few hours each decade are summarised in Table 8.6, **Volume 3B** of the EIS.

20 The magnetic field level across a range of line loadings could well be substantially lower than calculated because the modeling assumptions made here are chosen to ensure a conservative estimate of magnetic field level applicable to all locations. Indications that the calculated magnetic field levels are higher than would be expected under other typical loading is supported by measurements of existing 400 kV electricity lines in Ireland, which indicate that the magnetic field from 400 kV lines on similar towers is as much as three to four times lower than calculated here.

[13] The magnetic field level of 100µT equates to the ICNIRP (1998) Reference Level; refer to Table 8.2 of Chapter 8, **Volume 3B** of the EIS.

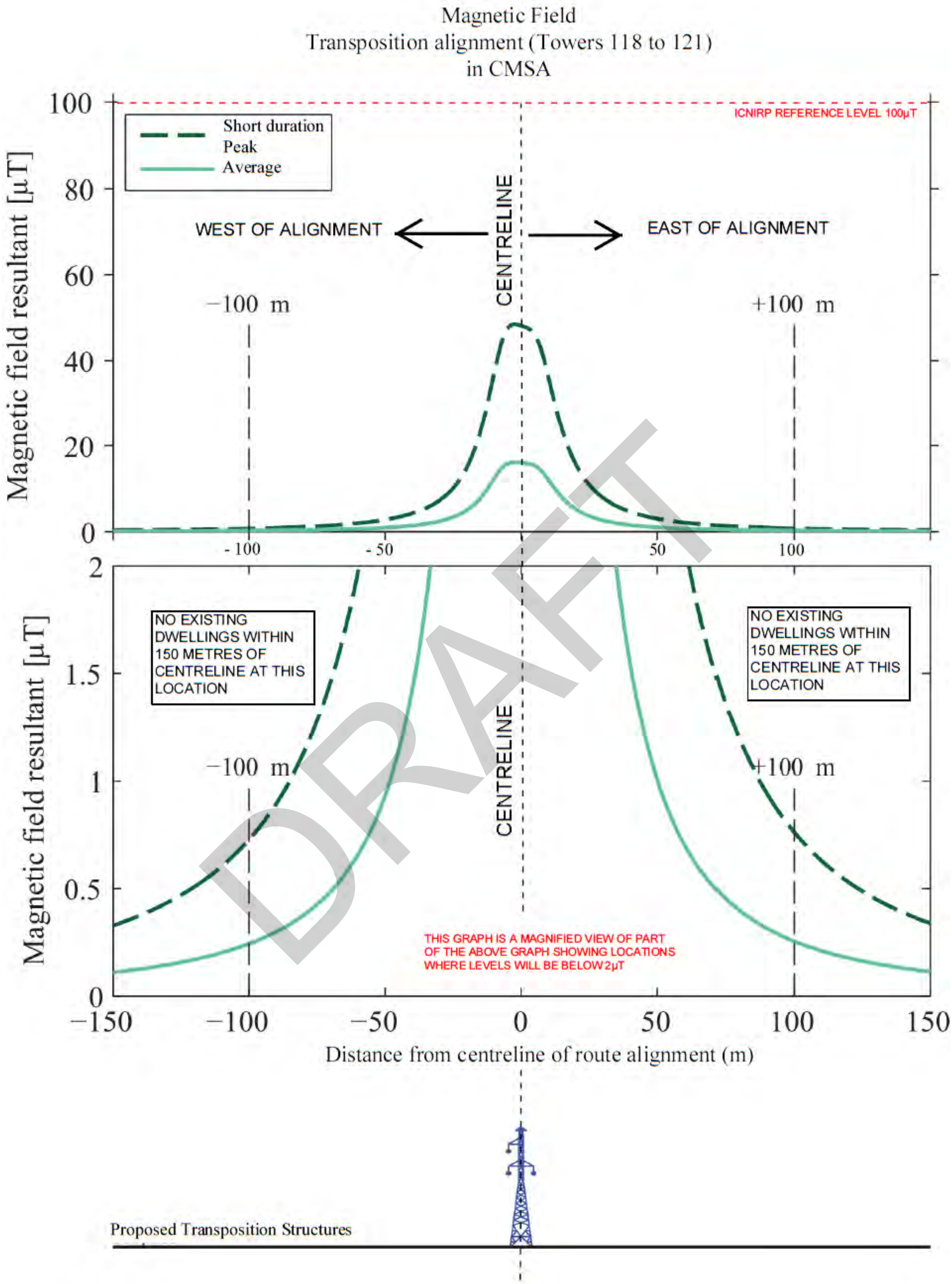


Figure 5.5: Calculated Magnetic Field Profile for the Proposed Transposition Tower Configuration for Short Duration Peak and Average Loading

5.5.3.4 Electric Fields

21 The electric field associated with the electricity line supported by transposition towers is shown in **Figure 5.6** and is similar to that from the single circuit intermediate lattice towers described in Chapter 8, **Volume 3B** of the EIS. Two views of the same graph are shown in the figure. Both have the same X-axis range of 0 to 150m from centre line of the route alignment. The uppermost graph has a Y-axis range of 0 to 15kV/m and can be used to visually determine the calculated electric field levels at locations within 50m of the centerline relative to the ICNIRP Basic Restriction Level of 9kV/m[14]. The lowermost graph has a Y-axis range of 0 to 2kV/m and can be used to visually determine the calculated electric field levels at locations from 50m to 150m from the centre line which are indiscernible on the uppermost graph.

22 The electric field level is calculated to be highest beneath the electricity line conductors and decrease rapidly with distance. The highest electric field is calculated to be approximately 8.0kV/m beneath the conductors. The electric field intensity diminishes with distance to about 0.3kV/m at a distance of 50m and to below 0.04kV/m beyond approximately 100m from the centre line. The highest calculated electric field levels, as well as field levels at 50m and 100m from the centre line, are shown in Table 8.7, **Volume 3B** of the EIS.

[14] Refer to Table 8.2 of Chapter 8, **Volume 3B** of the EIS.

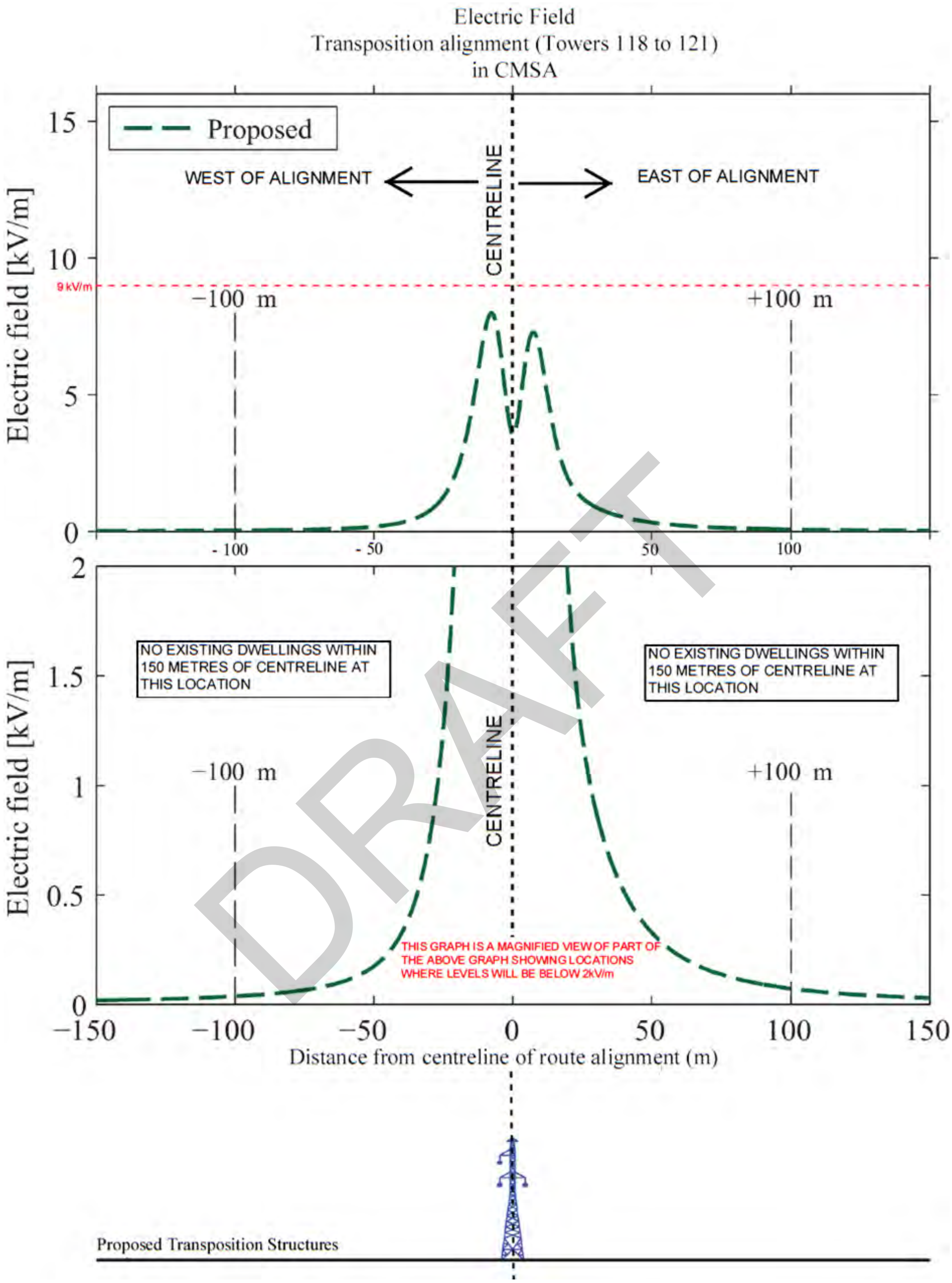


Figure 5.6: Calculated Electric Field Profile for the Proposed Transposition Tower Configuration

5.5.4 Decommissioning

23 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration.

5.6 MITIGATION MEASURES

24 The proposed development will be operated in compliance with relevant guidelines for the control of EMF, specifically with the relevant quantitative exposure guidelines.

5.7 RESIDUAL IMPACTS

25 No residual impacts are anticipated as the proposed development will be operated in compliance with relevant guidelines.

5.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS

26 This chapter should be read in conjunction with other chapters in this volume of the EIS including; **Chapter 2** Human Beings – Population and Economic, **Chapter 3** Human Beings – Land Use, and **Chapter 6** Flora and Fauna for a full understanding of the interrelationships between these environmental topics.

27 The main potential interrelationships arise from the following:

- **Chapter 2** - Human Beings – Population and Economic – There is a potential for interactions with human beings. However, the operating conditions for the proposed 400 kV line will ensure that EMF will remain below EMF guidelines for Ireland and the EU. A survey of scientific research on topics relating EMF to health of humans did not show that EMF at these levels would have adverse effects on these populations.

- **Chapter 6** - Flora and Fauna – There is a potential for interactions with flora and fauna. However, the operating conditions for the proposed 400 kV line will ensure that EMF will remain below EMF guidelines for Ireland and the EU. A survey of scientific research on topics relating EMF to health of animal species did not show that EMF at these levels would have adverse effects on these populations.

28 Chapter 8, **Volume 3B** of the EIS details the potential for interrelationships between human beings and flora and fauna and the related research and scientific studies.

5.9 CONCLUSIONS

29 The proposed development in the CMSA area primarily involves the development of a single circuit OHL over a distance of approximately 46km. Included in this distance is a short 765m section where it is proposed to perform a phase transposition.

30 Chapter 8, **Volume 3B** of the EIS discusses exposure guidelines, and how EirGrid complies with such guidelines. It discusses the scientific background to EMF, gives information on the sources and levels of background EMF which are typically found in the existing environment, reviews information in relation to ELF EMF health research and provides information in relation to how EirGrid complies with exposure guidelines. Having regard to the exposure guidelines outlined in Chapter 8, **Volume 3B** of the EIS**,** the calculations of EMF provided in this section clearly demonstrate that the magnetic field levels produced by the proposed 400 kV line are below the EU (1999) exposure limits (basic restrictions) and so would not cause internal electric fields and current density to exceed these biologically based limits on exposure. Since these calculations are based on conservative assumptions about the operation of the proposed 400 kV line, they are likely to overestimate levels of EMF from the electricity line.

31 In summary, even making conservative assumptions about the operating conditions assumed for the EMF calculations that would tend to overestimate field levels, the EMF from the proposed 400 kV line is still below EMF guidelines of Ireland and the EU. A survey of scientific research on topics relating EMF to health of humans and other species did not show that EMF at these levels would have adverse effects on these populations. This evaluation is consistent with reviews by national and international health and scientific agencies.

6 FLORA AND FAUNA

6.1 INTRODUCTION

1 This chapter presents an evaluation of the proposed development as set out in Chapter 6 **Volume 3B** of the Environmental Impact Statement (EIS) in relation to the potential for ecological impacts within the Cavan and Monaghan Study Area (CMSA).

2 That chapter describes the nature and extent of the proposed development, including elements of the overhead line (OHL) design and the towers. It provides a factual description, on a section by section basis, of the entire line route. The proposed line route is described in Chapter 6 **Volume 3B** of the EIS using townlands and tower numbers as a reference. The principal construction works proposed as part of the development are set out in Chapter 7**, Volume 3B** of the EIS.

3 The receiving environment of the CMSA is described and evaluated in terms of flora and fauna. The potential impacts (direct, indirect and cumulative) of the proposed development on flora, fauna and fisheries of the CMSA are evaluated and, where necessary, mitigation measures are proposed in order to avoid or reduce the severity of impacts. The potential impacts of the proposed development on European sites (sites designated as candidate Special Areas of Conservation (cSACs) or Special Protection Areas (SPAs) that form part of the Natura 2000 network) in the surrounding area have also been evaluated. This appraisal is presented separately in the form of a Natura Impact Statement (NIS) (refer to **Volume 5** of the application documentation).

4 The proposed development in the CMSA involves the construction of 134 individual steel towers, along a route totalling approximately 46km in length and the stringing of conductors and the earth wires that will be supported by the towers. For the purposes of this chapter, the proposed alignment is described in a south to north direction.

5 For description purposes, the proposed transmission line including towers and conductors is generally referred to as the ‗alignment or line‘ in text here. Towers and associated conductors are the main infrastructure being developed. The ‗study area‘ includes the route of the alignment but also the wider area in the vicinity as relevant to key ecological receptors discussed.

6 A large number of ecological studies, consultations and associated reports have been carried out to inform the baseline ecology of the receiving environment and recommended design since 2007. These studies have informed the ecological impact assessment and include the following:

- *Route Constraints Report (September 2007);*
- *Route Constraints Report Addendum* (September 2007);
- *North-South 400 kV Interconnector Development Preliminary Re-evaluation Report (May, 2011);*
- *North-South 400 kV Interconnector Development Final Re-evaluation Report* (April, 2013);
- *North-South 400 kV Interconnector Development Preferred Project Solution Report* (July 2013);
- Public consultation process; and
- Ecological studies (2007 – 2014).

7 These studies have informed the approach which has been taken throughout the route selection process with the aim of avoiding, where possible, potential impacts on the ecological receptors identified. The approach includes avoiding locating structures on hedgerows and treelines of high ecological value, which are the main notable ecological receptors in the CMSA.

6.1.1 Objectives

8 The objectives of the flora and fauna evaluation included:

- To carry out a desktop study in order to determine the previously recorded ecology of the area;
- To carry out a baseline flora and fauna survey of areas in close proximity to the proposed development;
- Evaluate the ecology of the CMSA based on the results of desk and field studies and identify Key Ecological Receptors (features of ecological importance that may be sensitive to impacts from the proposed development);
- To predict the potential direct and indirect impacts of the proposed development on flora and fauna of the area;
- To propose mitigation measures in the design, construction and operation of the proposed development so as to minimise potential impacts on flora and fauna; and

- To prepare this chapter of the EIS (Flora and Fauna) in accordance with the requirements of EU and Irish national legislation and inform the NIS (refer to Volume 5 of the application documentation).

6.1.2 Statutory and Guidance Documents Context

9 The appraisal has been prepared in accordance with the following legislation:

- Consolidated EIA Directive 2011/92/EU;
- *Wildlife Acts 1976-2012;*
- The Habitats Directive 92/43/EEC;
- The Birds Directive 2009/147/EC;
- The *European Communities (Birds and Natural Habitats) Regulations 2011* [S.I. No. 411 of 2011];
- The *European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011* [S.I. No. 456 of 2011];
- *European Union (Environmental Impact Assessment and Habitats) Regulations 2011* [S.I. No. 473 of 2011];
- *European Union (Environmental Impact Assessment and Habitats) Regulations 2012* [S.I. No. 246 of 2012]; and
- Flora (Protection) Order, 1999.

10 In addition, in considering the ecological impacts of the proposed development in the CMSA, regard was made to the following guidance and information documents:

- *Cavan County Development Plan 2014 - 2020*;
-
- Department of Arts, Heritage and the Gaeltacht (DAHG) (2011). *Ireland"s National Biodiversity Plan: Actions for Biodiversity 2011 – 2016*;
- Department of Environment, Community and Local Government (DoECLG) (2013). *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*;

- DoEHLG (2009). *Appropriate Assessment of Plans and Projects in Ireland*;
- EirGrid (2012). *Ecology Guidelines for Transmission Projects*: *A Standard Approach to Ecological Impact Assessment of High Voltage Transmission Projects*;
- Environmental Protection Agency (EPA) (2002). *Guidelines on the information to be contained in Environmental Impact Statements*;
- EPA (2003). *Advice notes on current practice (in the preparation of Environmental Impact Statements)*;
- EPA (2013). *Integrated Biodiversity Impact Assessment – Streamlining AA, SEA and EIS Processes: Practitioners Manual*.
- European Commission (2002). *Assessment of plans and projects significantly affecting Natura 2000 sites*;
- European Commission (2013). *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*;
- Fossitt (2000). *A Guide to Habitats in Ireland*;
- Institute of Ecology and Environmental Management (IEEM) (2006). *Guidelines for Ecological Impact Assessment in the United Kingdom*;
- *Monaghan County Development Plan 2013 - 2019;*
- National Roads Authority (NRA) (2005a). *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes;*
- NRA (2005b). *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes;*
- NRA (NRA) (2006a). *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (Revision 1, National Roads Authority)*;*
- NRA (2006b). *Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes;*
- NRA (2006c). *Guidelines for the Treatment of Otters prior to the Construction of National Roads Schemes.* National Roads Authority, Dublin.
- NRA (2006d). *Guidelines for the Treatment of Bats during the Construction of National Roads Schemes;*

- NRA (2009a). *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes;*

- NRA (2009b). *Guidelines for Assessment of Ecological Impacts of National Road Schemes.* (Revision 2, National Roads Authority)*;*

- NRA (2010). *Guidelines on the Management of Noxious Weeds and Non-Native Plant Species on National Roads; and*

- Smith *et al.* (2011). *Best Practice Guidance for Habitat Survey and Mapping in Ireland*.

6.1.3 Cavan Monaghan Study Area (Ecology Context)

11 A consideration of the general ecological character is important in scoping and evaluating key ecological receptors. The CMSA traverses County Monaghan (approximately 37km length of alignment) and the eastern part of County Cavan (approximately 9km length of the alignment). Due consideration has been given to known ecological sites that occur in the wider CMSA (within 5km of the alignment), while more detailed assessment of ecological receptors has been undertaken within the likely zone of impact which is deemed to be within an 80m wide corridor centred on the alignment.

12 The landscape of the wider CMSA consists of a rolling drumlin landscape with relatively small intensively managed fields typically enclosed by hedgerows dominated by hawthorn and ash. Poorly drained soils often occupy the interdrumlin hollows giving rise to frequent wetland areas in the wider CMSA. The landscape is largely dominated by agricultural farmland managed for livestock rearing and silage crop production. Field boundaries largely consist of overgrown linear hedgerows (typically Hawthorn dominated) occasionally growing in association with more mature trees (principally Ash). Occasional mature deciduous treelines occur notably around domestic farmland buildings.

13 Arable land and other land uses such as forestry are scarce. There are a number of rivers and smaller watercourses with associated bankside vegetation (often linear Alder and Ash woodland). A number of lakes are located at least 200m from the alignment of the route including Lough Egish pNHA, Tassan Lough pNHA, Bocks Lough, Lough Morne, Toome Lough, Greaghlone, Comertagh Lough, Drumgristin Lough, Coogan‘s Lough and Shantonagh Lough.

14 The key static ecology features requiring consideration include field boundaries (hedgerows and treelines) and watercourses. Mobile flocks of Whooper Swans specifically also require consideration. More significant ecological features such as designated conservation sites, and significant areas of semi-natural habitat (such as woodland, wetlands, unimproved grasslands) are scarce in the area and are largely avoided by careful line design which included repeated

appraisal and due consideration to ecological concerns identified during the design phase of the development.

6.1.4 Project Description

15 A detailed description of the development is presented in Chapters 6 and 7, **Volume 3B** of the EIS. The key phases of the development as relevant to the evaluation of ecological impacts will consist of the construction and operational phases.

6.1.4.1 Construction Phase

16 The following activities will be undertaken during the construction phase and therefore need to be given due consideration in the evaluation of ecological impacts:

- Site clearance and any drainage requirements at tower locations to facilitate construction;
- Temporary access routes to be used by machinery during construction;
- The use of heavy machinery and associated disturbance within the ‗works area' during construction;
- The excavation of soils for the installation of tower foundations and any associated drainage requirements;
- The use of concrete and other potentially harmful substances at each works area;
- Management, storage and disposal of excavated material during the construction;
- Locations to be used by machinery for the stringing of conductors; and
- Trimming and lopping of woody vegetation to facilitate clearance beneath the line between towers.

6.1.4.2 Operational Phase

17 The operational phase of the development will require:

- Occasional tree trimming beneath the alignment to ensure safe clearance distances around infrastructure;
- Maintenance of towers and associated equipment throughout the lifetime of the project;

- Maintenance of bird diverters as the line may pose a collision risk to vulnerable bird species; and

- Monitoring of mitigation measures (including bird diverters) to ascertain and ensure effectiveness of proposed mitigation measures, with improvements being made if and as required.

6.1.5 Constraints and Technical Difficulties

18 The main constraint during the preparation of the EIS was restricted land access to undertake baseline surveys (refer to sections 1.5.1 and 1.5.2 of Volume 3B of the EIS for further details on restricted access). However, notwithstanding this difficulty, a comprehensive description of the baseline ecology of the CMSA, likely to be impacted by the proposed development, is presented in this chapter of the EIS. This evaluation is based on a combination of three different survey approaches including:

- Walkover ecology surveys (see further information on methodology in **Section 6.2**) were undertaken on lands where access for survey was granted and at locations where the alignment crosses public roads. In all, 28 tower locations and associated alignment sections were subjected to walkover field surveys.

- Visual surveys of the route were undertaken from an extensive network of public roads throughout the CMSA and at all locations where the alignment crosses public roads. This allowed a large proportion of the route to be viewed and together with desktop sources (Geographical Information System (GIS) and aerial photo analysis) enabled a thorough consideration, identification and confirmation of habitat types and dominant species composition. In all, approximately 45 tower locations and a large number of intervening alignment sections were subjected to visual surveys.

- The proposed development was evaluated using LiDAR (Light Detection and Ranging) imagery (refer to Section 1.5 of **Volume 3B** of the EIS for a detailed description of LiDAR and its capabilities) and other GIS datasets (including the subsoils dataset (Meehan 2004), Ordnance Survey Ireland (OSI) six inch mapping, OSI contours, OSI 1:5000 vector mapping) where walkover or visual surveys were not possible.

19 To overcome the difficulties with limited land access, and to ensure that appropriately robust appraisals were undertaken, a precautionary approach was adopted in the design of the proposed development. In those situations where towers are required on lands that were not subject to field survey, tower locations were selected based on the presence of habitats of low ecological value (e.g. improved agricultural grassland) thereby minimising the potential for impacts of significance associated with tower construction.

20 Further details on the methodology used in defining the baseline ecology of the study area is presented in **Section 6.2** .

6.2 METHODOLOGY

21 The ecological appraisal included three main elements to inform the baseline ecology of the CMSA. These included consultation with key stakeholders, a desktop ecological evaluation, and field surveys. The approach and methodology has regard to the guidance documents listed in **Section 6.1.2**.

6.2.1 Consultation and Constraints Identification

22 As part of the overall project development and EIS preparation, a desktop review was carried out to identify features of ecological importance within the wider CMSA and surrounding region, including a review of sites designated for nature conservation.

23 Consultation with various state agencies and environmental Non-Governmental Organisations (NGO's) was undertaken to inform the EIS. As part of consultation on the *Preferred Project Solution Report (PPSR) (July 2013)* these consultees were invited to comment on the preferred line design and issues to be addressed in the environmental appraisal.

24 The project ecologist consulted with the National Parks and Wildlife Service (NPWS) through the Development Applications Unit (DAU) and directly with divisional ecologists and local staff from both the Northern and Eastern Division of NPWS, Inland Fisheries Ireland (IFI), Cavan County Council and Monaghan County Council.

25 A summary of key meetings conducted with prescribed authorities and key NGO parties is detailed below.

6.2.1.1 National Parks and Wildlife Services (NPWS)

26 Meetings were conducted with NPWS divisional ecologists on the following dates: 21st October 2010, 26th November 2011, 13th November 2012 and 18th December 2012.

27 The outcome of these meetings was an approach to locating the vast majority of towers off hedgerows and onto agricultural land. The approach also included avoiding other semi-natural habitats such as wetlands and woodlands.

28 It was confirmed that flight diverters would be used for sections of the transmission lines identified as being of a collision risk hazard for wintering birds, in particular Whooper Swan.

29 The outcomes of these meetings resulted in response letters received from the Department of the Arts, Heritage and the Gaeltacht (DAHG) on 13th February and 10th April 2013, refer to **Appendix 6.2, Volume 3C Appendices** of the EIS. These letters indicated that they were satisfied with the approach being adopted in relation to ecological assessment for the development, and welcomed the fact that there will be less hedgerow loss due to the modified approach (avoidance of hedgerows and treelines).

6.2.1.2 Inland Fisheries Ireland (IFI)

30 A meeting was held with IFI on 1st October 2013 which focussed on water quality protection measures and significant fisheries in the CMSA. During this meeting clarification was provided to IFI regarding proposed development works and associated risks. It was confirmed that water pollution measures would be carefully considered in the EIS. No further correspondence has been received to date.

6.2.1.3 Department of Agriculture, Food and Marine (DAFM)

31 All tower locations were reviewed by the managers of the Wildlife Programme in the DAFM[15]. The DAFM has a very extensive database (data as recent as 2012) of badger sett locations throughout County Cavan (38.26% farmland surveyed) and Monaghan (27.52% farmland surveyed) which they have gained as part of the Bovine Tuberculosis (BTB) eradication programme led by the Eradication of Animal Diseases Board (ERAD). The DAFM advised which towers may potentially disturb Badger setts. In this regard, towers potentially close to a known Badger sett were relocated as a precautionary measure in order to avoid potential impacts. It should be noted that information on Badger sett locations collected under the ERAD programme is confidential and therefore locations are not detailed in this EIS.

6.2.1.4 Birdwatch Ireland

32 As part of ongoing consultation with Birdwatch Ireland, reports on Winter Bird Studies conducted in the CMSA (October 2013) were submitted for comments.

33 A submission was received from Bird Watch Ireland on 6th November 2013 relating to this report and other ongoing EirGrid projects. This submission is included in **Appendix 6.2, Volume 3C Appendices** of the EIS. A number of key considerations relevant to the project were outlined as follows:

[15] http://www.agriculture.gov.ie/animalhealthwelfare/diseasecontrol/bovinetbbrucellosiseradicationschemes/wildlifepolicybadgers/.

- Ireland's obligations for protection of birds and the protection status of birds;
- Best practise guidelines to reduce the impact of power lines on birds;
- Potential impacts to sensitive bird species in particular collision and displacement impacts; and
- Required actions including required surveys to inform the assessment of potential impacts, recommendations for an Avian Protection Plan and post construction monitoring.

34 A subsequent meeting was held with Birdwatch Ireland on 11th December 2013. During this meeting Birdwatch Ireland reiterated concerns detailed in its submission, in particular, in relation to Whooper Swans and wider impacts on populations, appropriate mitigation and monitoring.

6.2.1.5 Cavan County Council

35 A meeting was held with Cavan County Council on 17th October 2013. It was outlined to Cavan County Council that the approach in the development design was to locate towers off hedgerows and avoid other sensitive habitats such as wetlands. It was also highlighted that an extensive six years of winter bird studies has been conducted to inform the assessment of impacts on Whooper Swans and other bird species. Water quality protection was outlined by Cavan County Council as a key consideration for the construction phase of the proposed development.

6.2.1.6 Monaghan County Council

36 It was outlined to Monaghan County Council that the approach in the development design was to locate towers away from hedgerows and avoid other sensitive habitats such as wetlands. It was also highlighted that an extensive six years of winter bird studies has been conducted to inform assessment of impacts on Whooper Swans and other birds.

37 Monaghan County Council made the following observations relevant to the flora and fauna assessment:

- Requirement for detailed habitat mapping and identification of habitat complexes;
- Identify areas requiring bog matting (to minimise impacts to wetlands);
- Identify impacts to hedgerows and woodlands;
- Identify impacts to wider European designated sites (potentially linked to effects from the development e.g. Dundalk Bay cSAC);

- Identify on mapping, areas where permanent access tracks will be required;
- Outline data sources requiring consideration including historical mapping;
- Outline that EPA water quality data requires consideration;
- Highlighted the fishery at Lough Morne; and
- Highlighted that a disposal site should be identified for excess spoil removed during construction (this issue is dealt with in **Chapter 7** of this volume of the EIS).

6.2.1.7 An Bord Pleanála

38 The scoping opinion received from An Bord Pleanála (Appendix 1.3, **Volume 3B Appendices** of the EIS) identified the following issues as being relevant to this chapter of the EIS:

- Baseline data should include an ecological survey of all works sites at an appropriate time of the year. Where ex-situ impacts are possible survey work may be required outside of the development sites.
- Assess the impacts on flora, fauna and habitats with particular regard to:
  - Natura 2000 sites and other (proposed) sites;
  - Habitats and species listed on Annexes I, II and IV of the Habitats Directive;
  - Birds listed on Annex I of the Birds Directive and important habitats for birds including nesting, feeding / wintering areas and flight corridors;
  - Habitats that can be considered to be corridors or stepping stones for the purpose of Article 10 of the Habitats Directive;
  - Other species protected under the Wildlife Acts, Red Data Book species; and biodiversity in general; and
  - The assessment should include the indirect effects of construction activity, including construction access, as well as long term impacts in terms of fragmentation and severance.
- An assessment of potential impacts on the aquatic environment during construction and operation, including impacts on water table levels or groundwater flow which may impact on wetland sites some distance away.
- Any proposed mitigation measures should be identified in a construction management plan which must be included as part of the EIS / NIS.

- The EIS should address the issue of invasive alien plant and animal species, and methods to ensure they are not introduced or spread.

- An assessment of the extent and cumulative impact of hedgerow removal or linear woodland loss along the route. Mitigation should include suitable planting of native species and timing of works outside the nesting season.

- Identify any requirement for licenses or derogations arising.

39 Consultees who informed this response as relevant to the flora and fauna section of the CMSA included: Minister for Arts, Heritage and the Gaeltacht (Developmental Applications Unit), EPA, Monaghan County Council, Cavan County Council and Inland Fisheries Ireland. Key relevant information (relating to flora and fauna) detailed in this response, is considered in this section of the EIS.

40 No other specific feedback relating to flora and fauna has been received from other stakeholders.

6.2.2 Project Design Approach

41 Key project design approaches to avoid or minimise impacts (informed by a combination of consultation outcomes, a review of known impacts of overhead electricity lines, and best practice) recommended by the project design team included:

- Avoidance of OHL development within European sites (i.e. candidate Special Areas of Conservation (cSACs) or Special Protection Areas (SPAs)), Natural Heritage Areas (NHAs) and proposed NHAs (pNHAs), except where oversailing is unavoidable at river crossings.

- Identification of non-designated ecological sites where targeted field survey was advised. Where such surveys were not possible, mitigation by avoidance was adopted.

- Avoidance of notable semi-natural areas (non-designated) – e.g. raised bogs and other wetlands, semi-natural woodland areas identified in published ecology data sets, field survey and aerial imagery.

- Minimising the development footprint and avoidance of locating towers within woodland type habitats (of some local ecological value) e.g. mature demesne woodland, linear mature semi-natural woodland.

- Sensitive location of tower locations with respect to hedgerows and treelines. The location of towers along hedgerows has only been considered where field survey allowed for adequate consideration of hedgerow quality in terms of ecological value and where impacts have been quantitatively assessed.

- A minimum buffer zone of 5m to be retained between tower sites and all natural watercourses. Distances of over 20m are to be retained between tower locations and larger streams and rivers. Such buffer zones aim to minimise risks to water quality and associated sensitive aquatic receptors (e.g. salmonids and otter).

- Avoidance of potential badger sett habitat (hedgerows / treelines and other woody habitat) and maintenance of a buffer zone (5m from outer extent of tree crown) which minimises significant risk of disturbance.

- Avoidance of known badger setts (identified during field surveys and in the DAFM dataset).

- Minimise cutting of mature trees to accommodate the OHL. Where possible impacts to mature deciduous tree lines and more extensive mature woodland is avoided or minimised.

6.2.3 Desk Study

42 As part of the overall project development and preparation of the EIS, a desktop literature review was carried out. This included a review of documented evidence regarding the effect of OHL developments on ecology as well as a review of material (published and un-published reports and datasets) to identify features of ecological importance within the wider CMSA and surrounding region, including a review of sites designated for nature conservation. This involved the following:

- Identification of all sites designated for nature conservation (cSAC, SPA, NHA, pNHA) within 30km of the proposed development and a review of their site synopses, other available information and identification of potential linkage to effects from the proposed development.

- Review of Ordnance Survey maps, aerial photography and other available GIS datasets (sub soils, contour mapping etc.) to assist in identifying habitats and features of potential ecological interest that occur within the CMSA.

- A review of detailed LiDAR imagery – which allowed accurate tree-line / hedgerow identification in addition to heights. A detailed description of LiDAR and its capabilities are summarised in Section 1.5 of **Volume 3B** of the EIS. This information facilitated a quantification of hedgerow / treeline impact.

- Review of EPA water quality data and river catchment water quality information (Water Framework Directive).

- Review rare and protected species records within the CMSA including relevant information sources for protected flora, bats, otter, birds and badger (including the National Biodiversity Data Centre records).

- A review of relevant ecological reports and literature and associated datasets (referenced throughout this text and listed in the bibliography). This included reference to ecology survey datasets (wetlands, woodlands and grasslands) compiled by NPWS and Monaghan County Council. Sources reviewed are listed in **Appendix 6.1, Volume 3C Appendices** of the EIS.

- Detailed review of published and unpublished literature on interactions of birds and powerlines in particular, and other potential impacts of OHLs on wildlife and natural habitats.

- Consultation with interested birdwatchers / landowners regarding bird species of conservation concern, in particular Whooper Swans.

- An evaluation of impacts to hedgerows and treelines was undertaken using available GIS datasets. This study entitled *Hedgerow Impact Study* (September 2011) assisted in informing the evaluation and informed the line design. This report is presented in **Appendix 6.3**, **Volume 3C Appendices** of the EIS.

- An evidence based study on actual impacts of electricity lines on hedgerows / treelines in other similar habitats / areas in Ireland. This was undertaken to inform the impact assessment and inform best mitigation practice. This study entitled *Intervening Hedgerow Impact* is presented in **Appendix 6.4, Volume 3C Appendices** of the EIS.

6.2.4 Field Studies

43 Extensive field surveys have been carried out throughout the CMSA over a seven year period (2007 - 2014). These include multidisciplinary ecology surveys (habitats, flora and fauna), winter and breeding bird surveys, and targeted bat surveys as presented in **Table 6.1**.

44 During these surveys areas of scientific and / or conservation interest, as well as the presence of protected plant and faunal species, in the vicinity of the proposed development were investigated. Relevant survey reports are included as appendices (refer to **Appendices 6.3 - 6.6**, **Volume 3C Appendices** of the EIS) and the main findings are summarised in the body of this section of the EIS. Further details of the survey methodology are presented in the following paragraphs.

Table 6.1: Survey Works and Periods Conducted

Survey Period	Surveys Conducted
November 2007 - March 2008	Monthly winter bird survey were conducted in the wider study area (including all route corridors). A focused flightline study was conducted on the route corridor of the final alignment (Corridor A).
July - September 2008	Baseline ecology surveys (habitats, breeding birds and protected mammals and flora) at alignment road crossings.
October 2008 - April 2009	Monthly winter bird surveys were conducted in the wider study area (including all route corridors). A focused flightline study conducted on the route corridor of the final alignment (Corridor A).
April - June 2009	Baseline ecology surveys (habitats, birds and protected mammals and flora) conducted at alignment road crossings.
October 2009 - April 2010	Monthly winter birds surveys were conducted in the wider study area (including all route corridors). A focused flightline study was conducted on the route corridor of the final alignment (Corridor A).
March - July 2010	Walkover surveys were conducted on specific landholdings where consent was granted. These surveys included an evaluation of hedgerow ecological value, bird survey, habitat description including botanical identification, assessment of bat roost potential and recording of other mammal evidence (Otter and Badger signs). Bat activity surveys were conducted at alignment road crossings.
October 2010 - April 2011	Monthly winter bird surveys were conducted in the wider study area (all route corridors). A focused flightline study was conducted at identified relevant locations on the route corridor of the final alignment.
May - June 2011	A research study was conducted to assess actual impacts of locating towers on hedgerows in summer 2011 by examining existing electricity infrastructure. This study looked at the longer term impacts of locating towers in hedgerows and informed approaches for minimising impacts with future developments.
October 2011 - April 2012	Monthly winter birds surveys were conducted in the wider study area (all route corridors). A focused flightline study was

Survey Period	Surveys Conducted
	conducted at identified relevant locations on the route corridor of the final alignment.
July 2012	A consideration of potential impacts caused by lopping of trees / hedgerows under the then indicative line was conducted in Summer 2012.
April - July 2012	Breeding Bird Surveys were conducted from the extensive road network crossed by the alignment and included noteworthy habitats up to 2km away. These surveys targeted key relevant and sensitive ground nesting species identified such as Lapwing, Snipe, and Curlew.
October 2012 - April 2013	Monthly winter bird surveys were conducted in the wider study area (all route corridors). A focused flightline study was conducted at identified relevant locations on all route corridors and surrounding areas.
Late March - July 2013	Breeding Bird Surveys were conducted from the extensive road network, crossed by the alignment and noteworthy habitats up to 2km away.
August, September, and October 2013	Bat activity surveys were conducted at alignment road crossings.
July - September 2013	Multi-disciplinary walkover surveys were conducted to specific landholdings where consent was granted. These surveys included an evaluation of hedgerow ecological value, identification of larger treelines potentially impacted (for checking accuracy of LiDAR tree height evaluation), bird survey, habitat description including botanical identification, consideration of bat roost potential, recording of other mammal evidence (otter and badger signs).
July - October 2013	Multi-disciplinary walkover surveys (habitats, birds and protected mammals and flora) were conducted at alignment road crossings. Specific bat surveys were conducted at alignment road crossings.
October 2013 - April 2014	Monthly winter bird surveys were conducted in the wider study area (all route corridors). A focused flightline study was conducted at identified relevant locations on the route corridor of the final alignment (Corridor A).

Survey Period	Surveys Conducted
June, July, September 2014	Bat activity surveys were conducted at alignment road crossings.
Late March - August 2014	Breeding bird surveys were conducted from the extensive road network, crossed by the alignment and noteworthy habitats up to 2km away.

6.2.4.1 Habitats

45 A multidisciplinary walkover survey following the methodology outlined by the NRA (2009) was undertaken in those areas along the proposed alignment where access to survey was permitted by landowners. This included a survey of the proposed location of towers, temporary access routes, stringing areas and areas beneath the proposed conductors (intervening hedgerows and habitats). A visual survey of the proposed route was also undertaken from the extensive network of public roads throughout the CMSA and at all locations where the alignment crosses public roads. This allowed a large proportion of the route to be surveyed in the field. These visual surveys were deemed to be adequate to assess habitats of low ecological interest (following methodology outlined in Smith *et al.* 2011). These surveys aimed to record the habitats, flora and fauna present within the survey area as described in the following paragraphs.

46 Where land access was available, surveys were undertaken of all semi-natural habitats encountered along the alignment including the collection of data on dominant vegetation, qualitative assessment of plant species diversity, vegetation structure, topography, drainage, disturbance and management. The data was recorded and the habitats encountered during site visits were classified in accordance with Fossitt (2000) and where appropriate, reference is made to the EU Habitats Directive classification. Specific surveys of hedgerows and treelines were undertaken with a view to assessing their importance based on species composition, structure and management. The methodology used during the survey of hedgerows broadly followed those proposed by Murray (2003). Visual surveys of watercourses in the vicinity of the proposed development were also undertaken. Watercourse characteristics including bankside vegetation, substrate and flow rate were recorded. An evaluation was made on the suitability of the habitat for aquatic species of conservation concern.

47 Species identification and nomenclature follows Parnell and Curtis (2012) for higher plants, Watson (1981) for bryophytes and Fitter *et al.* (1984) for grasses and sedges.

48 In addition to habitat surveys, fauna surveys were conducted to assess usage of the areas by birds and mammals (see below).

49 Following the completion of desktop analysis and field surveys, habitat maps of the entire proposed alignment were prepared according to methodology outlined in Smith *et al.* (2011). The habitat maps detail habitats and habitat complexes recorded within the alignment including a general 40m buffer zone either side of the centre line and the extent of LiDAR imagery (dated November 2013). The mapping takes account of whether the habitat determination was made by detailed field survey, visual field inspection from a distance or from remote sensing techniques as recommended by Smith *et al.* (2011).

50 Faunal surveys were conducted to evaluate usage of the areas by birds and mammals (as detailed below). Considering the characteristics of the habitats present and the nature of the proposed development, it was considered unnecessary to carry out evaluations of more specialised groups such as invertebrate species although incidental records of Lepidoptera (Butterflies and Moths) and Odonata (Dragonflies and Damselflies) were made.

6.2.4.2 Birds

51 Early scoping was informed by extensive consultation (NPWS and public consultation) and a detailed literature review (e.g. Lack (1986); Gibbons *et al*. (1993); Crowe (2005); Lynas *et al. (*2007); Colhoun and Cummins (2013); and EirGrid (2012) identified birds and specifically Whooper Swans as a faunal group requiring consideration in the study area. Whooper Swans are listed on Annex I of the EU Birds Directive and are known to occur in significant numbers throughout the wider study area. The species is also reported as being vulnerable to potential collision as they lack agile flight EirGrid (2012).

52 Extensive multi-year and seasonal bird surveys were conducted to take into account all bird species likely to be present throughout the year within the CMSA and their activities (i.e. breeding, wintering and passage migrant bird species) focusing on identified sensitive species and in particular species of conservation significance (Lynas *et al. (*2007) and Colhoun and Cummins (2013)) and Annex I of the EU Birds Directive identified as occurring in the study area. These species were the ‗Target Species' upon which bird survey efforts focused. The main aim of these studies was to determine the distribution and abundance of species of conservation significance throughout the wider study area that are likely to be sensitive to the proposed development.

53 A full year of bird surveys (breeding and wintering) was conducted in 2009, 2012, 2013 and 2014. In addition to these full annual surveys, winter bird surveys were undertaken in 2008, 2010 and 2011. These are discussed below under breeding and wintering birds.

6.2.4.2.1 Breeding Birds

54 Annual breeding bird surveys were conducted (refer to **Table 6.1**). The appraisal was also informed by a desk study, consultation and public feedback. The final 2014 report (which includes both the CMSA and MSA) considers all survey years to date and is included in **Appendix 6.5, Volume 3C Appendices** of the EIS.

55 The breeding bird survey was carried out during the recommended period for conducting breeding bird surveys (late March to end July inclusive, with more focussed surveys in April, May and June). The methodology broadly followed BirdWatch Ireland countryside breeding bird survey methodologies and appropriate methods detailed in Gilbert *et al.* (1998). A section of road / track at all alignment road crossings was walked and all birds observed by sight and sound were recorded. In addition, fields and other habitats off the road were surveyed for bird activity using binoculars (10 x 42 magnifications) or telescope as required. Lakes, ponds, rivers and woodlands were surveyed for water fowl, waders and passerines (as relevant). Such surveys were also undertaken within lands that were accessed elsewhere along the alignment.

56 The survey was conducted early to mid-morning (between 5.30am and 12pm). Further surveys were conducted from suitable vantage points for birds of prey during the afternoon period to determine presence / absence of these species. Evening surveys were also conducted when daily bird activity increases again. Habitat that is particularly suitable to breeding birds, including scrub, cutaway bog, rivers, and lakes (e.g. Toome or Crinkill Lough) were surveyed in the general area of the proposed alignment (within 1km). Particular attention was paid to lakes and ponds where species prone to collision with OHL including Mute Swan, Great-crested Grebe, Coot, Grey Heron and Cormorant may potentially breed.

57 All bird species were recorded by call and sightings and based on the summary findings of the two repeat surveys per season, bird breeding status was categorised as:

- Probable / confirmed breeder (B);
- No breeding evidence though possibly breeding (NC); and
- Non breeder i.e. wintering, passage migrant or habitat unsuitable (NB).

58 A list of bird species was detailed for each location and signs of breeding activity were recorded in the field. Based on the findings of the early and late season surveys (over all years), a summary of target breeding bird species presented was determined. Location and comments on general abundance and habitat association are provided for all target species of conservation significance. Weather conditions during all of the site visits were deemed to be suitable for carrying out bird survey work.

59 Any nocturnal bird activity was recorded during bat surveys to determine presence of species such as Woodcock.

6.2.4.2.2 Wintering Birds – Whooper Swan

60 Whooper Swans were identified at an early stage in the project as a key target species requiring survey to inform the overall appraisal and mitigation for the proposed development. Other less significant target species identified were wildfowl such as: Mute Swan, Cormorant and duck species.

61 Surveys were conducted based on Wetland Bird Survey (Webs) Core Counts methodology detailed in Gilbert *et al.* (1998) and Vantage Point flightline surveys were based on Scottish Natural Heritage (2013) methods as appropriate. Surveys focused on target species identified during scoping and in consultation with NPWS. However, the survey allowed for identification of other potentially relevant species that may occur based on suitable habitats present e.g. Hen Harrier Winter Roosts (CMSA relevant only).

62 As detailed in **Table 6.1**, seven years of extensive surveys were conducted within the study area including all route corridors considered, in earlier stages of the project development and the wider landscape including up to 5km east and west of the outer corridors focussing on key sites and target species. **Appendix 6.6**, **Volume 3C Appendices** of the EIS details the most recent (2013 / 2014) Winter Bird Survey which includes a summary of previous survey findings.

63 Extensive drive round surveys were conducted of known winter bird sites (sourced from BirdWatch Ireland I-WeBS database) and numerous other potential sites in the vicinity of the proposed development. All sites were scanned using binoculars and telescopes as appropriate, from vantage points on public roads. Likely habitats close to these sites were also checked, as were areas deemed suitable for Whooper Swans that were seen whilst driving between sites. Records were taken of numbers of Whooper Swans, weather conditions and habitat type. Other species of conservation concern were also recorded if observed.

64 In order to determine flight lines, dawn and dusk vantage point surveys were conducted. These vantage point locations were chosen based on known areas utilised by Whooper Swans, observed flocks (during drive around) and known roost sites nearby in which potential for flight lines and hence collision risks are most likely to arise. Potential sites (lakes and identified forage areas) were checked before commencement of watches (before dusk) to determine where Whooper Swans were located and hence observe the direction and locations to which these birds flew. Dawn watches generally commenced half an hour before sunrise and continued for a further hour after. Similarly, dusk watches generally started half an hour before sunset and continued for a further hour after to detect night flying birds which was possible as they are very vocal. Daylight surveys of Whooper Swans were also conducted, although

Whooper Swans do not generally move much during daytime feeding periods. Based on changes in the numbers of individuals at key sites between survey dates and overnight, it was determined if unrecorded flights had occurred.

65 In addition to standard terrestrial survey methods, aerial survey from light aircraft was undertaken. Two aerial surveys per year were conducted of the entire CMSA in winters 2010 / 2011, 2011 / 2012 and 2013 / 2014. Three surveys were conducted in 2012 / 2013. The survey methodology followed the NPWS approach for monitoring extensive and relatively inaccessible SPAs such as the Shannon Callows. A four seat, single engine light aircraft was used for the survey. The surveys were undertaken in conditions of good light and visibility, when flocks of Whooper Swans were detectable up to at least 10km either side of the aircraft. To minimise disturbance, the plane avoided flying below 1000 feet (approximately 300m) as much as possible. Two ornithologists experienced in the methodology were engaged in locating the Whooper Swans, counted them accurately and identified areas used by the Whooper Swans.

66 These in flight surveys allowed confirmation of total numbers of Whooper Swans and locations utilised within the CMSA, including areas that could not easily be surveyed during terrestrial surveys. This survey methodology also had the added benefit of verifying the accuracy of standard terrestrial surveys. It also indicated any sites where more survey work would have been beneficial regarding potential flight lines and allowed accurate counts of birds at specific sites and the overall survey area.

6.2.4.3 Terrestrial Mammals

67 A terrestrial mammal survey was carried out at all sites (lands where permission to survey was granted) targeting potential breeding habitat (i.e. hedgerows / treelines) in the vicinity of proposed tower locations. The key target mammals potentially occurring within habitats which may be potentially affected by the proposed development are badger, bat species and to a much lesser extent otter and deer species. Other species as detailed in **Table 6.12** are also considered in the evaluation. Potentially suitable bat roost sites and foraging habitat were also noted (see bat survey methods outlined in **Section 6.2.4.3.3**).

68 Badgers setts and otter holts tend to be located in unmanaged woody vegetation associated with hedgerows / treelines and in the case of otters, drains and streams linked to more significant foraging habitat e.g. rivers and lakes (Hayden and Harrington (2000)). Outside these areas, in managed farmland (where the towers are mostly located) the risk of disturbance to breeding sites is very low. In this regard mitigation by avoidance was adopted in those areas not subject to walkover surveys by ensuring that tower locations are removed from areas that provide suitable badger or otter habitat as described above. The presence of other protected species including Irish Hare, Pine Marten and Red Squirrel were recorded if signs were observed. Other common mammal species were also noted.

69 All signs and tracks (Bang and Dahlstrom (2004)) were evaluated as they were encountered in the field. Suitable mammal habitat and incidental records of other common faunal groups were also noted e.g. deer species, Irish Hare and rabbits.

70 Surveys methods adopted during the target species surveys, for otter and badger are outlined in the following sections.

6.2.4.3.1 Otter

71 Dedicated otter surveys were conducted at river and bridge crossings within or close to the alignment and a minimum 100m upstream and downstream (where access was possible) to confirm otter presence in the area.

72 In addition all drains and watercourses at lands accessed were checked for signs of otter presence and activity such as holts (breeding and temporary), slides and territorial marking points (spraints) with each sign recorded.

6.2.4.3.2 Badger

73 Badger activity was determined by surveys for setts, trails, latrines and feeding signs. Surveys for badger activity were undertaken at those lands that were subject to field survey (landholdings where permission was granted and alignment road crossings) paying particular attention to suitable habitat in proximity to the alignment (proposed tower locations, temporary access routes and habitat traversed by the alignment). The DAFM provided information as to whether towers and associated works areas were located in close proximity to badger setts based on their available data. Based on this information, all tower and works locations are removed from known badger setts.

6.2.4.3.3 Bats

74 No known bat roosts or sites with significant potential for bat roosts such as old buildings, souterrains, caves, houses or other buildings will be impacted by the proposed development. Potential tree roost sites were identified along the proposed alignment. The confirmation of bat roosts in trees is very difficult, even with regular bat activity surveys at potential tree roost sites, as noted by Kelleher and Marnell (2006). The approach to the bat survey is outlined below:

- Trees which have potential as bat roosts were identified with reference to Andrews et al. (2013). These generally consist of trees with cavities, splits, cracks, knotholes and under loose bark. These features are consistent with mature or dying trees. Mature old trees with potential as temporary bat roosts may be impacted due to tree lopping required. An evaluation was conducted of potential tree roost sites from alignment road crossings. Where land access was facilitated, tower locations and sections where tree lopping is likely to be required were examined.

- Where treelines could not be accessed or viewed, GIS mapping of larger / mature treelines was reviewed to identify very mature treelines where precautionary mitigation is advised. This appraisal was based on detailed aerial imagery (including LiDAR). This allowed more mature treelines consistent with possible bat roost sites to be identified.

- During late Summer and Autumn 2013 and Summer 2014, dusk and night bat activity surveys were conducted at all alignment road crossings, using a bat detector in dual mode (heterodyne and frequency division). This allowed the detection of bat presence, evidence of roosts from bat emergence at dusk and song perches, habitat associations, and relative abundance. Bats were identified by their ultrasonic calls coupled with behavioural and flight observations. The bat survey was conducted from dusk to dark and into night. The survey involved spot surveys (generally 5 to 10 minute duration) at all road crossings focussing on mature treelines. In addition, a drive round survey at and between all road crossings was conducted based on detection and car speed detailed outlined in Roche *et al.* (2012). All rivers and lakes in the vicinity of the proposed alignment were surveyed.

75 The bat surveys conducted allowed for the;

- Determination of any evidence of bat roosts (to support visual assessment);

- Confirmation of key habitats where bats congregate e.g. taller mature hedgerows;

- Identification of bat species present in the area;

- Identification of tree lines / mature deciduous woodland areas where precautionary mitigation is recommended; and

- The findings of the survey within a large sub-sample of possible bat roost habitat (treelines/ hedgerows at road crossings) provided data on the likelihood of bat roosts being present in trees across the entire route.

6.2.4.4 Fisheries and Aquatic Ecology

76 Ponds and lake habitats will be avoided by the proposed development. A number of streams will be oversailed by the proposed development. Visual surveys of these watercourses in the vicinity of the alignment were undertaken. Watercourse characteristics including bankside vegetation, substrate, and flow rate were recorded. An assessment was made on the suitability of the habitat for aquatic species of conservation concern (e.g. freshwater crayfish and salmonids). All watercourses were mapped according to Fossitt (2000).

77 Given that direct impacts are avoided to streams and rivers, it was considered that no in stream sampling was required.

78 Towers are not located in or along watercourse riparian zones. In this regard the potential for direct impacts to water courses and associated protected species is avoided.

79 For more information on water quality protection and the approach to minimise impacts to associated fisheries and aquatic ecology refer to **Chapter 8** of this volume of the EIS.

6.2.4.4.1 Other Fauna

80 The Common Frog (*Rana temporaria*), the Smooth Newt (*Triturus vulgaris*) and the Common Lizard (*Lacerta vivipara*) are all protected species under the Wildlife Act *1976* and 2000 as amended) and have a widespread distribution in Ireland. Each of these species are likely to occur within the CMSA. Pools, ponds, drainage ditches and wet grasslands provide suitable habitat for amphibians in the area. The common lizard is widespread in suitable habitats such as dry banks, heathland and bog habitats. These species and potential breeding habitat were noted if seen.

81 Other species such as Marsh Fritillary (*Euphydryas aurinia*) may potentially occur within the CMSA. Signs of this species were searched for during field surveys based on Northern Ireland Environment Agency (NIEA) (2011) methods.

82 Taking into consideration the ecology of the CMSA coupled with the characteristics of the proposed development, it was considered unnecessary to carry out field surveys of other more specialised faunal groups including fungi, invertebrates and moths.

6.2.5 Evaluation of Ecological Significance

83 The significance of any particular predicted impact is a combined function of the value of the affected feature (its ecological importance), the type of impact and the magnitude of the impact. It is necessary, therefore, to determine the value of ecological features within the CMSA in order to evaluate the significance and magnitude of possible impacts.

84 The method of evaluating ecological significance used in this study is based on a standard approach developed by the NRA (2009b) in the Ecological Assessment of National Road Schemes and has been adopted for use in electricity transmission projects (EirGrid 2012). The results of desktop and field surveys were used to evaluate the significance of identified ecological sites located in the CMSA on an importance scale ranging from international (A) - national (B) - county importance (C) - local importance, high value (D) - local importance, low value (E). Those features identified as being of high local importance or greater are then given

particular mention in the ecological assessment as ‗Key Ecological Receptors' when considering the potential for significant impacts and subsequent requirement for appropriate mitigation. The criteria shown in **Table 6.2** have been used in evaluating ecological value within the CMSA. In addition to the criteria listed in **Table 6.2** the evaluation of habitats and species also considers other factors such as potential ecological value, secondary supporting values where habitats may perform a secondary ecological function, and social values of an ecological feature such as educational, recreational and economic value.

85 Specific habitat and species (non sites) identified were evaluated based on protected status and in the case of specific habitats they are identified if they are potentially of high local ecological value.

86 Individual hedgerow and treeline habitat at tower locations was summarised into one of three evaluation categories (high, moderate or low) broadly based on NRA (2006a) – *Ecological Criteria for Evaluation of Hedgerows* and also with reference to Smith *et al.* (2011).

87 This evaluation for each hedgerow surveyed can be summarised briefly as follows;

- High Value – These hedgerows are relatively rare. They are generally a species rich, robust and relatively wide hedgerow dominated by native species and generally include old ‗standard' trees and or associated watercourses. Woodland ground flora indicator species will typically be well represented. Protected mammal breeding sites (e.g. bats, badger, otter) are more likely to be present. These hedgerows tend to be old semi-natural linear woodland habitats and many are associated with old townland boundaries. Many will have streams associated.

- Moderate Value – These hedgerows are the typical hedgerows common in the Irish landscape variably managed to the requisite criteria (refer to NRA 2006).

- Low Value – These are generally the most managed hedgerows and relatively species poor. Many have an overgrazed field layer and will have low to moderate woody species diversity. Many of these hedgerows will be remnant hedgerows. This type of hedgerow is also relatively common.

Table 6.2: Criteria used in Assessing the Ecological Importance of Sites

Ecological Evaluation Scheme (NRA 2009b)

International Importance:

- ‗European Site', including candidate Special Area of Conservation (cSAC) or Special Protection Area (SPA).
- Site that fulfils the criteria for designation as a ―European Site” (see Annex III of the Habitats Directive, as amended).
- Features essential to maintaining the coherence of the Natura 2000 Network.
- Site containing ‗best examples' of the habitat types listed in Annex I of the Habitats Directive.
- Resident or regularly occurring populations (assessed to be important at the national level) of the following:
    - Species of bird, listed in Annex I and / or referred to in Article 4(2) of the Birds Directive; and / or
    - Species of animal and plants listed in Annex II and / or IV of the Habitats Directive.
- Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).
- World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).
- Biosphere Reserve (UNESCO Man & The Biosphere Programme).
- Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).
- Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).
- Biogenetic Reserve under the Council of Europe.
- European Diploma Site under the Council of Europe.
- Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).

National Importance:

- Site designated or proposed as a Natural Heritage Area (NHA).
- Statutory Nature Reserve.
- Refuge for Fauna and Flora protected under the Wildlife Acts.
- National Park.
- Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Acts; and / or a National Park.
- Resident or regularly occurring populations (assessed to be important at the national level) of the following:
    - Species protected under the Wildlife Acts; and / or
    - Species listed on the relevant Red Data list.
- Site containing ‗viable areas' of the habitat types listed in Annex I of the Habitats Directive.

County Importance:

- Area of Special Amenity.
- Area subject to a Tree Preservation Order.
- Area of High Amenity, or equivalent, designated under the county development plan.
- Resident or regularly occurring populations (assessed to be important at the County level) of the

Ecological Evaluation Scheme (NRA 2009b)
following: - Species of bird, listed in Annex I and / or referred to in Article 4(2) of the Birds Directive; - Species of animal and plants listed in Annex II and / or IV of the Habitats Directive. • Species protected under the Wildlife Acts. • Species listed on the relevant Red Data list. • Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance. • County important populations of species or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared. • Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. • Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
Local Importance (higher value): • Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared. • Resident or regularly occurring populations (assessed to be important at the Local level) of the following: - Species of bird, listed in Annex I and / or referred to in Article 4(2) of the Birds Directive; - Species of animal and plants listed in Annex II and / or IV of the Habitats Directive; - Species protected under the Wildlife Acts. - Species listed on the relevant Red Data list. • Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality; and • Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
Local Importance (lower value): • Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; and • Sites or features containing non-native species that are of some importance in maintaining habitat links.

[Source: Guidelines for Assessment of Ecological Impacts of National Road Schemes (2009)]
cSAC = candidate Special Area of Conservation; SPA = Special Protection Area; NHA = Natural Heritage Area
BAP = Biodiversity Action Plan (these have been published for many local authority areas)

6.2.6 Assessment of Impacts and Impact Significance

88 The evaluation of impacts is broadly based on guidance offered by the Institute of Environmental and Ecological Management (IEEM) in the published *Guidelines for Ecological Impact Assessment* (2006) with reference to national guidance provided in EirGrid (2012), NRA (2009b) and EPA (2002). Impacts are discussed and evaluated in relation to impact type (positive, neutral or negative), character and sensitivity of the affected feature, magnitude, duration, reversibility, timing and frequency.

89 Criteria to be used in describing and assessing impact type and magnitude are presented in **Tables 6.3** and **6.4**.

Table 6.3: Criteria Used in Ecological Impact Assessment

Positive or Negative: Is the impact likely to be positive or negative? International and national policy now pushes for projects to deliver positive outcomes for biodiversity.
Character: The type of habitat (e.g. natural or highly modified woodland; mature or recently established, wet or dry) is important, as is the quality of the site (e.g. undamaged active blanket bog).
Significance: State whether a site has a designation, such as a SAC or NHA, or contains a listed (Annex I) habitat. The ecological value of a site can be assigned a rating using an evaluation scheme (e.g. undesignated areas of semi-natural broadleaved woodland are normally rated as high value, locally important).
Sensitivity: Indicate changes that would significantly alter the character of an aspect of the environment (e.g. changes in hydrology of a wetland due to placing of access tracks).
Magnitude and extent: A scheme may affect only a small part of a site but the area of habitat affected in that location (in hectares) should be given in the context of the total area of such habitat available (e.g. 1ha of a woodland which measures 30ha in total)
Duration: Indicate the time for which the impact is expected to last prior to recovery or reinstatement of impacted habitats and / or species. The duration of an activity may differ from the duration of the resulting impact caused by the activity (e.g. short term construction activities may cause disturbance to birds during the breeding season, however, there may be longer –term impacts due to a failure to reproduce in the disturbed area during that season). EPA (2002) timescales used as follows: • Temporary (0-1 years) • Short term (1-7 years) • Medium term (7-15 years) • Long term (15-60 years) • Permanent (60+ years)
Reversibility: Identify whether an ecological impact is permanent (non-reversible) or temporary (reversible – with or without mitigation).
Timing and Frequency: Some changes may only cause an impact if they happened to coincide with critical life-stages or seasons (for example, the bird nesting season). This may be avoided by careful scheduling of the relevant activities.

(Source: IEEM (2006); EPA (2002))

Table 6.4: Criteria for Assessing Impact Magnitude

Impact Magnitude	Definition
No change:	No discernible change in the ecology of the affected feature.
Imperceptible Impact:	An impact capable of measurement but without noticeable consequences
Minor Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary, but these consequences are not considered to significantly affect the distribution or abundance of species or habitats of conservation importance.
Moderate Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to significantly affect the distribution and / or abundance of species or habitats of conservation importance.
Substantial Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to significantly affect species or habitats of high conservation importance and to potentially affect the overall viability of those species or habitats in the wider area.
Major Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to be such that the overall viability of species or habitats of high conservation importance in the wider area is under a very high degree of threat (negative impact) or is likely to increase markedly (positive impact).

(Sources: Gittings (1998); EPA (2002))

90 A separate assessment of impacts procedure is detailed specifically for collision risks to Whooper Swans. The evaluation is more relevant to bird species. It is based on sensitivity of populations and magnitude of possible impacts, as outlined below in **Table 6.5**. The magnitude of possible impact considers the proposed development in the context of the survey findings and likely impacts from a development of this nature based on existing information and evidence of co-existence.

91 This approach follows standard assessment criteria based on Percival (2003) with additional consideration of NRA (2009). Sensitivity and magnitude (of impact) is determined based on:

- Seven years of information gathered to date on winter bird distribution, known wintering bird concentrations, significance of these concentrations and flight line surveys conducted;
- Desk study / literature review on potential impacts and mitigation approaches; and
- Evidence of actual impacts determined through ongoing studies / observations by surveyors.

Table 6.5: Criteria for Assessing Impact on Bird Species

Components	Definition
Sensitivity Factor	**VERY HIGH:** Species that form the cited interest of SPAs and other statutorily protected nature conservation areas. Cited in this case means mentioned in the citation text for the site as a species for which the site is designated. **HIGH:** Species that contribute to the integrity of an SPA but which are not cited as species for which the site is designated. Ecologically sensitive species including the following: divers, common scoter, hen harrier, golden eagle, red-necked phalarope, roseate tern and chough. Species present in nationally important numbers (>1% Irish population). **MEDIUM:** Species on Annex 1 of the EC Birds Directive Species present in regionally important numbers (>1% regional (county) population), other species on BirdWatch Ireland‘s red list of Birds of Conservation Concern. **LOW:** Any other species of conservation interest, including species on BirdWatch Ireland‘s amber list of Birds of Conservation Concern not covered above.
Magnitude of Possible Impact	**VERY HIGH:** Total loss or very major alteration to key elements / features of the baseline conditions such that the post development character / composition / attributes will be fundamentally changed and may be lost from the site altogether. Guide: < 20% of population / habitat remains. **HIGH:** Major loss or major alteration to key elements / features of the baseline (pre-development) conditions such that post development character / composition/ attributes will be fundamentally changed. Guide: 20-80% of population / habitat lost. **MEDIUM:** Loss or alteration to one or more key elements / features of the baseline conditions such that post development character / composition / attributes of baseline will be partially changed. Guide: 5-20% of population / habitat lost. **LOW:** Minor shift away from baseline conditions. Change arising from the loss / alteration will be discernible but underlying character / composition / attributes of baseline condition will be similar to predevelopment circumstances / patterns. Guide: 1-5% of population / habitat lost. **NEGLIGIBLE:** Very slight change from baseline condition. The change is barely distinguishable, approximating to the ‗no change‘ situation. Guide: < 1% population / habitat lost.

92 The considerations of magnitude and sensitivity are brought together in order to determine the ‗significance of the potential impact‟. This is achieved by cross-tabulating the magnitude and sensitivity, using **Table 6.6**, to give a prediction of the significance of each potential impact on bird species.

Table 6.6: Significance Matrix: Combining Magnitude and Sensitivity to Assess Significance of Potential Impact on Bird Species

SENSITIVITY (→) / **MAGNITUDE OF EFFECT (↓)**	**Very High**	**High**	**Medium**	**Low**
Very High	Very High	Very High	High	Medium
High	Very High	Very High	Medium	Low
Medium	Very High	High	Low	Very low
Low	Medium	Low	Low	Very low
Negligible	Low	Very low	Very low	Very low

93 The following is a summary description of each category of significance as outlined in **Table 6.6**:

- **Very low** and **low** should not normally be of concern and there is no requirement for further mitigation;
- **Medium** represents a potentially significant impact that requires careful individual evaluation. It may be of a scale that can be resolved by revised design and / or appropriate mitigation; and
- **Very high** and **high** represent a highly significant impact on bird populations.

6.2.7 Appropriate Assessment

94 Article 6(3) of the EU Habitats Directive requires an ‗Appropriate Assessment' to be carried out by a competent authority where a plan or project is likely to have a significant impact on a designated European Site (commonly referred to as a Natura 2000 site). In Ireland, European Sites include cSACs and SPAs.

95 The EU Commission's methodological guidance (2002) promotes a four stage process to undertaking Appropriate Assessment with the outcome of each successive stage determining if a further stage in the process is required. The first stage is referred to as Screening, and this is carried out to determine the potential for significant impacts from the plan or project, alone or in combination with other plans or project and European sites. The outcome determines the necessity for undertaking a more detailed (Stage 2) Appropriate Assessment and preparation of a Natura Impact Statement (NIS) where potential impacts are deemed to be of significance. It is

the responsibility of the competent authority (or consenting authority) to undertake Appropriate Assessment.

96 In the case of the proposed development (MSA and CMSA), a NIS was prepared (refer to **Volume 5** of the application documentation) as the potential for significant impacts on two European sites (River Boyne and Blackwater cSAC, and the River Boyne and Blackwater SPA) could not be ruled out through Screening.

97 Having considered the issue of Stage 1 Screening (for Appropriate Assessment) without reference to mitigation measures, in conducting a Stage 2 Appropriate Assessment, mitigation measures should be tested to ensure they are effective and capable of implementation. Hence, a series of mitigation measures have been developed to ensure that the proposed development will not adversely affect the integrity of the European sites concerned. These measures are detailed in the NIS where it is concluded that the conservation interests of the relevant European sites will not be compromised and that the development will have no adverse impact on the integrity of the relevant sites.

6.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

98 The potential impacts on flora and fauna in the CMSA occur during both the construction and operational phases. Details of the potential impacts are included in **Section 6.5**. Overall, the construction programme is anticipated to last approximately three years. The proposed development entails the construction of towers as individual sites separated on average by a distance of approximately 340m. In general the construction phases can be broken down into the following: site preparation works including laying of temporary access tracks, removal of fences and erection of temporary fencing where required, establishment and operation of the construction materials storage yard, installation of tower foundations, erection of towers, guard poles, tree lopping, stringing of conductors, commissioning of the line and reinstatement of land.

99 The following activities and ecological features in particular warrant specific attention in the consideration of potential impacts:

- Construction Phase:
    - Permanent and temporary habitat loss during site clearance / construction;
    - Disturbance to fauna; and
    - Pollution runoff risks to surface and groundwater quality (aquatic receptors).
- Operational Phase:
    - Presence of OHL (conductors and earth wire) may present a collision risk to sensitive bird species; and

- Ongoing maintenance activities.

6.4 EXISTING ENVIRONMENT

100 This section describes the existing ecological environment within the CMSA.

6.4.1 Designated Conservation Areas

101 The location of all designated sites within 30km of the alignment is illustrated in Figure 6.1, **Volume 3C Appendices** of the EIS. The extensive buffer zone of 30km is used to ensure adequate consideration is given to all sites potentially linked to the development. Sites detailed include cSACs, SPAs for birds, NHAs, pNHA and Areas of Special Scientific Interest (ASSIs) (areas recognised as being of national conservation importance in Northern Ireland) and (non-designated but proposed) Natural Heritage Areas (pNHAs) located throughout the wider landscape.

102 Further details of those designated sites within 5km of the alignment are presented in **Table 6.7**. Considering the scale and characteristics of the proposed development, it is considered highly unlikely that sites further than 5km would be impacted. However, due consideration is given to two sites outside of this 5km radius where there is potential for the following impacts:

- Designated sites known to support important populations of wintering birds; and
- Designated aquatic sites located downstream of the alignment.

103 Where it is deemed that the conservation interests of such sites could potentially be impacted, they are also included within **Table 6.7**, which lists designated sites in order of increasing distance from the alignment.

104 The alignment is not within or directly adjacent to any designated areas in the CMSA. The closest designated site is Tassan Lough proposed Natural Heritage Area (pNHA) located approximately 250m south of the alignment. The conservation interest of most designated sites in the surroundings area includes lakes and associated wetland habitats, and would therefore be sensitive to activities in the local catchments. The nearest European site (cSAC or SPA) to the alignment is Killyconny Bog cSAC located approximately 11km to the south-east. A detailed assessment of potential impacts of the proposed development on European sites (cSACs and SPAs) is presented in the NIS (refer to **Volume 5** of the application documentation).

Table 6.7: Designated Sites for Nature Conservation within 5km of the Alignment within the CMSA (Sites further than 5km are included where a potential pathway for impacts is identified)

Site Code	Site	Designation	Site Description	Approximate Distance to the Alignment
001666	Tassan Lough	pNHA	The site comprises a small lake which is noted for its bedrock geology which comprises Silurian outcrops which support rare plant species. The lake is fringed with *Phragmites australis*. Elsewhere rock outcrops occur with grassland and *Sphagnum* moss communities thrive. Surveyed by Foss and Crushell (2007). Considering the scale and characteristics of the proposed development together with the interest features of the site it is concluded that there is no potential for adverse impacts on the conservation interest of the site and therefore the site is not considered further.	250m (south of Tower 115)
ASSI182	Drumcarn Fen ASSI (Drumgallan Bog pNHA)	ASSI / pNHA	The site comprises a large cutover bog area with secondary fen habitat. Other habitats include wet grassland, heath and scrub. The site is renowned for its diversity of dragonfly species (14 species of dragonfly have been recorded on site). Surveyed by Foss and Crushell (2007). Considering the scale and characteristics of the proposed development together with the interest features of the site it is concluded that there is no potential for adverse impacts on the conservation interest of the site and therefore the site is not considered further.	600m (north-east of Tower 109)
001605	Lough Egish	pNHA	Lough Egish comprises a medium to large sized open water lake.. One of the few examples of intact raised bog occurs adjoins the north western part of the lough which was surveyed by Foss and Crushell (2011).	600m (east of Tower 163)
001558	Breakey Lough	pNHA	This site is located approximately 7km south-west of Kingscourt. The site comprises two small loughs which are separated by freshwater marsh, wet woodland, cutover bog and wet grassland. Considering the scale and characteristics of the proposed development together with the interest features of the site it is concluded that there is no potential for adverse impacts on the conservation interest of the site and therefore the site is not considered further.	1.3km (south of Tower 236)
001268	Cordoo Lough	pNHA	Cordoo Lough comprises a lake surrounded by a broad fringe of *Phragmites australis* merging into a meadow community. *Potamogeton lucens* (Shining Pondweed) occurs within this site and is indicative of calcium rich	1.3km (west of Tower 132)

Site Code	Site	Designation	Site Description	Approximate Distance to the Alignment
			water. A stream occurs at the south western end of the site. Surveyed by Foss and Crushell (2012). There is no potential for the proposed development to affect the conservation interest of the site and therefore this site is not considered further.	
ASSI183	Crossbane Lough	ASSI	A large and diverse site comprising a variety of plant communities. There is a gradual transition from the open water of the lough through a range of fen communities, to heath. Fen vegetation occurs in small stands among rocky outcrops and shallow basins. The site supports a diverse invertebrate assemblage. Considering the scale and characteristics of the proposed development together with the interest features of the site it is concluded that there is no potential for adverse impacts on the conservation interest of the site and therefore the site is not considered further.	1.4km (east of Tower 105)
ASSI179	Straghans Lough	ASSI	A large and diverse site with various wetland habitats. Designated as an ASSI for wetland habitats and rich and diverse invertebrate communities. Considering the scale and characteristics of the proposed development together with the interest features of the site it is concluded that there is no potential for adverse impacts on the conservation interest of the site and therefore the site is not considered further.	2.9km (east of Tower 103)
001595	Lough Bawn House Loughs	pNHA	This site is connected via a stream to Black Lough. A small wooded island occurs on the lough. The lough is fringed by Common Reed with Alder and Willow trees in the surroundings. The remainder of the site comprises mixed woodland and deciduous woodland. Surveyed by Foss and Crushell (2008). Lough Bawn is a locally important site for waterbirds.	3.9km (west of Tower 176)
001607	Lough Smiley	pNHA	This site exhibits a good diversity of habitats dispersed over a large area. The lough comprises floating marsh which is fringed by Willow (*Salix*) reed swamp with Common Reedmace (*Typha latifolia*), Reeds (*Phragmites australis*) and Water Horsetail (*Equisetum fluviatile*) dominate the surrounding area. Small areas of raised bog occur throughout the site. Surveyed by Foss and Crushell (2007). This site is of value to waterbirds.	5km (east of Tower 139)
004091	Strabannan Braganstown SPA	SPA	Grassland site, this SPA is of importance for Greylag Goose of which 35% of the national population occurs within the site. Whooper Swan, Greenland White-fronted goose and Golden Plover have also been	24km (east of Tower 230)

Site Code	Site	Designation	Site Description	Approximate Distance to the Alignment
			recorded feeding at the site during winter.	
000455 / 004020	Dundalk Bay cSAC / SPA	cSAC / SPA	The cSAC includes coastal (salt meadows) and marine intertidal and sub-tidal (estuaries) habitats. The SPA is of importance due to the occurrence of large numbers of waterbirds during winter and migration periods.	28km (east of Tower 200)
004049	Lough Oughter and associated loughs	SPA	The SPA is designated for protection for water bird species including Whooper Swan, Great Crested Grebe and Wigeon.	32km (west of Tower 86)

6.4.2 Non-Designated Sites of Conservation Interest

105 A number of non-designated ecological sites of varying ecological value that occur in proximity to the alignment were identified during the desktop studies. Only those sites within 1km of the alignment were considered due to their non-designated status (of lower importance than designated sites listed above) and the essentially non-destructive nature of works associated with the proposed OHL. However, non-designated bird sites that occur within 5km of the alignment are also included. These sites together with a brief description and evaluation are listed in **Table 6.8.**

106 In summary, no towers are proposed to be located within any non-designated sites of ecological value and most non-designated sites have been fully avoided through careful selection of the final line route. The alignment does oversail five non-designated sites of known ecological importance (refer to **Table 6.8**).

Table 6.8: Non-Designated Sites of Ecological Value in Proximity of the Alignment within the CMSA

Site Name	Description	Evaluation	Location (with reference to alignment)
Corlea Bog	Area of cutover bog with regenerating fen communities. Surveyed by Foss and Crushell (2008).	National Importance	Proposed alignment oversails this wetland site between Towers 206 – 207 at Scalkill and Corlea (ED Drumcarrow) townland boundary.
Greaghlone Bog	Cutover bog site with good diversity comprises wet willow-alder-ash woodland and transition mire (surveyed by Foss and Crushell 2012). Considering the scale and characteristics of the proposed development together with the interest features of the site, it is concluded that there is little potential for adverse impacts on the conservation interest of the site and therefore the site is not	County importance	60m west of the alignment at Tower 204 in Greaghlone North.

Site Name	Description	Evaluation	Location (with reference to alignment)
	considered further.		
Raferagh South	Wetland site comprises dystrophic lake, transition mire, reed and large sedge swamp and marsh (surveyed by Foss and Crushell 2011). Considering the scale and characteristics of the proposed development together with the interest features of the site it is concluded that there is no potential for adverse impacts on the conservation interest of the site and therefore the site is not considered further.	County importance	Wetland site occurs approximately 60m north of alignment (Tower 198) at Raferagh.
Corvally Lake	This site has a fairly extensive fen area to the south and a considerable area of floating vegetation. (Monaghan Wetland Map 2010). Considering the scale and characteristics of the proposed development together with the interest features of the site it is concluded that there is no potential for adverse impacts on the conservation interest of the site and therefore the site is not considered further.	County importance	This wetland site occurs approximately 60m west of alignment between Towers 193 – 194 at Corvally.
Bocks Lough	Wetland site comprises a lake, wet woodland and bog woodland. The woodland fringing the lake shore is dominated by birch (*Betula pubescens*) with frequent grey willow (*Salix cinerea*) in the canopy. (Monaghan Wetland Map 2010; NSNW (Perrin *et al*. 2008)). Considering the scale and characteristics of the proposed development together with the interest features of the site it is concluded that there is no potential for adverse impacts on the conservation interest of the site and therefore the site is not considered further.	County importance	Bocks Lough occurs approximately 100m east of the alignment between Towers 175 – 176 at Tullyglass.
Tullyglass Woodland	Comprises oak-birch-holly woodland (NSNW (Perrin *et al*. 2008)).	Local importance (Higher Value)	Alignment oversails the site between Towers 171 – 172 at Tullyglass.
Lough Nahinch (Cashel Bog)	Wetland complex comprising two lakes with intervening transition mire habitat. Some bog communities persist in parts of the site together with scrub and birch woodland (surveyed by Foss and Crushell 2008).	National importance	Alignment oversails the southern part of the site between Towers 117 – 118 at Cashel and Tassan townland boundary.
Clarderry	Extensive area of cutover bog. Western side comprises good	County	Alignment oversails the south eastern boundary of this wetland

Site Name	Description	Evaluation	Location (with reference to alignment)
Bog	quality fen habitat regenerating in cut out area (surveyed by Foss and Crushell 2012).	importance	between Towers 127 - 128 at Clarderry.
Tassan Grassland	Excellent example of neutral to acid grassland with abundant orchids (*Dactylorhiza fuchsii* and *Platanthera chlorantha*) (surveyed by Foss and Crushell (2011).	National importance	The alignment oversails part of this site between Towers 117-118.
Dromore wetlands	Wintering Bird sites and network of lakes along the Dromore River Valley immediately west of Ballybay.	National importance	The alignment avoids bisecting this wetland network hence minimising bird collision risks. The closest concentration of wintering birds is located 4.2km to the west of the nearest tower (beside Ballybay).
Shantonagh Area wetlands lakes	Wintering Bird sites and network of lakes.	County importance	The alignment avoids bisecting this wetland network hence minimising bird collision risks. The closest lake, Shantonagh, is located 1.2km to the west of the nearest tower.
Lough Morne and lakes to the west	Wintering Bird sites and network of lakes.	County importance	The alignment avoids bisecting this wetland network hence minimising bird collision risks. The closest lake, Morne, is located 210m from the alignment and approximately 250m from to the west of the nearest tower (number 167).

107 All non-designated sites of high conservation value located in close proximity of the alignment have been avoided through careful selection of the final route.

6.4.3 Rare and Protected Flora

108 The alignment is located within the Ordnance Survey National Grid 10km squares H70, H71, H72, H82 and N79. A plant species list for these 10km squares was generated from the CD-ROM version of the *New Atlas of British and Irish Flora* (Preston *et al*. 2002). This list was then compared to the list of species protected under the Flora (*Protection*) Order, (1999), the Wildlife (NI) Order, (1985), and those which are included in the *Irish Red Data Book* (Curtis and McGough, 1988). **Table 6.9** presents the rare or protected species with records occurring in these grid squares. The habitat requirements of these species is also presented and the likelihood of any impacts. No protected flora species were recorded during the course of field surveys.

Table 6.9: Rare and Protected Plant Species Previously Recorded in the Study Area

Common name	Latin name	Status	Category	Habitat Requirements	10km Square	Likelihood of Impact
Bee Orchid	*Ophrys apifera*	NI	Red Data Book: Threatened	Open scrub; grassland (lime rich soils); dry banks and sand dunes.	H82	Towers avoid potential suitable habitat within the study area.
Bog Rosemary	*Andromeda polifolia*	NI	Red Data Book : Threatened	Lowland raised bogs; upland peats.	N79; H72	Towers avoid potential suitable habitat within the study area.
Cowslip	*Primula veris*	NI	Red Data Book: Threatened	Widespread species local in old meadows and pastures, on railway cuttings and embankments, coastal cliffs and road verges.	H70; H72	It is likely that the species occurs within the study area.
Fir Clubmoss	*Huperzia selago*	Protected ROI	EU Habitats Directive; Annex V	Mountain cliffs and wet heath mostly above 300m but sometimes on lowland bogs.	H71; N79	Towers avoid potential suitable habitat (wet heath) within the study area.
Round leaved Crane's Bill	*Geranium rotundifoliumm*	Protected ROI	Red Data Book; Vulnerable	Banks; walls; roadsides & stoney ground.	H70	Unlikely – towers avoid this habitat
Stag's Horn Clubmoss	*Lycopodium clavatum*	Protected ROI	EU Habitats Directive; Annex V	Wet heath; grassy mountain slopes.	N79	Towers avoid potential suitable habitat within the study area.
Water Violet	*Hottonia palustris*	Protected ROI & NI	Red Data Book; Rare	Marshes; ditches; shallow ponds.	N79	Towers avoid potential suitable habitat within the study area.

(Source: Preston *et al.* 2002)

6.4.4 Habitats

6.4.4.1 General Ecological Character of the Route

109 In this section, the overall ecological character of the landscape along the alignment in the CMSA is described. The description of the alignment is broken down into a number of sections from south to north. Local townlands and tower numbers are used as reference points. More detailed ecological information on the habitats encountered along the alignment is presented in **Section 6.4.2.2**, while sites of particular ecological interest are described in **Table 6.14** . Habitat

Maps of an 80m corridor centred on the alignment are presented in Figures 6.2.1 – Figure 6.2.19, **Volume 3C Figures** of the EIS.

6.4.4.1.1 Clonturkan to Dingin: Towers 236 to 224

110 Tower 236 is located in the townland of Clonturkan. The habitat in this townland is improved agricultural grassland with boundary hedgerows. The alignment runs in a general northward direction between Clonturkan and the townland of Cordoagh (ED Enniskeen). The landscape is undulating and the ecological character is generally agricultural grassland with some areas recently ploughed and re-seeded. The dominant habitats along this part of the alignment include improved grassland on well drained areas with occasional wet grassland indicated by rushes. There are fragments of other habitats including hedgerows and treelines along field boundaries. Pockets of marsh occur at inter-drumlin hollows between Towers 231 and 235 in the townlands of Carrowreagh and Corraneary (ED Enniskeen). The alignment crosses two streams identified as tributaries of the River Dee along this section. The alignment turns in a north-east direction towards the townland of Corrycholman, passing north of Muff Lough, a eutrophic lake bordered by reed-swamp and wet woodland. There is some planting with broadleaves on the north shore. The alignment avoids the lake running across elevated drumlins. The alignment crosses three un-named streams that flow into Ervey Lough to the East. The towers avoid natural watercourses along this section. At Dingin, the line turns north again, continuing through agricultural grassland to the townland of Corglass (ED Lisagoan).

6.4.4.1.2 Dingin to Scalkill to Doagh: Towers 224 to 203

111 At Dingin, the alignment crosses an un-named tributary of the River Drumsallagh. The line crosses a second stream (Drumsallagh Stream) at Collops which is bordered by a mature ash treeline. From Collops to Lisagoan the alignment again traverses agricultural fields with patches of wet grassland bordered with hedgerows and a watercourse that feeds into the River Lagan downstream. The line turns in a north-west direction at Drumiller. In the townland of Lisagoan the line crosses a fragment of conifer woodland, with the supporting structures remaining outside of the woodland area. The alignment crosses a tributary of Magheracloone stream along the southern boundary of this woodland. North of the woodland area, the line crosses another stream along a road in Lisagoan (see **Table 6.14**) which is bordered by a large mature treeline comprising Ash, Hazel and Willow. Between Lisagoan and Scalkill the habitats are dominated by improved agricultural grassland and hedgerows. The line crosses a roadside stream at Skalkill (between Towers 210 and 211) which is a tributary of the Greaghlone. The line avoids a fragment of wetland just to the south at Scalkill, dominated by tall herbs. It also remains removed (and downstream) from the wetland complex of Greaghlone Lough. At the townland borders of Scakill and Corlea (ED Drumcarrow), the alignment oversails Corlea Bog (between Towers 206 and 207) (see **Table 6.14**), a cutover bog with secondary fen habitat identified in the Fen Survey of Monaghan (Foss and Crushell, 2007). Either side of the Corlea

wetland site the area is dominated by improved agricultural grassland. Towers 206 and 207 are located within elevated areas of improved pasture removed from the wetland area. The line continues north to Doagh, avoiding a similar cutover bog area in the townland of Greaghlone.

6.4.4.1.3 Doagh to Ardragh to Sreenty: Towers 203 to 186

112 From Doagh the alignment continues to the north-west and crosses a wet willow-birch woodland complex (see Cornalaragh Marsh, **Table 6.14**) at Cornalaragh (between Towers 202 and 201). The woodland complex is a diverse site with Willow, Birch, Broom, Ash and areas of open water with Common Reedmace and patches of heathland. To the east of the line is Comertagh Lough (see Comertagh and Raferagh Loughs, **Table 6.14**). This is another site of local ecological value comprising wetland and woodland habitats that is avoided by the alignment.

113 At the crossroads between Cornalaragh and Raferagh South, there is a fragment of wet woodland dominated by willow, at the crossing of a stream. The alignment avoids crossing this woodland and from this point continues in a northerly direction and continues through agricultural grasslands. The line passes east of a small lake at Corvally which is bordered with reed swamp and wet woodland habitat. The line continues in a northward direction and skirts a small section of conifer woodland planted on cutover bog at the crossroads between Corvally and Ardragh. The line passes through the eastern section which is considered to be of low ecological value. From this point the habitats are dominated by agricultural grassland and small patches of scrub near the townland borders at Ardragh and Sreenty. The alignment turns north-east at Tower 188 towards the townland of Sreenty. A wetland comprising marsh deemed to be of local importance (higher value) occurs at the road crossing between the townlands of Ardragh and Sreenty (Towers 187 to 188) (see Ardragh Wetland, **Table 6.14**).

6.4.4.1.4 Sreenty to Cornasassonagh to Drumillard: Towers 186 to 169

114 To the north of Ward's Cross the line turns in an easterly direction, through the townland of Ummerafree and north-east again to Cornasassonagh. Again, the habitats are dominated by agricultural grassland with patches of gorse scrub and wet grassland at Corrinenty and Cornasassonagh. From that point, the line turns in a north-west direction (Tower 176), 0.2km east of Bocks Lough, a small lake surrounded by wetland deemed to be of county importance (see Bocks Lough and Woodland, **Table 6.8**). The alignment is routed to the east of this wetland crossing agricultural grassland and a small fragment of wet woodland (between Towers 175 and 176). The line continues through the agricultural fields occurring on raised drumlins, through the townlands of Tullyglass and Tooa. At Tullyglass, the alignment crosses a small eutrophic pond (Towers 172 to 173) and an area of broadleaved woodland (Towers 171 to 172) along an un-named stream. The woodland and surrounding hedgerows and treelines in this area are considered to be of local importance, higher value (see Tullyglass Pond and Tulyglass Woodland, **Table 6.14**). The woodland occurs in depression between elevated drumlins on

which the towers are sited. Between Tooa and Drumillard the landscape is dominated by improved agricultural fields.

6.4.4.1.5 Drumillard to Cooltrimeglish to Greagh: Towers 169 to 154

115 From Drumillard the alignment turns in a north-east direction passing across elevated agricultural grasslands, avoiding Lough Morne (200m) and Boraghy Lough (300m) which occur to the west. The alignment turns north-east at Aghmakerr (Tower 166) and oversails an area of low lying marsh at the crossroads between the townlands of Aghmakerr and Boraghy (Towers 165 to 166). The line crosses a natural watercourse that discharges from Boraghy Lough (south of Tower 163) and flows eastwards towards Lough Egish pNHA, located approximately 600m to the east. The line turns north-west in the townland of Cooltrimeglish, again crossing agricultural grassland and a low lying cutover bog area (see Tullynahinnera Bog, **Table 6.14**) comprising a mosaic of wetland habitats including scrub and wet grassland (Towers 158 to 159). Drainage ditches occur throughout the wetland indicating degraded conditions. At Greagh the alignment oversails another low lying wetland comprising marsh and transition mire habitat (see Greagh Marsh, **Table 6.14**) (Towers 156 to 157). These secondary wetland habitats are likely to have become established within an area of cutover bog. The wetland is considered to be of local importance, higher value. At Greagh the line route turns in a northerly direction, again the grassland habitats are largely intensively managed for agriculture.

6.4.4.1.6 Greagh to Terrygreeghan to Drumroosk: Towers 154 to 130

116 Through the townlands of Greagh, Drumhowan, Drumgillew Lower, Clogher and Crinkill the alignment occurs on raised drumlins that are intensively managed as agricultural grassland with mostly hawthorn and ash hedgerows forming field boundaries. The alignment crosses a stream in Drumhowan. Tower 152 is located approximately 20m from this stream and associated hedgerow. The alignment crosses a small clear felled woodland (Towers 150 to 151) at the townland boundaries of Drumhowen and Drumguillew Lower, a Badger sett has been recorded from this area (see Drumhowan, **Table 6.14**). From Drumgiullew Lower, the alignment turns north-west continuing through agricultural lands approximately 500m to the south-east of Crinkill Lough. The alignment avoids small sections of scrub fragmentary wetland habitats of marsh and willow woodland between Towers 144 to 146 (see Clogher Marsh, **Table 6.14**). The alignment oversails a small low lying wetland (see Terrygreeghan Marsh, **Table 6.14**) along the townland boundaries of Cornamucklagh South and Terrygreeghan (Towers 142 to 143). Habitats that occur in this area includes marsh and transition mire. Towers are located on elevated agricultural lands removed from the wetland site.

117 At Tower 142 the alignment turns in a northerly direction and continues across agricultural grassland through the townlands of Terrygreeghan and Rausker. The alignment traverses an unnamed stream at the townland boundaries of Terrygreeghan, Rausker and Cornanure

(Monaghan By). The alignment crosses a section of wetland (see Cornanure Marsh, **Table 6.14)** between Towers 138 and 139. This wetland appears relatively undisturbed with no indication of recent drainage. Towers are located within improved grassland outside of the wetland area. A small fragmented wetland area (see Caraghramer Marsh, **Table 6.14**) is also oversailed by the alignment between Towers 135 and 136. This area appears fragmented and relatively disturbed comprising a mix of wet grassland and scrub habitat. The alignment continues through improved grassland and fragments of scrub and hedgerows along field boundaries through the townlands of Caraghramer and Drumroosk, passing to the east of a small wetland at Tower 134 (see Dromroosk Marsh, **Table 6.14**). The alignment is routed to avoid a number of small lakes and associated wetland habitats (Coogan's Lough, Drumgristin Lough and Ghost Lough) located to the east.

6.4.4.1.7 Drumroosk to Cashel to Annaglogh: Towers 130 to 112

118 At Drumroosk, the line turns in a north-east direction (Tower 132) and crosses extensive improved agricultural grassland with small pockets of scrub throughout the townlands of Drumroosk and Derryhallagh (Monaghan By). At Clarderry, just north of Dunfelimy, the line oversails the eastern margin of Clarderry Bog (see Clarderry Bog, **Table 6.14**), a relatively large wetland complex occurring in an area of cutover bog with a good diversity of regenerating wetland and woodland habitats. The site was reported to be of county importance by Foss and Crushell (2012). That part of the wetland oversailed by the alignment comprises willow scrub. From Cornamucklagh North, the alignment turns eastward avoiding areas of wet grassland and marsh to the south of Tower 126. The alignment crosses a river in the townlands of Cornamucklagh North and Clarderry and continues over elevated ground with improved pasture and into the townland of Annagh. The line avoids crossing an area of cutover bog at Annagh and oversails scrub at the southern edge (between Towers 117 to 118) of a large wetland complex at Cashel (see Lough Nahinch, **Table 6.14**) deemed to be of national importance (Foss and Crushell 2008). A complex of four fields of unimproved grassland (see Tassan Grassland, **Table 6.14**) with good species diversity adjoins the eastern part of Lough Nahinch wetland between Towers 117 and 118. Towers in this are all located in improved pasture of low ecological value. The alignment avoids Tassan Lough pNHA, located approximately 250m to the south at Tassan. The alignment continues across improved agricultural grasslands between Towers 116 and 112 at Annaglogh, Larnakelly and Tassan. A number of confirmed active badger setts are avoided in this area.

6.4.4.1.8 Annaglogh to Lemgare: Towers 112 to 103

119 An area of semi-improved calcareous grassland and gorse scrub occur in the area of Annaglogh and Lisdrumgormly between Towers 110 and 112, where Tower 111 is situated in an area of semi-improved grassland. The alignment oversails further areas of scrub and outcropping rock at Lemgare between Towers 107 and 108. The line avoids the Drumgallan

Bog area (Duncarn Fen) which is located approximately 1km to the east of the line route at this location. Between Lemgare and where the line crosses the border, the area is dominated by improved pasture with associated managed hedgerows.

6.4.4.2 Habitat Descriptions

120 This section describes habitats identified within an 80m corridor centred on the proposed line route. It also considers habitats traversed by temporary access routes, many of which extend beyond 80m. This section should be read in conjunction with Figures 6.2.1 - 6.2.19, **Volume 3C Figures** of the EIS.

121 A complete list of flora species recorded during surveys undertaken along the alignment is presented in **Appendix 6.8, Volume 3C Appendices** of the EIS.

122 In addition, **Appendix 6.7, Volume 3C Appendices** of the EIS (Flora & Fauna Plates) illustrates the habitats recorded within the wider CMSA. Agricultural activity is the dominant land use within the vicinity of the proposed development and hence habitats are significantly influenced by this activity. The habitats detailed below are those habitats identified along the alignment.

123 The following habitat types recorded within the corridor of the alignment (within 80m centred on the alignment) (Fossitt 2000) are described below and their distribution in relation to the alignment illustrated on the Habitat Maps presented in Figures 6.2.1 – 6.2.19, **Volume 3C Figures** of the EIS.

- Freshwater: Eutrophic lakes (FL5)
Other artificial lakes and ponds (FL8)
Reed and large sedge swamp (FS1)
Depositing / lowland rivers (FW2)
Drainage ditch (FW4)
- Grassland: Improved agricultural grassland (GA1)
Dry calcareous and neutral grassland (GS1)
Dry meadow and grassy verge (GS2)
Wet grassland (GS4)
Freshwater Marsh (GM1)
- Peatland: Cutover Bog (PB4)
Transition mire (PF3)
- Woodland & scrub: Oak-birch-holly woodland (WN1)
Wet willow-alder-ash woodland (WN6)
Scrub (WS1)
Conifer Plantation (WD4)
Hedgerows (WL1)
Treelines (WL2)
- Cultivated & built land: Arable crops (BC1)
Stonewalls and other stonework (BL1)
Buildings and artificial surfaces (BL3)

124 The dominant habitats along the alignment include improved agricultural grassland (GA1), hedgerows (WL1), and treelines (WL2). At roadsides, grassy verges (GS2) are often present. Drainage ditches (FW4) are commonly associated with linear woodland and hedgerows throughout the CMSA.

125 Less frequently occurring habitats include species poor modified wet grasslands, marsh / cutover bog, conifer plantation and natural watercourses.

6.4.4.2.1 Eutrophic Lakes (FL5)

126 Eutrophic lakes are rare throughout the alignment. Characteristically, the habitat is nutrient rich with an abundance of algae. The habitat is surrounded by a margin of wet grassland dominated by Soft Rush (*Juncus effusus*) together with Bottle Sedge (*Carex rostrata*). Improved agricultural grassland occurs in the wider surroundings. Aquatic plant species recorded include *Potamogeton natans*. The alignment crosses a small example of this habitat at Tullyglass.

127 This habitat may serve as a wetland refuge for local wildlife particularly invertebrate groups such as dragonflies and damselflies. The habitat that occurs within the CMSA does not correspond with the Annex I protected habitat ‗natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation (3150)'.

6.4.4.2.2 Other Artificial Lakes and Ponds (FL8)

128 Artificial lakes and ponds are rare throughout the alignment in the CMSA being recorded at only one location at Lennan. Characteristically, the habitat comprises bodies of standing water usually arising as a result of human modifications to the landscape. The nutrient status of these artificial waters is variable. The pond margins contain disturbed areas of excavated material with ruderal plants including Thistle spp. (*Cirsium* spp.), Broadleaved Dock (*Rumex obtusifolius*) and False Oat-grass (*Arrhenatherum elatius*). The habitat present within the CMSA is small in extent with no marginal wetland vegetation.

6.4.4.2.3 Reed and Large Sedge Swamp (FS1)

129 This wetland habitat has largely been avoided by the alignment throughout the CMSA although is present within wetlands that occur in the wider study area. Characteristically, this habitat is dominated by reeds including Common Reed (*Phragmites australis*), Common Reedmace (*Typha latifolia*) and to a lesser extent Reed Canary-grass (*Phalaris arundinacea*) and surrounds open pools comprising aquatic plants. Other plant species include Bogbean (*Menyanthes trifoliata*), Meadowsweet (*Filipendula ulmaria*) and Wild Angelica (*Angelica sylvestris*). Reed and large sedge swamp (FS1) occurs together with Dystrophic Lakes (FL1) to the north of the alignment at Raferagh fen in the townland of Raferagh.

130 This habitat often forms part of a more extensive wetland systems. The habitat is avoided by the proposed alignment.

6.4.4.2.4 Depositing Lowland Rivers (FW2)

131 The watercourses are variable in width and largely free of vegetation, with Water Cress (*Apium nodiflorum*), Brooklime (*Veronica beccabunga*), Duckweed (*Lemna minor*) and Floating Reed Grass (*Glyceria fluitans*) in parts. In some instances there are good examples of riparian woodland along stream edges, dominated by Alder (*Alnus glutinosa*) and Willow (*Salix* spp.) but this is fragmentary in occurrence.

132 Riparian vegetation is variable and includes improved grassland, isolated trees and areas of linear riparian woodland. Marsh and other habitats were also noted along the alignment. Some watercourses provide suitable habitat for a number of protected aquatic species (Atlantic Salmon, Lamprey and Freshwater Crayfish as listed on Annex II of EU Habitats Directive) and also provide potentially suitable habitat for Otter (Annex II and IV of EU Habitats Directive).

133 Natural watercourses with good water quality provide suitable salmonids and other protected aquatic species. Parts of the watercourses crossed by the alignment may correspond with the Annex I habitat ‗*Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation*‖. However, a clear definition of this habitat (and its sub-types) has not yet been developed for Ireland and its distribution remains unclear (NPWS, 2013). There are approximately 27 watercourses oversailed by the alignment, most of which are small streams being less than 2m in width (refer to **Appendix 6.7, Volume 3C Appendices** of the EIS Plate 9 and Plate 11, of the EIS.). The main watercourses which the alignment oversails include those listed in **Table 6.10**.

Table 6.10: Larger Rivers and Streams Crossed by the Proposed Alignment and Distance of Closest Towers

River Name	Nearest Tower	Distance to River (m) (approximately)
Unnamed tributary of the River Dee	Tower 235	85m
Lough Morne Stream	Tower 167	167m
Watercourse (Cooltrimegish) at Boraghy Lake	Tower 163	30m
Watercourse (Lisquigney)	Tower 139	85m
River Fane	Tower 126	170m
Unnamed tributary of Clontibret stream	Tower 103	65m

6.4.4.2.5 Drainage ditches (FW4)

134 This habitat is widespread and common throughout the alignment. Drainage ditches associated with field boundaries particularly along hedgerows and treelines throughout the CMSA occur most frequently along field boundaries particularly adjacent to hedgerows and treelines. Drainage ditches were also recorded traversing a number of wetland habitats and conifer plantations. Aquatic plants such as Fools Watercress (*Apium nodiflorum*), Duckweed (*Lemna minor*) and Brooklime (*Veronica beccabunga*) were also noted.

6.4.4.2.6 Improved Agricultural Grassland (GA1)

135 The dominant habitat (over 80% of all habitat mapped) that occurs throughout the alignment is improved agricultural grassland (see Plate 7, **Appendix 6.7, Volume 3C Appendices** of the EIS). The habitat is a common feature of the undulating hills that form the wider landscape of the CMSA being intensively managed for cattle grazing and silage crop production. The main plant species that occur within this habitat comprise Perennial Rye-grass (*Lolium perenne*). Other grass species include Sweet Vernal-grass (*Anthoxanthum odoratum*), Crested Dog's-tail (*Cynosurus cristatus*), Yorkshire-fog (*Holcus lanatus*) and Cock's Foot (*Dactylis glomerata*). Broadleaved herbs that are found in this habitat type include White Clover (*Trifolium repens*), Meadow Buttercup (*Ranunculus acris*), Creeping Buttercup (*Ranunculus repens*) and occasional dock (*Rumex* spp).

136 Where drainage is poor, particularly in inter-drumlin, this grassland type grades into rush (*Juncus* spp.) pasture or wet grassland (GS4). Drainage ditches and hedgerows are common features around field boundaries. This common and widespread habitat is of low ecological value. The species recorded within the habitat are common throughout the wider countryside.

The habitat is generally of low interest to wildlife species although, in suitable situations, Whooper Swans may use the habitat as foraging grounds during winter months.

6.4.4.2.7 Dry Calcareous and Neutral Grassland (GS1)

137 Dry calcareous and neutral grassland is uncommon and likely to be confined to the northern part of the CMSA. This habitat type typically occurs on free draining soils where grassland is semi-improved and not managed intensively for agriculture.

138 Plant species that occur include Yorkshire Fog (*Holcus lanatus*), Crested Dog's-tail (*Cynosurus cristatus*), Meadow Grasses (*Poa* spp.), Cock's-foot (*Dactylis glomerata*), White Clover (*Trifolium* repens), Red Clover (*Trifolium pratense*) and Ragwort (*Senecio jacobaea*) and Common Spotted Orchids (*Dactylorhiza fuchsii*). Examples of this habitat occur at Annaglogh and Lisdrumgormly. A good example of the habitat which is avoided by the alignment occurs at Tassan.

139 The habitat is uncommon and restricted in its distribution across the CMSA. Better examples of the habitat can correspond to the Annex I habitat ‗Orchid Rich Grassland' where the diversity of orchids is high. The example of the habitat recorded within the CMSA does not correspond to the Annex I habitat.

6.4.4.2.8 Dry Meadows and Grassy Verges (GS2)

140 Dry meadows and grassy verges are most common at road crossings and along the margins of field boundaries throughout the alignment. The habitat comprises tall coarse tussock grasses such as Cock's-foot (*Dactylis glomerata*) and False Oat-grass (*Arrhenatherum elatius*). The habitat occasionally forms mosaics with scrub where management of agricultural lands has been abandoned. The habitat is widespread throughout the CMSA.

6.4.4.2.9 Wet Grassland (GS4)

141 Wet grassland is frequent throughout the CMSA and occurs where there is impeded drainage. The habitat that occurs within the CMSA is generally dominated by Soft Rush (*Juncus effusus*) and Jointed Rush (*Juncus articulatus*). The habitat comprises soft rush tussocks that range from 0.5m to 1.0m in height. Grasses recorded include Yorkshire Fog (*Holcus lanatus*), Sweet Vernal Grass (*Anthoxanthum odoratum*) and Creeping Bent (*Agrostis stolonifera*). The grass species are generally low-growing and dominate the inter-tussock spaces. Herbs recorded include: Creeping Buttercup (*Ranunculus repens*), Meadowsweet (*Filipendula ulmaria*), Sorrel (*Rumex acetosa*), Daisy (*Bellis perennis*), Marsh Thistle (*Cirsium palustre*), with occasional stands of Yellow Flag-iris (*Iris pseudacorus*). A number of bryophytes are present, including *Rhytidiadelphus squarrosus* and *Eurhynchium praelongum*. These are species commonly

found in wet grassland habitat. This habitat is patchy in occurrence and may grade into patches of poor fen (PF1) or marsh (GM1) typically in poor draining areas. Examples of where this habitat occurs along the alignment include Collops, Canusassonagh, Tullyglass, Greagh, Drumroosk and Annagh.

142 The habitat provides a refuge for wetland flora. It is relatively common in the wider countryside and generally species poor. The examples of the habitat recorded within the study area do not correspond with the more species rich Annex I habitat ‗Molinia meadows (6410)'.

6.4.4.2.10 Marsh (GM1)

143 Freshwater marsh occurs occasionally throughout the alignment. The habitat occurs at inter-drumlin hollows and in natural depressions where drainage is impeded by underlying substrates. The habitat is commonly associated with drainage ditches. The quality of marsh varies within the CMSA from substrates with a high water table to areas drying out as indicated by the presence of drainage ditches and encroachment of scrub species. Most abundant species include: Meadowsweet (*Filipendula ulmaria*), Wild Angelica (*Angelica sylvestris*) and Soft Rush (*Juncus effusus*). Other species that were recorded include Yellow Iris (*Iris pseudacorus*), Water Horsetail (*Equisetum fluviatile*), Soft Rush (*Juncus effusus*), Creeping Buttercup (*Rannunculus repens*), Common Reedmace (*Typha latifolia*), False Oat-grass (*Arrhenatherum elatius*) and Reed Canary-grass (*Phalaris arundinacea*). Ground conditions are characterised by waterlogged mineral soil. Marsh habitat provides a refuge to a diversity of wetland species. Examples of this habitat occur at Raferagh, Ardragh, Sreenty, Corrinenty, Aghmakerr, Crinkill, Terrygreeghan, Cornamucklagh North and Lemgare.

6.4.4.2.11 Cutover Bog (PB4)

144 There are a number of areas of isolated fragmentary habitats comprising cutover bog. These areas were once raised bog habitats that occupied inter-drumlin hollows, however they have been drained extensively and cutaway for peat in historic times. The regeneration of these areas after turf-cutting ceases can lead to a mosaic of habitats of local value that are collectively described as cutover bog. There may be fragments of dry and wet heath (dominated by Ling Heather (*Calluna vulgaris*); open water with bog mosses (*Sphagnum cuspidatum*) and Bog Cotton (*Eriophorum angustifolium*); poor fen and in some instances examples of rich fen or transition mire (see Plate 12, **Appendix 6.7, Volume 3C Appendices** of the EIS). Throughout cutover bog areas there are also stands of birch or willow scrub. Good examples of the habitat occur at Corlea (ED Drumcarrow), Brackly, Derryhallagh, Annagh and Cashel (Lough Nahinch) although the alignment has avoided the requirement to locate towers in these areas.

6.4.4.2.12 Transition Mire and Quaking Bog (PF3)

145 Transition mire occurs occasionally throughout the CMSA. Characteristically, the habitat is a wet peat forming system intermediate between poor and rich fen. Transition mires are usually found in the wettest part of a bog or fen comprising a floating raft of vegetation dominated by a rich moss layer supporting a variety of sedge species. The habitat supports a number of sedges including Common Cotton-grass (*Eriophorum angustifolium*), *Carex diandra, and Carex rostrata* together with broadleaved herbs such as Bogbean (*Menyanthes trifoliata*), Marsh Cinquefoil (*Potentilla palustris*) and Lesser Spearwort (*Ranunculus flammula*). The habitat may also support scattered stands of Grey Willow (*Salix cinerea*). Examples of this habitat occur at Scalkill and Terrygreeghan. The alignment has avoided the requirement to locate towers in these areas.

146 The habitat is considered to be an important wetland refuge for flora and fauna and corresponds to the EU Annex I habitat ‗Transition mires and quaking bogs'. The design of the proposed development has been successful in avoiding this habitat.

6.4.4.2.13 Oak – Birch - Holly Woodland (WN1)

147 Mixed broadleaved woodland is uncommon along the proposed route alignment. A single stand of mature birch dominated woodland occurs along the alignment at Tullyglass Woodland (see **Table 6.14**). The area in proximity of the alignment is dominated by Birch (*Betula pubescens*) with a field layer of Bramble (*Rubus fruticosus* agg.)) and various grass species. The following description is from Perrin *et al.* (2008): ‗Cattle grazing occurs through out the site and there are many areas with poached soil. Invasive shrubs are problematic with *Rhododendron ponticum* and *Prunus laurocerasus* dominating substantial areas. Most of the site is on sloping ground and is freely draining although there are some wetter areas along the streams. Elsewhere within the site are a mixture of Hazel (*Corylus avellana*), Ash (*Fraxinus excelsior*), birch (*Betula pubescens*), Beech (*Fagus sylvatica*), Sycamore (*Acer pseudoplatanus*) and Holly (*Ilex aquifolium*) with a field layer dominated by Bramble (*Rubus fruticosus* agg.), Germander Speedwell (*Veronica chamaedrys)*, Bluebell (*Hyacinthoides non-scripta*), Primrose (*Primula vulgaris*) and Creeping Buttercup (*Ranunculus repens*)'.

148 Good examples of this woodland type may provide valuable habitat for terrestrial mammals, bats and common woodland birds.

6.4.4.2.14 Wet willow – Alder - Ash Woodland (WN6)

149 Wet willow-alder-ash woodland occurs occasionally within the CMSA. The habitat occurs in areas that are predominantly wet or flushed for most of the year. The tree layer is characterised by mature trees including Grey Willow (*Salix cinerea*), White Willow (*Salix alba*), Alder (*Alnus*

glutinosa), Ash (*Fraxinus excelsior*) and occasional Birch (*Betula pubescens*). Drainage ditches are associated with this habitat in the CMSA. Ground conditions are typically characterised by a waterlogged peat substrate with bramble growing in the understorey. Examples of this habitat occur at Corraneary (ED Enniskeen), Ummerafree, Tullyglass, Crinkill and Raferagh.

150 The habitat is widespread in areas associated with wet ground conditions, particularly around the perimeter of lakes and cutover bog areas. Good examples of the habitat may correspond to the Annex I habitat ‗Alluvial woodland', however, no such stands have been identified within the corridor of the alignment.

6.4.4.2.15 Scrub (WS1)

151 Scrub occurs frequently along the alignment. The habitat varies somewhat depending on a number of factors including drainage. Gorse (*Ulex europaeus*) typically dominates in drier areas associated with rock outcrops or at the edge of well drained peatlands. Willow (*Salix* spp.) scrub occurs most commonly in wetter sites such as poorly drained cutover bog sites and adjacent lakes or watercourses. Other species that commonly dominate the habitat include Hawthorn (*Crataegus monogyna*), Birch (*Betula* spp.) and Bramble (*Rubus fruticosus* agg.). The habitat was usually found growing in association with areas or rock outcrop or on areas of cutover bog. Examples of where this habitat occurs along the alignment include Cordoagh (ED Enniskeen), Greagh, Ardragh, Clarderry, Cashel, Corrinenty, Annaglogh and Lemgare (see Plate 10, **Appendix 6.7, Volume 3C Appendices** of the EIS).

152 The habitat is common and widespread throughout the CMSA. Scrub may provide valuable cover to terrestrial mammals (Badger) and nest sites to common farmland bird species.

6.4.4.2.16 Conifer Plantation (WD4)

153 Conifer forestry occasionally occurs throughout the CMSA. Characteristically, tree stands comprise non-native conifer species planted in distinct rows and are managed for commercial timber production. Semi-mature stands were most common throughout the CMSA although mature and immature plantations are also present. Species diversity is low, often comprising monoculture stands of Sitka Spruce (*Picea sitchensis*) often planted in areas of cutover bog and marsh.

154 Conifer plantations in the CMSA are fringed with Bramble (*Rubus fruticosus* agg) thicket. Artificial Drainage Ditches (FW4) are present within and surrounding the perimeter of this habitat. Examples of where this habitat occurs along the alignment include Leiter, Lisagoan and Corvally.

6.4.4.2.17 Hedgerows (WL1)

155 Hedgerows form the main field and road boundaries throughout agricultural lands within the CMSA. Targeted surveys were carried out on those hedgerows and treelines that occur along the alignment where access was possible or good visual interpretation from a distance could be made. Other hedgerows were assessed using LiDAR imagery which allows a good interpretation of the structure of hedgerows and their likely value as wildlife habitat. The majority of the hedgerows that occur along the alignment are largely managed and intact. Drainage ditches often occur alongside hedgerows. Species that occur most commonly throughout the hedgerows include Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Elder (*Sambucus nigra*), Common Gorse (*Ulex europaeus*), Willow (*Salix* spp.) and Ash (*Fraxinus excelsior*) and typically attain heights of 2-5m (see Plate 8, **Appendix 6.7, Volume 3C Appendices** of the EIS). Larger more mature trees are also common with ash being the most abundant although the following species were also recorded: Oak (*Quercus* spp.), Rowan (*Sorbus aucuparia*), Horse chestnut (*Aesculus hippocastanum*) and Sycamore (*Acer pseudoplatanus*). Where trees are mature they attain heights of up to 15m but generally their occurrence is scattered and patchy.

156 The understory typically includes species such as bramble (*Rubus fruticosus* agg.), Ivy (*Hedera helix*), Common Nettle (*Urtica dioica*), Cowslip (*Primula veris*), Ground Ivy (*Glechoma hederacea*), and Vetch species (*Vicia* spp.). The more robust examples have a higher diversity of woodland flora with a dense ground layer and often comprise Herb Robert (*Geranium robertianum*), Wood Sorrel (*Oxalis acetosella*), Lesser Celandine (*Ranunculus ficaria*) and Primrose (*Primula vulgaris*). A number of ferns may also be present including Male fern (*Dryopteris filix-mas*), Hard Fern (*Blechnum spicant*), Hart's-tongue Fern (*Asplenium scolopendrium*) and other Fern species (*Dryopteris* spp.).

157 Non native shrubs including Fuchsia (*Fuchsia magellanica*) and Snowberry (*Symphoricarpos albus*) were also recorded amongst hedgerows. Good examples of hedgerow habitat were recorded at Corraneary (ED Enniskeen), Tullyglass, Annagh and Cornamucklagh North. For the purposes of this evaluation, hedgerows have been classified into two distinct types depending on their height and structure to enable a quantitative evaluation of potential impacts associated with the proposed development. Each hedgerow along the alignment has been classified into one of the following two types:

- Type A: Managed / low hedgerows typically dominated by hawthorn. These are generally less than 6m high and no significant tree trimming will be required.

- Type B: Overgrown / unmanaged hedgerows typically with immature or semi-mature trees (most commonly Ash). There may be isolated mature standard trees. These are generally less than 12m high and will typically require some lopping and / or trimming to facilitate adequate clearance beneath conductors.

158 In all, the alignment passes over 390 Type A hedgerows and 92 Type B hedgerows. Hedgerows occur within the proposed footprint of six towers throughout the length of the alignment. Hedgerows serve as important corridors for wildlife linking areas of semi-natural habitat within an agricultural landscape. Good examples of hedgerow habitat form well developed intact structures serving to provide suitable habitat for terrestrial mammals, bats and birds.

6.4.4.2.18 Treelines (WL2)

159 This habitat typically comprises lines of mature native and non-native trees which may include Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*), Birch (*Betula* spp.), Oak (*Quercus* spp.), Alder (*Alnus glutinosa*), Grey Willow (*Salix cinerea*), White Willow (*Salix alba*) and Rowan (*Sorbus aucuparia*). Mature trees along the alignment typically attain heights of up to 15-25m high. The majority of treelines comprise native species usually growing in association with hedgerows comprising hawthorn and bramble. Good examples of where this habitat occurs include Clonturkan, Collops, Corglass (ED Lisagoan) (refer to Plate 9, **Appendix 6.7, Volume 3C Appendices** of the EIS), Lisagoan, Drumhowan and Tullyglass.

160 The alignment traverses a total of 56 treelines, while treelines occur within the footprint of towers at two locations along the entire alignment. Treelines may provide valuable roost and foraging areas for bats. A number of Badger setts were recorded along ash treelines particularly at Cordoagh (ED Enniskeen), Drumhowan and Latnakelly. Treelines also function as ecological corridors linking areas of semi-natural habitat within the intensively managed agricultural landscape.

6.4.4.2.19 Arable Crops (BC1)

161 This habitat is uncommon throughout the CMSA and is of low ecological value.

6.4.4.2.20 Stone Walls and Other Stone Work (BL1)

162 This habitat is associated with hedgerows in parts of the CMSA. This habitat will be retained and is considered under WL1 habitat in potential impacts.

6.4.4.2.21 Buildings and artificial surfaces (BL3)

163 The alignment crosses a number of tracks and roads along its length. The proposed route alignment avoids built structures and no demolition of buildings is necessary to facilitate the

proposed development. Old and derelict buildings may provide important valuable roost sites for bats.

6.4.5 Fauna

6.4.5.1 Birds

164 The main findings of the bird surveys are summarised in this section under breeding and wintering birds. The focus is on bird species identified as being at potential risk from impacts associated with the development (Target species). Sensitivity to potential effects of the OHL development is based on the extensive desktop study conducted, consultation with relevant stakeholders and field studies. Sensitivity factors include one or more of the following – known collision risk (with transmission lines), risk of disturbance (during site clearance works), displacement (permanent outcome of development) and species distribution within the study area. EirGrid Guidelines (2012) detail vulnerability of bird species in Ireland to collision with electricity transmission lines and this has also informed the evaluation. This evaluation is detailed as appropriate for individual species detailed below.

165 Target species were identified as species sensitive to this type of development. They are species listed on Annex I of the EU Birds Directive (79/409/EEC)[16] and birds listed as being of high (Red listed) and medium (Amber listed) conservation concern (as identified by Colhoun and Cummins (2013)). Also considered are common species which have been identified as relatively sensitive to potential collision impacts from this type of development (EirGrid, 2012).

6.4.5.1.1 Breeding Birds

166 A detailed survey of breeding birds in the CMSA has been undertaken to inform the ecological impact evaluation. This survey report is presented in **Appendix 6.5, Volume 3C Appendices** of the EIS. Key species of conservation significance identified are summarised below into potentially sensitive and relatively non sensitive, to potential impacts from the proposed development.

167 The species accounts presented below relate to those species of conservation concern that are considered to be sensitive to the OHL development as per rationale described in Section 6.4.5.1 above.

[16] The species listed in Annex I of the EU Birds Directive are those in danger of extinction, rare, vulnerable to specific changes in their habitat requiring particular attention for reasons of the specific nature of their habitat.

6.4.5.1.1.1 Sensitive Species of Conservation Significance

168 **Lapwing** (Red Listed), a wader species of high conservation concern was probably breeding at one location only (Corvally), which is located 200m away from the alignment in 2009 and 2010. No breeding pairs were noted in 2012, 2013, or 2014. The species is considered currently to be very scarce as a breeding species in the wider CMSA. This species is considered a moderately collision prone species.

169 **Curlew** (Red Listed), a species of high conservation concern, is a very rare breeding species in parts of the wider CMSA study area. No breeding pairs were recorded in 2012, 2013 or 2014. Habitat in the study area is considered generally unsuitable. A pair was noted in 2011 in the townland of Lemgare (c.a. 500m from the alignment) in less improved pasture which has since been reclaimed.

170 **Coot** (Amber Listed), is considered a highly collision prone species. In CMSA this species is a scarce breeding species in the CMSA in larger lakes. A pair was noted in 2012, 2013 and 2014 at Toom or Crinkill Lough in the townland of Crinkill, located approximately 500m east of Tower 146.

171 **Cormorant** (Amber Listed) frequents the larger rivers and lakes. Cormorants are regularly recorded at Lough Egish (located approximately 500m east of alignment at Tower 163) and other lakes throughout the CMSA though mainly non breeding individuals. This is considered a highly collision prone species. It is also a relatively mobile species which makes regular flights between foraging areas (lakes and rivers).

172 **Great Crested Grebe** (Amber Listed) is a widespread breeding species on medium to larger sized lakes within 2km of the proposed alignment within the CMSA. Most lakes have one breeding pair though more than this occurs in larger lakes (see below). In 2013 and 2014 at least one breeding pair of this species within 2km of the alignment were recorded at:

- Bocks Lough (located approximately 250m from the alignment);
- Lough Toome or Crinkill (located approximately 500m from the alignment);
- Lough Morne (located approximately 250m from the alignment);
- Lough Comertagh (located approximately 750m from the alignment);
- Lough Egish - 3+ pairs (located approximately 800m from the alignment);
- Lough Shantonagh - 2+ pairs (located approximately 1km from the alignment); and

- Lough Greaghlone (located approximately 1.4km from the alignment).

173 This species is considered a highly collision prone species. However this species is also considered to be at low risk from the proposed development as the line route is removed from breeding areas with the nearest confirmed breeding lakes being located approximately 250m from the alignment (see above). It is also a relatively sedentary species which does not follow regular flight paths.

174 **Little Grebe** (Amber Listed) is relatively scarce on smaller ponds and lakes in CMSA. In 2013 it was recorded breeding at two lakes within 1km of the alignment - Muff Lough and Corawaddy Lough. This species is considered a high collision prone species. However this species is considered to be at very low risk from the proposed development as it is relatively sedentary and occurs at very low numbers well removed from the development.

175 **Mute Swan** (Amber Listed). This species is a widespread breeding species on waterbodies from small ponds to large lakes throughout the CMSA. In CMSA this species breeds on a number of small lakes located between approximately 250m and 3km from the alignment. In particular locally significant numbers congregate on Lough Egish in winter and a minimum of three pairs usually breed at this site annually. In 2013 and 2014 breeding pairs of this species were also confirmed at lakes including Lough Morne, Lough Shantonagh, Toome or Crinkill Lough, Muff Lough (located approximately 250m from the alignment) and Lurgacham Lough (located approximately 1.1km from the alignment). Mill Lough (located approximately 700m from alignment) and Bellatrain Lough (located approximately 3km from the alignment) were probable breeding sites.

176 Mute Swan is considered a high collision prone species. In the CMSA they are considered to be at low risk from the proposed development as they are relatively sedentary and do not make regular flightlines at least during the breeding season. Flight diverters are proposed between Lough Egish and Lough Morne as precautionary mitigation for this species as flightlines occur in this area.

177 **Snipe** (Amber Listed). In the wider CMSA much suitable breeding habitat for Snipe occurs. No breeding pairs were recorded in 2014. This species was only recorded at Drumcarn ASSI and Milltown Lough during 2013 which are located away from the alignment. In the past Snipe has been recorded breeding at Raferagh Lough and at Cashel Bog also. It likely breeds at low densities in cutover bog and wetland habitats throughout CMSA. This species is considered a moderately collision prone species. Suitable habitat is largely avoided and this species is not considered sensitive to the proposed development.

178 **Teal** (Amber Listed). None were recorded in 2014. In 2013 this species was recorded once as possibly breeding on Lough Nahinch though none were noted in previous surveys. This species is considered a highly collision prone species. This species is not considered sensitive to the proposed development as it is a low flying species (typically below the height of proposed conductors) and the only possible breeding site (Lough Nahinch) is removed from the development.

179 **Tufted Duck** (Red Listed), is a highly collision prone species. In CMSA Tufted Duck (flock of 10) were recorded in early (11th) April 2014 on Lough Morne, located approximately 250m west of the alignment. No Tufted Duck were recorded here in later surveys and no evidence of breeding was determined on lakes in the vicinity of the development during all years of survey.

180 **Water Rail** (Amber Listed). This species is widespread in wetlands and overgrown drumlin hollows throughout the CMSA. This species is considered a moderately collision prone species. This cryptic species is not considered sensitive to the proposed development as it is a sedentary low flying species.

181 **Woodcock** (Red Listed) were not recorded as a breeding species within the CMSA. This species is a cryptic species active at night which likely breeds in scrub, overgrown wetland edges and forestry. This species is considered a moderately collision prone species. This skulking sedentary species is not considered sensitive to the development.

182 Common species which are moderately or highly vulnerable to collision are summarised below. Most of these species listed are associated with water bodies which will not be impacted by the proposed development, the exception being Pheasant which is bred for recreational hunting.

- Duck species and Moorhen;
- Grey Heron; and
- Pheasant.

6.4.5.1.1.2 Non Sensitive Species of Conservation Significance

183 **Barn Owl** (Red Listed) is a nocturnal bird of prey species which potentially breeds in the CMSA. This species typically breeds in old uninhabited buildings and outhouses though they may possibly use hollows in large old trees (Notice Nature, 2013). This species is very rare in the study area (Balmer et al., 2013). None were recorded during surveys in the CMSA and impacts to typical nesting areas are avoided. No significant potential nest sites (old trees with large cavities) were determined at any roadside crossings or lands accessed. The likely absence of

breeding sites in proximity to the alignment coupled with the relatively rare occurrence of the species throughout the CMSA suggests that collision risk would be negligible.

184 **Kingfisher** (Annex I EU Birds Directive and Amber Listed) is associated with river, riparian habitats and lakes in the overall CMSA though none were recorded during surveys. This is not a collision prone species but is sensitive to disturbance of breeding habitat where the alignment crosses potential breeding areas (rivers and associated riparian areas).

185 The following passerine species of high conservation concern were recorded, all of which are considered to have low susceptibility to collision with powerlines (EirGrid, 2012); Meadow Pipit and Grey Wagtail. Meadow Pipit was recorded throughout suitable habitat along the alignment (semi-improved pasture and cutover bog). Grey Wagtail was recorded along watercourses and associated riparian habitat.

186 The following passerine species of moderate conservation concern were recorded, all of which are considered to have low susceptibility to collision with powerlines (EirGrid, 2012); House Sparrow, Kestrel, Skylark, Linnet, Sand Martin, Starling, Swallow, House Martin and Swift. Some woody vegetation nesting species may be susceptible to disturbance during woody vegetation clearance prior to construction.

6.4.5.1.2 Wintering Birds

187 Detailed multi-annual surveys have been conducted of wintering birds in particular Whooper Swans to inform the ecological impact assessment. The most recent survey report (2013 / 2014) includes a consideration of all previous surveys and is presented in **Appendix 6.6, Volume 3C Appendices** of the EIS.

188 The key findings of this study, in relation to sites and inter year usage by Whooper Swan is detailed in Figure 6.3.1, **Volume 3C Figures** of the EIS. Identified and probable flightlines based on surveys conducted are detailed in Figure 6.3.2, **Volume 3C Figures** of the EIS.

189 A summary of the key findings of the annual winter survey from 2007 / 2008 to 2013 / 2014are detailed below.

6.4.5.1.2.1 Whooper Swans (Annex 1 EU Birds Directive)

190 Whooper Swans were highlighted in the An Bord Pleanála (the Board) scoping opinion and also during consultation with BWI and NPWS, as extensively using the CMSA, in numbers that can exceed nationally significant levels (greater than 150 birds (Boland et al., 2010). This species is considered highly susceptible to collision with powerlines. In this regard it was identified as a key target species for consideration regarding potential effects of the proposed development.

Given that collision risk was identified as an issue for this key target species; a more species specific method of impact assessment was utilised (see **Tables 6.5** and **6.6**). This approach differs from the procedure implemented for all other identified potential impacts on ecological receptors including other identified impacts to Whooper Swans (e.g. displacement and disturbance).

191 Over a period of seven years, surveys for Whooper Swan and other wintering birds were undertaken monthly during the period of October to April. 56 No. sites have been identified in the CMSA as being utilised by Whooper Swan during the study (desk and field survey) and historically. Three of these sites are historical records only i.e. despite being regularly surveyed during the current study, no Whooper Swans were recorded. These sites include Lough Major, Lough Sillan, and Bawn Lakes. It should be noted that the wider study area has been subject to continual winter surveys (2010 – 2014 inclusive) as highlighted in Figure 6.3.1, **Volume 3C Figures** of the EIS.

192 During the course of surveys, no individual site within the wider CMSA study area exceeded nationally significant levels. The most regularly utilised and important site close to the alignment is Lough Namachree with maximum counts of 65 swans (approximately 0.5% national population). Other sites of county importance identified during the study include Lough Creeve and fields at Ballintra. Key wintering Whooper Swans and other wintering bird sites have been avoided by the proposed development, refer to **Table 6.11**. No Whooper Swans have been noted during surveys to date on Lough Major which has held nationally significant numbers in the past (Source: NPWS).

193 The key findings of the study, as presented in **Appendix 6.6, Volume 3C Appendices** of the EIS, include:

- At Ballintra a regular flightline was confirmed in the first four winters of the study (between 2007 and 2011) and again in 2014. Ballintra consists of a feeding area which swans fly to during the day. They roost at two small lakes (Loughs Tonyscallan and Toome (or Crinkill)) which are located approximately 1.5 and 2km east and east south-east of Ballintra respectively. This flightline crosses the proposed alignment as shown in Figure 6.3.2, **Volume 3C Figures** of the EIS. In winters 2011 - 2013 inclusive no Whooper Swan activity was recorded in this area.

- Based on observed number changes, an irregular flight line exists across the alignment in the Comertagh, Corvally, Greaghlone, Mill Lough, and Raferagh Pond area as Whooper Swan move throughout the winter between this cluster of lake sites.

- Similarly, based on observed number changes, an irregular flight line exists across the alignment between Lough Egish and Lough Morne and lakes to the west.

- In 2013 / 2014 three new sites were determined relatively close to the alignment including Corvally (650m) and Greaghlone Loughs (1.25km) – see above. A small number (3) of Whooper Swans were additionally recorded at Corawaddy Lough (750m).

6.4.5.1.2.2 Other Wintering Bird Species

194 Flocks of Golden Plover and Lapwing (maximum count 260 Golden Plover and 140 Lapwing) are regular during specific periods (late spring and early autumn) around Lough Egish. These are birds on migration and do not stay for extended periods throughout the winter but use this area for foraging and resting before migrating further. No flightline was observed of these species crossing the alignment.

195 Mute Swan uses most lake sites in the CMSA. A key area identified where there may be potential impacts is between Lough Egish and Lough Morne as non-breeding individual numbers can build up on these lakes in some years, and unrecorded flight lines occur between these lakes which are bisected by the alignment.

196 Relatively large numbers of cormorant, winter at times on Lough Egish (maximum count of 40 in 2009).

197 Most other lakes, besides those highlighted for Whooper Swans, are typically utilised by low densities of Mute Swan and Great Crested Grebe and are unlikely to be measurably affected by the proposed development.

198 As part of the assessment, SPAs in the wider area were considered, refer to the NIS in **Volume 5** of the application documentation.

199 Strabannan-Braganstown SPA (Site Code 004091) is the closest SPA at 21km from the proposed development. This site has been designated for wintering Greylag Goose (*Anser anser*) though Whooper Swans also use this site. Greylag Geese are very irregular wintering birds in the CMSA to date with only one individual noted (in 2014). In this regard it is concluded that the conservation interest of the SPA will not be affected.

200 Lough Oughter and Associated Loughs SPA (Site Code: 004049) is located approximately 32km from the proposed development and has been designated for species common to the study area including Great Crested Grebe and Whooper Swans. There is the possibility that individual Whooper Swans may move occasionally between these areas given their mobile nature though numbers are likely to be extremely low. No evidence of possible linkage e.g. bird tags was identified during bird surveys. Great Crested Grebe breeding populations at this

European site are suitably removed from the proposed development by a very extensive buffer zone and this species is relatively sedentary minimising collision risks.

201 It is considered that no significant impacts will arise to qualifying interest bird species in SPA sites including the closest i.e. Strabannan Braganstown SPA, Dundalk SPA and Lough Oughter and associated loughs SPA.

6.4.5.1.2.3 Summary Birds Evaluation

202 A summary evaluation of the key bird species determined and key areas are detailed in **Table 6.11**. For sites with flight lines refer to Figure 6.3.2, **Volume 3C Figures** of the EIS.

Table 6.11: A Summary and Evaluation of Key Bird Areas and Species within the CMSA

Key Bird Species to consider	Key Areas and Evaluation	Description of Location / Flighlines
Whooper Swan	Ballintra area, Lough Tonyscallon and Toome or Crinkill Lough. County Importance.	Sites detailed are avoided (located between 600m and 1km from alignment). Ballintra (core feeding area and other fields) are located between 300 and 600m from the alignment). Whooper Swan flightline confirmed as relevant to the development.
Whooper Swan	Loughs Comertagh, Corvally, Greaghlone, Raferagh and Mill Lough. County Importance.	Loughs detailed are avoided (located 120m, 680m and 740m respectively from alignment). No flights observed to date despite extensive multi-year survey which confirmed flights are highly irregular. However changes in numbers indicate occasional movement between these lakes and hence a Whooper Swan flightline is confirmed as relevant to the development.
Great Crested Grebe	Various – Bocks Lough and Lough Morne are closest breeding sites. Local Importance (Higher value).	Loughs detailed are avoided and > 240m from the alignment.
Mute Swan, Cormorant, Great Crested Grebe, Tufted Duck, Whooper Swan	Lough Egish and Lough Morne. County Importance.	Loughs detailed are avoided (Lough Morne = 240m and Lough Egish = 600m from alignment). Mute Swan flightline confirmed as relevant to project. Very irregular Whooper Swan flightline occur at least in some years.
Common collision prone species: Grey Heron, Common duck species	Throughout study area concentrated at rivers and hedgerow crossings. Local Importance (Lower value).	Some features traversed by the alignment may support small populations of these species.

6.4.5.2 Mammals

203 Mammal surveys were undertaken in areas where potentially suitable habitat (hedgerows, scrub and treelines) occurred at proposed tower locations.

204 Based on a review of the National Biodiversity Data Centre (NBDC) and field survey findings, the following protected mammals utilise the CMSA and require consideration regarding potential impacts; Badger (*Meles meles*), Otter *(Lutra lutra),* Irish Hare (*Lepus timidus hiberinicus)* and bat species. Those mammal species of conservation interest previously recorded (NBDC 2013) within the 10km grid squares of the alignment are listed in **Table 6.12**.

Table 6.12: Protected Mammal Occurring in the CMSA and Legal Status

Common Name	Latin Name	Protected Status
Irish Hare	*Lepus timidus subsp. hibernicus*	Habitats Directive Annex V; Wildlife (Amendment) Act 2000
European Otter	*Lutra lutra*	Annex II of EU Habitats Directive Annex IV of Habitats Directive Wildlife (Amendment) Act 2000
Eurasian Badger	*Meles meles*	Wildlife (Amendment) Act 2000
Pine Marten	*Martes martes*	Annex V of Habitats Directive Wildlife (Amendment) Act 2000
Red Squirrel	*Sciurus vulgaris*	Wildlife (Amendment) Act 2000
Myotis Bat species	*Myotis*	Annex IV of Habitats Directive Wildlife (Amendment) Act 2000
Daubenton's Bat	*Myotis daubentonii*	Annex IV of Habitats Directive Wildlife (Amendment) Act 2000
Natterer's Bat	*Myotis nattereri*	Annex IV of Habitats Directive Wildlife (Amendment) Act 2000
Leislers Bat	*Nyctalus leisleri*	Annex IV of Habitats Directive Wildlife (Amendment) Act 2000
Pipistrelle Bat species	*Pipistrellus*	Annex IV of Habitats Directive Wildlife (Amendment) Act 2000
Pipistrelle	*Pipistrellus pipistrellus sensu lato*	Annex IV of Habitats Directive Wildlife (Amendment) Act 2000
Soprano Pipistrelle	*Pipistrellus pygmaeus*	Annex IV of Habitats Directive Wildlife (Amendment) Act 2000
Brown Long Eared Bat	*Plecotus auritus*	Annex IV of Habitats Directive Wildlife (Amendment) Act 2000

(Source: National Biodiversity Data Centre (NBDC) 2013)

205 The findings of surveys for these species listed are summarised below.

6.4.5.2.1 Bats

206 All Irish bat species and their breeding and resting places are afforded protection under the *Wildlife Act 1976* (as amended 2000) and the *Habitats Directive 1992* (Annex IV). Of those species detected during activity surveys, Leisler‘s Bat is the only species considered ‗near threatened‘ in the published *Red List* of terrestrial mammals, the remaining species are considered ‗least concerned‘ (Marnell *et al.* 2009).

207 No potential significant roost sites for bat species; (such as old ruined buildings, bridges, and uninhabited buildings) were recorded within proposed work areas although they are likely to be relatively common in the wider study area. Potential suitable tree roost sites are very scarce in the study area. In addition all known bat roosts (provided by NPWS and Biodiversity Ireland) are avoided.

208 The CMSA contains a large network of hedgerow, with scattered trees and woodland habitats which provide abundant foraging habitat and commuting routes for bat species throughout the area. River corridors, lakes, ponds and wetlands also provide foraging potential.

209 Bat activity surveys confirmed abundant bat foraging activity along mature hedgerows, rivers and linear woodland throughout the alignment. Bat species recorded included foraging and commuting Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*), Leisler (*Nyctalus leisleri*), Brown Long-eared (*Plecotus auritus*), Natterer‘s (*Myotis* nattereri) and Daubenton‘s (Myotis daubentonii).

210 In summary, bats have been recorded foraging amongst suitable habitat (hedgerows, woodlands and river corridors) throughout the study area. No bat roosts have been recorded, and all those potentially nationally important roosts (such as old buildings and bridges) are avoided. Mature trees that could potentially provide roost sites occur along treelines and wooded areas that have been identified within the alignment as shown in habitats maps presented in Figures 6.2.1 - 6.2.19, **Volume 3C Figures** of the EIS.

6.4.5.2.2 Otter

211 No breeding sites or signs of otter were determined during field surveys. Otters are likely to be widespread, though scarce, in the CMSA with distribution focussed around larger lakes such as Lough Egish (located approximately 500m from the alignment) and along some of the more significant watercourses. A national survey undertaken in 2004 / 2005 did not cover any of the 10km squares that occur within the CMSA study area (Bailey and Rochford 2006). During this national survey, the authors found that, in Ireland, otters are mostly associated with watercourses that exceed 2m channel width. Similar findings were reported from a survey in Northern Ireland (Preston 2004). Most watercourses within the CMSA are first or second order

streams and therefore very few exceed 2m in width. In all, nine watercourses have been identified that may provide suitable habitat for otter and all of these are removed (> 20m) from proposed tower locations and works areas. Therefore there is an absence of suitable otter habitat (watercourses and associated semi-natural habitat) in proximity to tower locations throughout the alignment (see Habitat Maps in Figures 6.2.1 - 6.2.19, **Volume 3C Figures** of the EIS).

212 Given the likely time delay between planning and construction of the proposed development, it is proposed to undertake a pre-construction survey amongst suitable habitat within the corridor of the alignment, in order to confirm the conclusions set out in this EIS.

213 Otter are afforded protection in Ireland under the *Wildlife Act (Amendment) 2000* and the EU Habitats Directive (Annex II and Annex IV). Otter are also listed as ‗near threatened' in the published *Red List* of terrestrial mammals (Marnell *et al*. 2009).

214 In summary, although not recorded during the current study, it is likely that otter occur along the main watercourses within the study area. The current study confirmed that there is an absence of suitable otter habitat in proximity to tower locations.

6.4.5.2.3 Badger

215 Field surveys confirmed the presence of badger at a number of locations along the alignment. Badger signs (including hair) were noted along hedgerows and tree lines at Cordoagh (ED Enniskeen), Drumhowan, Tassan, Latnakelly and Lemgare. In all, six setts were identified during field surveys, one of which was an active main sett. All of these sett locations are located no closer than 50m from the nearest tower location. A summary of badger activity recorded during field surveys is presented in **Table 6.13**. The exact locations of badger setts are described but not mapped in order to prevent disturbance of this protected species, or damage to their setts.

216 Data received from the Department of Agriculture, Food and Marine (DAFM) also indicates a relatively high number of breeding sites in the general study area, particularly towards the northern part of the alignment. It has been confirmed that all of these sites are removed from tower locations.

217 Badgers occur throughout most of the Irish countryside being well suited to woodland and farmland mosaics (Hayden and Harrington 2000). The most frequent location of badger setts is within or close to hedgerows and treelines, as these provide cover and safety from disturbance from agricultural and other activities. Setts are also frequently located in areas of deciduous

woodland and scrub and do not typically occur in wet soils (Hayden and Harrington 2000) as are frequent in the low lying areas of the study area.

218 Tower locations have been predominantly located in areas of improved pasture, and their locations have been selected to avoid habitats that are typically associated with badger setts.

Table 6.13: Badger Activity Recorded during Field Surveys within the CMSA

Location	Signs of Badger Activity Recorded
Line oversail between Towers 227 and 228 at Cordoagh (ED Enniskeen)	Single sett entrance recorded along an ash treeline with fresh earthen spoil (active). Black and white hairs confirm the presence of badger at this location. Other evidence of digging (including latrines) was recorded along hedgerows and scrub in the surroundings.
Oversail between Towers 150 and 151 at Drumhowan	Four badger sett entrances were recorded in an area of clear felled broadleaved woodland. Three of the sett entrances appear to be inactive based on recolonising vegetation recorded at sett entrances. One sett entrance was active with fresh earthen spoil. This is likely to be a subsidiary sett.
Oversail between Towers 142 and 143 at Terrygreeghan	Five active badger sett entrances with fresh spoil have been recorded south of a public road. This is likely to be a subsidiary sett.
South (approximately 60m) of Tower 115 at Tassan	Outlier sett with single entrance recorded along an intact hawthorn hedgerow with fresh earthen spoil. Prints were observed at sett entrance. Sett is considered to be active.
Oversail between Tower 113 and 114 at Latnakelly	Main sett with 26 badger entrances recorded at Latnakelly. Eighteen of the sett entrances were found to be active while eight of the entrances were found to be inactive. Large fresh earthen spoil, badger prints and badger hairs were confirmed at sett entrances. Sett is considered to be active.
Oversail between Towers 105 and 106 at Lemgare	Single sett entrance with large heaps of earthen spoil recorded along intact hawthorn hedgerow. An abundance of leaf litter, recolonising vegetation and bramble occurs at this entrance. Considered to be an inactive outlier sett.

219 Given the likely timescale between planning and construction of the project, it is proposed to undertake a pre-construction survey amongst potentially suitable habitat in proximity to tower locations to identify and record any active badger setts, in order to confirm the conclusions reached in this EIS.

220 In summary, badgers have been confirmed as occurring within suitable habitat within the study area. Tower locations have been selected with the aim of avoiding potentially suitable badger habitat by locating them away from hedgerows and other wooded habitat. Badgers and their setts are strictly protected under the *Wildlife (amendment) Act 2000*.

6.4.5.2.4 Other Protected Mammals

221 Other protected mammals noted included Irish Hare (*Lepus timidus hibernicus*). This species was noted on several occasions amongst grassland and field boundary areas along the

alignment. Irish Hare are relatively common in a wide range of habitats including semi-improved grassland, improved grassland, upland habitats and bogs.

222 The Irish Hare is a quarry species (may be hunted under licence) and has limited protection under domestic legislation. It is listed as a species of ‗least concern' in the published *Red List* of terrestrial mammals (Marnell *et al*. 2009). It is also listed under Annex V of the Habitats Directive as a species which may be exploited but not to the extent that it's favourable conservation status is compromised (Hayden and Harrington 2000).

223 No other protected mammal species were noted. Other protected species which may occur include Red Squirrel (*Sciurus vulgaris*). The Red Squirrel occupies a variety of woodland types across much of Ireland. It has now become largely absent in the CMSA as Grey Squirrel are now common. Grey Squirrel tends to displace Red Squirrel in farmland (lowland habitats).

6.4.5.2.5 Other Mammals

224 Other common mammal species present include: Grey Squirrel (*Sciurus carolinensis*), Rabbit (*Oryctolagus cuniculus*), Fox (*Vulpes vulpes*), Irish Stoat (*Mustela erminea*), Wood Mouse (*Apodemus sylvatica*), Pygmy Shrew (*Sorex minutus*), Hedgehog (*Erinaceus europaeus*) and Brown Rat (*Rattus norvegicus*). All of the aforementioned mammals may use the study area for hunting and / or foraging (Hayden and Harrington 2000).

6.4.5.3 Fisheries and Aquatic Species

225 The CMSA is located within parts of the North Western and the Eastern River Basin Districts.

226 The main catchments include the River Dee, River Glyde, River Annalee (Erne Catchment), River Fane and the Clontibret River (for further details, refer to **Chapter 8** of this volume of the EIS). The main watercourses and drainage ditches that occur along the alignment are shown in the Habitat Maps presented in Figures 6.2.1 - 6.2.19, **Volume 3C Figures** of the EIS. There are no major rivers crossed by the alignment (3rd order river or above based on EPA rivers dataset).

227 The watercourses within the CMSA are significant fishery areas holding Salmon and Trout stocks while the majority of the tributaries contain salmonid spawning and nursery habitats. The water quality in watercourses and lakes within the CMSA as reported by the EPA is reviewed in detail in **Chapter 8** of this volume of the EIS. In summary, most rivers along the alignment are suffering from water quality problems, principally eutrophication from suspected agriculture sources and Waste Water Treatment Plants (WWTP). Those rivers that retain good water quality (Q value of 4 - 5) such as the River Glyde and River Dee would be expected to support salmonid populations.

228 Other protected aquatic species which may occur in rivers crossed by the alignment include White Clawed Crayfish (*Austropotamobius pallipes*) (Reynolds *et al.* 2010) and Lamprey species in particular *Lampetra fluviatilis* (NPWS 2013) both of which are listed on Annex II of the EU Habitats Directive.

229 Freshwater Pearl Mussel (*Margaritifera margaritifera*) has been previously recorded (pre-1970 live populations) from the Annalee Catchment, however they have not been confirmed from the catchment in recent years (NPWS Map of Margaritifera Sensitive Areas, 2013). More recent records are confirmed from the Larah Catchment, which is a sub-catchment of the Annalee which is hydrologically disconnected from the alignment (NPWS Map of Margaritifera Sensitive Areas, 2013).

230 The lakes that occur throughout the wider CMSA contain stocks of coarse fish and are extensively used as recreational angling sites. The design of the proposed development has taken account of all known watercourses and waterbodies within the CMSA. All towers are removed from known watercourses and associated riparian habitats.

231 In summary, the rivers and streams that occur within the CMSA are of high importance due to the presence of sensitive aquatic species including salmonids. These species would be sensitive to any deterioration in water quality. While towers are removed from natural watercourses, there would be linkages via field drains that may occur in proximity to tower locations.

6.4.5.4 Other Fauna

232 Frogs were recorded in wet habitat and are likely to be associated with any wetland areas in proximity to the alignment. Smooth Newt is also likely to occur in ponds and other wetland habitats in proximity to the proposed development. These areas are largely avoided.

233 There are a number of important sites for aquatic invertebrates that have been identified in recent years following surveys of suitable wetland habitats (Woodrow Sustainable Solutions 2008; 2009), some of which have been included in **Table 6.8**. These areas are sufficiently removed from the proposed development to avoid any potential impacts.

234 Marsh Fritillary has been recorded from Drumcarn Fen (the part of Drumgallan Bog that occurs in Northern Ireland). This site is also sufficiently removed to avoid any potential impacts (see **Table 6.7**).

235 The avoidance of features such as wetlands, species rich grassland, and to a large degree wooded habitats should ensure that other less common invertebrate species that may be associated with these habitats will not be impacted by the proposed development.

6.4.6 Invasive Alien Species

236 The spread of alien species (both flora and fauna) is recognised as a major threat to biodiversity in Ireland (Stokes *et al.* 2006). The only terrestrial invasive alien plant species recorded was Japanese Knotweed (*Fallopia japonica*). The species was regularly recorded growing in dense stands along the public road network and at the edge of lakes in the wider study area. The species was not recorded during field surveys conducted along the alignment (walkover or visual surveys).

237 Aquatic and riparian habitats crossed by the alignment have the greatest potential to support invasive species and facilitate their dispersal. Works associated with the construction of towers avoid these areas.

6.4.7 Key Ecological Receptors

238 Following a review of the receiving environment (as presented above), it is possible to determine key ecological receptors requiring consideration regarding potential impacts and mitigation. These include specific sites that have been evaluated as being of high local importance or greater (according to site evaluation scheme outlined in NRA 2009b) and other ecological features deemed to be of conservation concern (such as particular habitats types, bird species or mammal species) that could potentially be impacted by the proposed development. Details of the key ecological receptors within the study area are presented in **Table 6.14**.

Table 6.14: Summary Evaluation of Key Ecological Receptors and Locations within the CMSA

Site / Feature	Evaluation	Brief Description of Ecological Receptor	Relevant Location
Designated Conservation Areas			
Lough Egish pNHA	National	No potential for impacts to habitats as site avoided by alignment. The site was very irregularly used by Whooper Swans during the winter bird studies. Mute Swan and Cormorant potentially fly between lakes in this area.	600m east of Towers 161-163
Non-designated Ecological Sites (listed as they occur along alignment from South to North)			
Cordoagh Scrub	Local Importance (Higher Value)	Area of scrub and ash treelines. Confirmed active outlier badger sett (single sett entrance) at this	Line oversails site between Towers 227 and 228. Badger sett occurs

Site / Feature	Evaluation	Brief Description of Ecological Receptor	Relevant Location
		location.	60m north of alignment at this location.
Corglass Stream	Local Importance (Higher Value)	The site comprises a mature ash treeline with occasional Hazel along a stream. Potential habitat for Badger.	Line oversails site between Towers 221 and 222 at boundary between Collops and Corglass (ED Lisagoan) townlands.
Lisagoan Stream	Local Importance (Higher Value)	Mature treeline comprises mixed native tree stands including Ash, Hazel and Willow along a stream. Potential habitat for Badger.	Line oversails site between Towers 213 and 214 at Lisagoan.
Corlea Bog	National	Cutover bog with secondary fen communities.	Line oversails wetland site between Towers 206 and 207.
Cornalaragh Marsh	Unknown (unsurveyed)	Interdrumlin marsh area with tree cover (wet willow-alder ash woodland).	Line oversails wetland site between Towers 201 and 202 at Doagh and Cornalaragh townland boundary.
Comertagh and Raferagh Loughs	County	Whooper Swans recorded regularly at these lakes. Whooper Swans irregularly fly between small lakes in this area.	In proximity to alignment between Towers 197 and 200.
*Ardragh Wetland	Local Importance (Higher Value)	Mosaic of wetland habitats comprising mostly marsh. Considering characteristics of proposed works together with the sensitivity of this site, it is concluded that potential impacts are not foreseen and therefore the site is not considered further in this assessment.	The line oversails this wetland site between Towers 187 and 188 at Sreenty and Ardragh.
Tullyglass Pond	Local Importance (Higher Value)	The site comprises a small eutrophic pond surrounded by wet and improved grassland. The site may be of value to water birds. Considering characteristics of proposed works together with the sensitivity of this site, it is concluded that potential impacts are not foreseen and therefore the site is not considered further in this assessment.	The line oversails this small wetland pond between Towers 172 and 173 at Tullyglass.
*Tullyglass Woodland	Local Importance (Higher Value)	Woodland comprises mixed woodland dominated by Birch (National Survey of Native Woodlands (NSNW Site Code: 860). (Perrin *et al.* 2008). Considering characteristics of proposed works together with the sensitivity of this site, it is concluded that potential impacts are not foreseen and therefore the site is not considered further in this assessment.	Line oversails the site between Towers 171 and 172 at Tullyglass.

Site / Feature	Evaluation	Brief Description of Ecological Receptor	Relevant Location
Tullynahinnera Bog	Unknown (unsurveyed)	Wetland site comprises area of cutover bog and wet grassland (Monaghan Wetland Map, 2010).	The line oversails some minor habitats of the main wetland site between Towers 158 and 159 at Brackly.
Greagh Marsh	Local Importance (Higher Value)	Wetland site comprises marsh and possible transition mire. Potential wetland value.	The line oversails this small wetland pond between Towers 156 and 157 at Greagh.
Drumhowan	Local Importance (Higher Value)	Site comprises clear felled woodland surrounded by mature ash treelines. Badger sett confirmed at this location.	The line oversails the site between Towers 150 and 151 at Drumhawan.
Clogher Marsh	Local Importance (Higher Value)	Wetland site comprises marsh and wet willow-alder-ash woodland.	The line oversails the site between Towers 144 and 146.
Ballintra	County	Whooper Swan foraging sites. Swans were recorded flying across the alignment between this area and both Tonyscallan Lake and Crinkill Lough to the East.	Located 500m west of Tower 143
Terrygreeghan Marsh	Local Importance (Higher Value)	Marsh with abundance of wetland vegetation including Meadowsweet (*Filipendula ulmaria*), Water Horsetail (*Equisetum fluviatile*), Common Reedmace (*Typha latifolia*), Yellow Flag-iris (*Iris Pseudacorus*) and Reed Canary Grass (*Phalarus arundinacea*). To north of marsh is an active Badger sett associated with area of scrub and linear woodland.	The line oversails the site between Towers 142 and 143.
Cornanure Marsh	Local Importance (Higher Value)	Site comprises an area of marsh / fen. Potential presence of Annex I habitats (EU Habitats Directive).	The line oversails the site between Towers 138 and 139 at Cornanure (Monaghan By). Tower 138 occurs approximately 15m to the north of this site.
Caraghramer Marsh	Local Importance (Higher Value)	Site comprises separate areas comprising marsh and broadleaved woodland. Confirmed habitat for Badger. Potential presence of Annex I habitats (EU Habitats Directive).	The line oversails the site between Towers 135 and 136 at Caraghramer and Cornanure (Monaghan By).
*Drumroosk Marsh	Unknown (unsurveyed)	Wetland site likely to comprise comprises marsh / fen. Potential presence of Annex I habitats (EU Habitats Directive). Considering characteristics of proposed works together with the sensitivity of this site, it is concluded that potential impacts are not foreseen and therefore the site is not considered further in this assessment.	The site occurs (approximately 40m) west of the preferred alignment at Tower 134 Drumroosk.
Clarderry Bog	County importance	Extensive area of cutover bog. Western side comprises good	Line oversails the south-eastern boundary of this

Site / Feature	Evaluation	Brief Description of Ecological Receptor	Relevant Location
		quality fen habitat regenerating in cut over bog area (surveyed by Foss and Crushell 2012).	wetland site between Towers 127 and 128 at Clarderry.
*Lough Nahinch (includes Cashel Bog)	National Importance	This large site contains a complex of habitats including three lakes, extensive area of poor fen, regenerating bog, scrub, wet woodland and mixed broadleaf woodland. (surveyed by Foss and Crushell 2008). It has been confirmed that there is no requirement for trimming of vegetation within the site. Considering the characteristics of proposed works together with the sensitivity of this site, it is concluded that potential impacts are not foreseen and therefore the site is not considered further in this assessment.	Line oversails the very southern margin of this wetland site between Towers 117 and 118.
Tassan Grassland	National Importance	Excellent example of neutral to acid grassland with abundant orchids (surveyed by Foss and Crushell 2011).	Line oversails this grassland site between Towers 117 and 118.
Farmland at Latnakelly	Local Importance (Higher Value)	Ash treeline with active main Badger sett.	Line oversails this site. Tower 113 has been sited to avoid the area.
Annaglogh grassland and scrub	Local Importance (Higher Value)	Calcareous and neutral grassland in association with extensive area of scrub to the north.	Tower 111 is located within this site. The line oversails the remaining part of the site from 110 and 111.
*Lemgare Rocks	Local Importance (Higher Value)	Site comprises an area of scrub in association with rock outcrop. Potential habitat for badger. Considering characteristics of proposed works together with the sensitivity of this site, it is concluded that potential impacts are not foreseen and therefore the site is not considered further in this assessment.	Line oversails the site between Towers 107 and 108 at Lemgare.
Habitats			
Hedgerows / Treelines	Cumulatively the network of these habitats is of high value to wildlife by providing ecological corridors (Article 10 Habitats Directive).	Three types of hedgerow / treeline have been identified as occurring along the alignment ranging from low managed hedgerows to continuous mature treelines as described in **Section 6.4.2**.	Mostly avoided by tower locations being sited in low managed hedgerows. Alignment oversails hedgerows and treelines throughout the length of the alignment.
Watercourses	Local Importance (Higher Value)	Watercourses that occur within the study area are mostly small and comprise channels that have been modified in the past with narrow fringing habitats. Important habitat for aquatic species of conservation concern (Salmonids; Lamprey and White-clawed Crayfish). Provide a	Towers are located in areas removed from watercourses. The alignment oversails a number of rivers and streams.

Site / Feature	Evaluation	Brief Description of Ecological Receptor	Relevant Location
		suitable habitat for Otter, a species listed on Annex I of EU Habitats Directive.	
Protected Species			
Whooper Swan	Annex I EU Birds Directive	Whooper Swans are dispersed throughout the wider study area during the winter season. Key wintering sites for Whooper Swans and other wintering birds have been avoided by the proposed development (see **Section 6.4.5** for further details).	Ballintra area; Lough Tonyscallon and Toome (or Crinkill) Lough; Loughs Comertagh, Corvally, Greaghlone, Raferagh, and Mill Lough.
Badger	*Wildlife (amendment) Act 2000*	Breeding sites (setts) usually occur along base of hedgerows / treelines or amongst scrub or woodland habitat.	A number of setts have been recorded amongst hedgerow habitat in proximity to the alignment. Likely to occur amongst suitable habitat. Towers have been positioned away from suitable breeding habitat.
Otter	Annex II of Habitats Directive Annex IV of Habitats Directive	Likely to occur along major watercourses within the wider study area although no records during field surveys.	Areas mapped as FW2 and adjoining semi-natural habitats as shown on Habitat Maps (Figures 6.2.1 - 6.2.19**, Volume 3C Figures** of the EIS).
Bats	*Wildlife (amendment) Act 2000* Annex IV of Habitats Directive	Forage throughout the study area. Likely that mature trees may provide (temporary) roost sites. Such trees are rare and typically associated with linear woodland (WL2) areas identified during surveys.	Various – refer to WL2 habitat highlighted in Habitat Maps.

*Note: The above table lists all ecological sites that occur beneath the alignment regardless of whether impacts are foreseen (together with other sites in surroundings that could be potentially impacted). Those sites where impacts are not foreseen are not considered further in the assessment.

6.5 POTENTIAL IMPACTS

239 The identification and description of impacts presented below takes account of the characteristics of the receiving environment as described throughout **Section 6.4** with particular reference to the Key Ecological Receptors identified in **Section 6.4.7**. Impacts are presented in relation to each phase of the project (construction and operation), refer to **Section 6.7**.

240 The impacts described in this section are those ecological impacts predicted due to the proposed development prior to the consideration of any appropriate mitigation measures, refer to **Section 6.6**. Residual impacts describe potential impacts following implementation of mitigation measures.

6.5.1 Do Nothing Scenario

241 In the case of no development occurring, there would continue to be changes in biodiversity or ecological value as a result of on-going land management within the CMSA. It is most likely that most of the area would continue to be managed intensively for agriculture. Possible changes in management could include further land drainage, scrub clearance and afforestation, the majority of which would have a localised negative impact on ecological value / biodiversity of the area, however, it is not expected that these changes in land use would be influenced by whether the proposed development proceeds or not.

242 The potential ecological impacts of the proposed development are detailed in **Section 6.5.2** (construction phase impacts) and **Section 6.5.3** (operational phase impacts). Residual impacts are described under **Section 6.7** post mitigation being implemented.

6.5.2 Construction Impacts

243 Based on the nature of the proposed development and the baseline ecological data collected on the CMSA, the following activities and ecological features warrant specific attention in the consideration of ecological impact:

- Permanent habitat loss to hedgerows, treelines and grasslands associated with construction activity including woody vegetation clearance, site access, tower foundation excavation, tower construction and line stringing within the defined works area for each tower location;

- Permanent / temporary habitat loss / disturbance associated with stockpiling of material on vegetation outside the works area (if required);

- Temporary habitat loss / disturbance associated with the laying of temporary access track locations and trimming of vegetation to widen existing access gaps in the hedgerows, if necessary;

- Temporary habitat disturbance associated with guarding locations (at road and other OHL crossings) and areas used for machinery required during stringing of conductors.

- Temporary habitat loss / disturbance associated with the operation of the construction material storage yard;

- Temporary noise and physical presence disturbance impacts from machinery and staff at work area locations to fauna (birds and mammals);

- Pollution runoff risks to surface water quality through drains and other watercourses close to the works area, potentially linked to more ecologically important streams, rivers and lakes;

- Pollution runoff risks to ground water quality in the vicinity of works area potentially linked to ground fed wetlands and other surface water features;

- Tree lopping of more mature treelines under the proposed alignment for conductor clearance and or installation of towers;

- Tree and hedgerow trimming under the proposed alignment for conductor clearance;

- Tree lopping and clearance in managed plantation woodland areas crossed by the alignment for construction and ongoing maintenance of the wayleave; and

- Tree lopping of mature deciduous woodland.

244 Potential ecological receptors of impacts include:

- Habitats that occur within the footprint of the proposed development;

- Watercourses surrounding and downstream of the alignment;

- Bird and mammal activity; and

- Identified Key Ecological Receptors (see **Table 6.14**).

6.5.2.1 Direct Impacts (Habitats)

245 Direct impacts upon habitats of highest ecological value have been minimised by constraint identification and avoidance and subsequently careful consideration to tower locations, stringing locations and temporary access routes. While other factors influence the siting of structures, ecological constraints have been addressed to the extent that the layout avoids the most important and sensitive habitats in the wider study area. In addition, due to the nature of the proposed development it is possible to span certain habitats of conservation interest and therefore avoid direct impacts. In the following paragraphs habitat loss and disturbance is assessed in relation to tower locations, along the alignment beneath conductors, and at stringing areas (where machinery used during stringing process will be stationed).

6.5.2.1.1 Habitat Loss and Disturbance – Tower Locations

246 Direct short term habitat loss will occur in those areas where towers are to be constructed. Stockpiling of material has the potential to cause additional short term habitat loss should it be placed in a manner that would smother vegetation.

247 In following the precautionary principle, all towers have been carefully positioned to ensure that there will be no direct impacts on habitats of high ecological value. Only a single tower is located within a site identified as a Key Ecological Receptor in **Section 6.4.5** (Annaglogh grassland and scrub, see **Tables 6.18** and **6.19** for assessment of impacts on this site). Due to the nature of the proposed development, with careful design it has been possible to span or oversail the remaining identified ecological sites. Furthermore, habitats of ecological value outside of these sites have largely been avoided.

248 It can be seen from **Table 6.15** that the vast majority of towers are to be constructed within habitats of low ecological value, with over 90% of all towers located within improved agricultural grassland. In all, direct habitat loss associated and disturbance with the construction of tower footings is estimated at 12.8ha, most of which (11.3ha) is improved agricultural grassland, which is a modified habitat of low ecological importance.

249 There are six towers located on boundary hedgerows and two on treelines causing direct habitat loss of 180m and 60m respectively. All of these sites have been assessed during walkover field surveys as being of low or moderate intrinsic value. This impact is therefore deemed to be an imperceptible localised negative impact.

250 Three towers are proposed to be located on drainage ditches. All three locations were assessed during field work. Two of the three ditches (Towers 216 and 235) at the time of survey had no water present and there was an absence of wetland species. Surface water was present within the third drainage ditch (at Tower 232), suggesting that it functions throughout the year, although an absence of vegetation suggests recent maintenance works. It was concluded that these features are of low intrinsic value but may, following periods of rainfall provide a potential pathway for pollutants to impact on more sensitive receptors downstream. The drainage ditches are likely to be diverted and subsequently culverted during the construction phase of the project.

251 Some additional temporary habitat disturbance will occur in the works area immediately surrounding each structure location (accounted for in **Table 6.15**) due to machinery movements and temporary stockpiling of excavated material. It has been possible to design these works areas so as to avoid sensitive habitats to the surroundings as they can be offset to areas of least ecological sensitivity.

252 Considering the value of the habitats affected it is concluded that habitat loss and disturbance will cause a direct short term minor negative impact. In the case of hedgerows and treelines the impact will be permanent in nature as in most cases it is unlikely to grow back to the same vigour as the surrounding hedgerows and will be continually managed (trimmed) throughout the operational phase.

Table 6.15: Impact of Locating Towers in Each Habitat Type within the CMSA

Habitat	Number of Towers[1]	% of all Towers	Maximum Area / length habitat impacted (worst case)[2]	Assessment of impact
Improved agricultural grassland (GA1)	125	93.3	11.3ha	Imperceptible
Wet grassland (GS4)	6	4.5	0.5ha	Imperceptible
Hedgerows (WL1)	6	4.5	180m	Minor
Scrub (WS1)	5	3.8	0.5ha	Imperceptible
Recolonising bare ground (ED3)	3	2.2	0.3ha	Imperceptible
Drainage ditches (FW4)	3	2.2	90m	Imperceptible
Treelines (WL2)	2	1.5	60m	Minor
Dry calcareous and neutral grassland (GS1)	1	0.8	0.1ha	Imperceptible
Dry meadows and grassy verges (GS2)	1	0.8	0.1ha	Imperceptible

1. A single structure can impact on more than a single habitat. However, for the purposes of this ecological assessment in the case of a tower impacting on more than a single habitat, it is assumed that all habitats are equally impacted therefore the area of calculated habitat loss / disturbance is likely to be overestimated.
2. Assuming an area of $900m^2$ impacted at each structure location and, where relevant 30m of linear habitat impacted.

6.5.2.1.2 Habitat Loss and Disturbance – Under Conductors

253 **The** habitats identified as being potentially impacted are mature hedgerow with trees, mature treelines and mature woodland. The requirement for a minimum 74m corridor (tree removal) within woodland areas is also considered.

Hedgerows and Treelines

254 There will also be a requirement for some trimming (and possibly lopping) of woody vegetation at hedgerows and treelines that occur between towers to provide adequate clearance beneath the OHLs. This measure is only foreseen where hedgerows exceed 6m in height and therefore

will be confined to Type B hedgerows (as defined in **Section 6.4**) and treelines that have been identified as occurring along the alignment. In summary, it is foreseen that 92 hedgerows (Type B) and 56 treelines will be impacted by tree trimming operations (see **Table 6.16**).

255 This is considered a worst case scenario as it is most probable that a proportion of these hedgerows and treelines will not require trimming. The degree of trimming required depends on a number of factors including topography and the potential sag of the conductors at the hedgerow location. Within the study area, most towers are located on somewhat elevated grounds throughout the drumlin landscape and therefore it is probable that adequate clearance will prevail where hedgerows and treelines occur at lower elevations, even when their height exceeds six metres.

256 Following trimming or lopping of individual trees, the structure of the hedgerows and treelines will largely be retained as the base and the shrub layer will not be affected and therefore the value of the habitat as a wildlife corridor will largely be maintained. The impact associated with tree trimming of hedgerows and treelines is deemed to be a permanent moderate negative impact. The impact will be localised in that it will only impact a very short section of each feature affected.

Table 6.16: Number of Linear Woodland Habitat Features Oversailed by the Alignment and Assessment of Impact

Habitat 1 and 2	Number of linear woody habitat features over sailed by alignment[3]	Impact	Assessment of Impact
Hedgerows (WL1) - Type A	390	No impact foreseen.	None
Hedgerows (WL1) - Type B	92	Tree trimming required.	Moderate
Treelines (WL2)	56	Tree trimming / lopping of higher limbs.	Moderate

1. Hedgerows Type A - hedgerows that do not include mature trees and therefore should not require tree lopping or significant trimming as vegetation is typically below the heights where woody vegetation cutting is required.

2. Hedgerows Type B – Overgrown hedgerows that typically include at least 1 mature tree and therefore will likely require tree lopping or bow cutting and / or hedgerow trimming.

3. Estimate is based on interpretation of LiDAR imagery coupled with field observations.

Woodland Areas

257 Long term habitat loss is foreseen in some wooded areas that the alignment oversails. There are a total of seven woodland stands (including both commercial and semi-natural woodland) that occur beneath the alignment as presented in **Table 6.17** (and illustrated in the Habitat Maps presented in Figures 6.2.1 - 6.2.19**, Volume 3C Figures** of the EIS). In those areas

where there is inadequate clearance beneath conductors (6m of clearance is required) it may be necessary to fell a 74m wide corridor (in a worst case scenario). Following a detailed analysis of vegetation at each of the seven locations (taking account of many variables including tower heights, ground topography and elevation, likely sag of conductors etc.), it has been shown that adequate clearance occurs at five of these sites thereby indicating that, at these sites, no felling or lopping of trees will be required.

258 Based on the vegetation analysis undertaken, some vegetation management will be required at the two woodland areas (mature conifer plantation at Lisagoan; and wet willow alder ash woodland at Tullyglass). Assuming that felling will be required at both of these sites to produce a 74m non-wooded corridor, then the area of woodland affected would be 0.4ha of conifer plantation at Lisagoan and 0.2ha of willow-alder-ash woodland at Tullyglass. Considering that both these areas have been evaluated as being of Local Importance (Lower Value), the impact associated with this is deemed to be a probable direct long term minor negative impact and localised in nature.

Table 6.17: Areas of Woodland Crossed by the Proposed Alignment

Location	Woodland Type	Evaluation	Extent of woodland loss[1]	Assessment of impact
Lisagoan (Tower 214-215)	Conifer Plantation (WD4)	Local Importance (Lower Value)	0.4ha	Minor
Cornalaragh (Tower 201-202)	Wet willow alder ash woodland (WN6)	Unknown (unsurveyed)	N/A	None
Corvally (Tower 192-193)	Conifer Plantation (WD4)	Local Importance (Lower Value)	N/A	None
Ummerafree (Tower 181-182)	Wet willow alder ash woodland (WN6)	Local Importance (Lower Value)	N/A	None
Tullyglass (Tower 175-176)	Wet willow alder ash woodland (WN6)	Local Importance (Lower Value)	0.2ha	Minor
Tullyglass (Tower 171-172)	Oak birch holly woodland (WN1)	Local Importance (Higher Value)	N/A	None
Crinkill (Tower 144-145)	Wet willow alder ash woodland (WN6)	Local Importance (Lower Value)	N/A	None

Note: [1]Calculation of habitat loss is based on the requirement to fell a corridor width of 74m.

6.5.2.1.3 Habitat Loss and Disturbance – Temporary Access Routes

259 In selecting appropriate temporary access routes, wet areas and areas comprising semi-natural habitat have largely been avoided.

260 Some clearance of woody vegetation to facilitate site access may be required to widen existing access points. However, in choosing suitable temporary access routes, potential adverse ecological impacts have been largely avoided by using existing farm tracks and gaps in hedgerows wherever possible. Access routes typically follow these existing tracks used by agricultural machinery or across lands that are actively managed for agriculture. All access points were assessed by an ecologist and no significant potential impacts were identified. Given that farm scale type machinery regularly utilise existing hedgerow gaps and farm entrances only minimal vegetation clearance is likely to be required to facilitate construction vehicles and equipment. No temporary access routes cross habitats of high ecological value such as wetlands or semi-natural woodland areas. Any clearance of vegetation required to facilitate access will be reinstated following the completion of construction.

261 Potential localised impacts associated with temporary access routes are determined to be short term imperceptible negative.

6.5.2.1.4 Habitat Loss and Disturbance – Stringing Areas and Guarding Locations

262 Stringing areas have been identified in the vicinity of angle tower locations for locating machinery required for the process of stringing conductor cables. These are all located in habitats of low ecological interest and avoid those sites identified as Key Ecological Receptors (see **Table 6.14** and Habitat Maps presented in Figures 6.2.1 - 6.2.19, **Volume 3C Figures** of the EIS). These areas will be reinstated post works and standard pollution controls (as detailed below) will be implemented.

263 Some minor temporary habitat disturbance may occur at those sites where guard poles are to be temporarily erected during the stringing of conductors. A number of these sites are located within areas identified as key ecological receptors (see **Table 6.14** and Habitat Maps presented in Figures 6.2.1 - 6.2.19**, Volume 3C Figures** of the EIS). These areas will be reinstated post works and standard pollution controls (as detailed below) will be implemented.

6.5.2.1.5 Habitat Loss and Disturbance – Construction Material Storage Yard

264 The principal habitat that occurs (Figure 6.2.19, **Volume 3C Figures** of the EIS) at the proposed construction material storage yard comprises improved agricultural grassland (GA1) being managed for grazing. The grassland is of little ecological interest with low species diversity and of limited value to wildlife. Low managed hedgerows and post and rail fencing

occur around much of the perimeter of the site with semi-natural hedgerow occurring along the southern boundary. No sensitive aquatic ecological receptors occur in proximity to the site. The operation of the site as a storage yard will cause the temporary loss of this grassland habitat throughout the site (estimated at approximately 0.25ha) for the duration of the construction phase. Some minor hedgerow removal will also occur along the southern boundary of the site to provide adequate vehicular access. The site will be reinstated as grassland following the construction phase of the project. The impact is considered a temporary imperceptible negative impact based on the low ecological value of the site.

6.5.2.2 Secondary (Indirect) Impacts to Habitat

6.5.2.2.1 Hydrological Impacts to Wetlands

265 The construction phase may require temporary drainage (3 - 6 days) to facilitate construction. This may cause a secondary (indirect) impact on adjacent habitats by causing drying out of the surface. The possibility of this impacting on wetlands sites in proximity to tower locations has been considered.

266 In all cases, towers are located on elevated lands a sufficient distance from sensitive wetland. The excavations associated with tower foundations are limited to the each tower footing and will not exceed 3.5m depth and are short term in duration. De-watering would not be expected to cause any material change to the water table in the surroundings for any significant period of time. Based on the low permeability soil and rock types present throughout the CMSA, only minimal dewatering is foreseen. Groundwater pumped out will be allowed to percolate back into the ground adjacent to the temporary excavations. It is therefore concluded that no impacts of significance are foreseen.

6.5.2.2.2 Water Quality (Aquatic Receptors)

267 Water quality perturbations associated with construction activity have potential to impact upon ecologically sensitive watercourses downstream of the proposed development.

268 No requirement for in-stream works during the proposed development is foreseen and therefore the risk of impacts on water quality is considered to be relatively low.

269 Potential impacts on freshwater habitats arising from the construction phase include, in the absence of mitigation, deterioration of water quality due to sediment release during the excavation of tower foundations or potential contamination of water from concrete and / or fuels during construction. Such potential impacts in the absence of mitigation could cause direct and indirect impact on aquatic ecology as follows:

- Sedimentation – temporary smothering of gravel beds with consequent loss of fish and spawning habitat.

- Sediment deposition can also provide a base for growth of filamentous algae on gravel beds, leading to a build up of sediment and loss of suitable habitat for crayfish and spawning habitat for lamprey and salmonids.

- Sedimentation impacts in the absence of mitigation include smothering fish eggs and causing mortalities in fish of all ages, reducing abundance of food and impeding movement of fish.

- Sedimentation impacts in the absence of mitigation also include smothering of food prey for juvenile salmonids i.e. macro invertebrates.

- Localised construction phase reduction of surface and groundwater quality in wetlands removed from, but linked to the proposed development.

- Accidental leakage / spillage of oil and fuels from construction vehicles can have indirect impacts on fish, fish food and fish habitats and other aquatic species.

- Accidental leakage / spillage of concrete, chemicals and / or fuels during the construction phase of the proposed development into the surrounding watercourses, could potentially impact on the habitat of sensitive aquatic receptors downstream. The duration of works at each tower location is approximately 2.5 weeks, with the majority of this time due to concrete setting.

- There is no requirement for in-stream works which has significantly reduced both direct and indirect impacts to the aquatic systems and their flora and fauna.

270 The sources of such impacts have been identified at tower locations where works are proposed in proximity to watercourses and surface and ground water dependant habitats. These locations are illustrated on the Habitat Maps presented in Figures 6.2.1 - 6.2.19, **Volume 3C Figures** of the EIS. All tower locations are located away from sensitive natural watercourses and permanent drainage features and therefore the risk of pollution of surrounding watercourses is low. Best practice construction techniques which will be adhered to during the construction phase of the project will also minimise the potential for these impacts to occur.

271 It is concluded that in the absence of mitigation, possible deterioration of the water quality of surrounding surface water during the construction phase could result in temporary, moderate, negative impacts to aquatic receptors.

272 Felling of conifer plantations required to facilitate the proposed development also has the potential to impact the water quality of downstream watercourses due to the possible release of sediments and nutrients. Considering the very limited extent of forestry felling required (total of 0.4ha at a single location at Lisagoan as shown in **Table 6.17**, and an absence of sensitive watercourses in this area, no impacts of significance are foreseen as a result of this activity.

273 Further details on the potential impacts on water quality are addressed in **Chapter 8** of this volume of the EIS.

6.5.2.2.3 Direct and Indirect Impacts on Fauna (Mammals and Birds)

274 Potential exists for direct disturbance of resident birds and mammals due to noise and activity associated with construction works and traffic. Disturbance effects would be expected to be higher during the breeding season than during the non-breeding season. However in most cases mammals and birds within the CMSA are thought to be sufficiently mobile so as to temporarily relocate from works areas, and construction traffic will be relatively light so as not to cause major disturbance. Furthermore, most construction related activity will be undertaken at tower locations. These locations have been selected on the basis that they avoid suitable mammal habitat (hedgerows, treelines and woodlands).

275 Those hedgerows that will be impacted directly by the construction of towers have been confirmed to be of low value to mammal species. It is concluded that the level of disturbance will be relatively low and it is foreseen that disturbance during construction will at most cause a temporary short term minor negative impact.

276 The removal and trimming of hedgerows and other habitats as detailed above may cause the loss of potential foraging and breeding sites for common bird species. Based on the extent of predicted habitat loss, and the phased nature of the works, this impact is deemed to be a probable minor negative impact.

277 Whooper Swan foraging sites identified during the winter bird surveys are sufficiently removed (>150m) from the alignment such that disturbance impacts are unlikely. Also, considering the short duration of construction at each tower location, any disturbance effects at a particular foraging site would be short term and it would be expected that the Whooper Swans would move temporarily to alternative sites in the surrounding areas. It is concluded that this unlikely negative impact would be imperceptible.

278 The potential for disturbance impacts to badgers and their setts has been minimised by the placement of towers (and sections of temporary access routes) away from known setts and potentially suitable habitat (hedgerows and wooded areas). It remains possible however that

disturbance effects could occur at badger setts in proximity to works areas. Badger sett tunnel systems can extend approximately 20m from sett entrances (NRA 2006). Typical site works (using heavy machinery) that occur within 50m of an active Badger sett could cause disturbance impacts if works are undertaken during the breeding season (December to June inclusive) (NRA 2006b).

279 There are no confirmed badger setts entrances within 50m of any works area and therefore this impact is not foreseen. However, it is possible that unidentified badger setts occur in proximity (within 50m) to works areas and therefore this potential impact can be described as a possible temporary moderate negative impact.

280 The potential for disturbance impacts on otter and their breeding sites has been minimised by the placement of towers (and section of temporary access routes) away from potentially suitable habitat (significant watercourses and associated semi-natural habitat). Larger watercourses (over two metres width) that are favoured by otter are rare throughout the study area and no evidence of otter occurring in close proximity to the alignment has been recorded during field surveys. It is concluded that the potential disturbance can be classed as an extremely unlikely temporary moderate negative impact.

281 Bat species may roost in large mature trees that provide suitable crevices and hollows. Surveys have confirmed that such large mature trees are rare throughout the zone of potential impact. Felling or trimming of such trees that function as transient bat roosts will cause displacement or death if not felled using appropriate techniques (‗soft‘ felling). It is concluded therefore that there is potential that temporary tree roosts will be lost during the construction phase. This unlikely temporary impact would be classed as moderate negative.

6.5.2.3 Construction Impacts on Key Ecological Receptors

282 A summary of potential impacts associated with the construction phase is presented in **Table 6.18**. The magnitude of predicted impacts range from temporary imperceptible to permanent moderate in significance.

Table 6.18: Summary of Potential Construction Phase Impacts on Identified Key Ecological Receptors within the CMSA

Site / Feature	Evaluation	Description of Impact Source	Assessment of Potential Impact
Designated Conservation Areas			
Lough Egish pNHA (Towers 161-163)	National	Construction related noise and activity may cause temporary disturbance to foraging Whooper Swans.	Temporary Imperceptible
Non-designated Ecological Sites (listed as they occur along alignment from South to North)			
Cordoagh Scrub (Towers 227-228)	Local Importance (Higher Value)	Construction related noise and activity may cause disturbance to Badgers resident in the area (known sett occurs approximately 60m of tower location) if construction is undertaken in breeding season. Minor temporary habitat disturbance associated with erection of guard poles.	Temporary Minor
Corglass Stream (Towers 221-222)	Local Importance (Higher Value)	Lopping of some higher limbs of mature ash trees is likely to be required. Minor temporary habitat disturbance associated with erection of guard poles.	Imperceptible
Lisagoan Stream (Towers 213-214)	Local Importance (Higher Value)	Lopping of some higher limbs of mature ash trees is likely to be required. Minor temporary habitat disturbance associated with erection of guard poles.	Imperceptible
Corlea Bog (Towers 206-207)	National	Minor temporary habitat disturbance associated with erection of guard poles.	Imperceptible
Cornalaragh Marsh (Towers 201-202)	Unknown (unsurveyed)	Minor temporary habitat disturbance associated with erection of guard poles.	Imperceptible
Comertagh and Raferagh Loughs (Towers 197-200)	County	Construction related noise and activity may cause disturbance to foraging Whooper Swans.	Temporary Imperceptible
Tullynahinnera Bog (Towers 158-159)	Unknown (unsurveyed)	Possible deterioration in water quality due to surface water run-off (sediment / accidental spillages). Drainage ditch and wetland approximately 20m west of Tower 158.	Imperceptible
Greagh Marsh (Towers 156-157)	Local Importance (Higher Value)	Minor temporary habitat disturbance associated with erection of guard poles.	Imperceptible
Drumhawan (Towers 150-151)	Local Importance (Higher Value)	Disturbance on resident Badger population associated with construction activity. Known sett occurs beneath line (100m from tower). Trimming and lopping of mature treelines between tower locations.	Temporary Moderate Long term Imperceptible

Site / Feature	Evaluation	Description of Impact Source	Assessment of Potential Impact
Clogher Marsh (Towers 144-146)	Local Importance (Higher Value)	Trimming and lopping of mature trees between tower locations.	Imperceptible
Ballintra (500m west of Tower 143)	Local Importance (Higher Value)	Construction related noise and activity may cause temporary disturbance to foraging Whooper Swans.	Temporary Imperceptible
Terrygreeghan Marsh (Towers 142-143)	Local Importance (Higher Value)	Disturbance on resident Badger population associated with construction activity. Known sett occurs at treelines beneath line. Minor temporary habitat disturbance associated with erection of guard poles. Trimming and lopping of mature ash between tower locations.	Temporary Moderate Imperceptible
Cornanure Marsh (Towers 138-139)	Local Importance (Higher Value)	Lopping of some higher limbs of mature ash trees is likely to be required along northern boundary of site.	Imperceptible
Caraghramer Marsh (Towers 135 – 136)	Local Importance (Higher Value)	Minor temporary habitat disturbance associated with erection of guard poles.	Imperceptible
Clarderry Bog (Towers 127-128)	County importance	Lopping of some higher limbs of mature ash trees is likely to be required along southern boundary of site.	Imperceptible
Tassan Grassland (Towers 117-118)	National Importance	Lopping of some higher limbs of mature trees will be required along eastern boundary of site. Potential damage to grassland surface if heavy machinery used to access trimming / lopping site.	Imperceptible
Farmland at Latnakelly (Towers 113-114)	Local Importance (Higher Value)	Disturbance on resident Badger population associated with construction activity. Known sett located 70m from tower at hedgerow beneath alignment. Trimming and lopping of mature ash between tower locations.	Temporary Moderate Imperceptible
Annaglogh grassland and scrub (Towers 110-111)	Local Importance (Higher Value)	Short term habitat loss and disturbance affecting approximately 0.1ha of dry calcareous (GS1).	Imperceptible
Habitats			
Hedgerows / Treelines	Cumulatively the network of these habitats is of high value to wildlife by providing ecological corridors (Article 10 Habitats Directive).	Vegetation clearance at construction sites. Trimming and lopping of trees that occur beneath conductors. It is predicted that 180m of hedgerow (six locations) and 60m of treelines (two locations) will need to be removed to facilitate the development. A further 92 hedgerows and 56 treelines will be affected by trimming and lopping of trees.	Permanent Moderate
Watercourses	Local Importance (Higher Value)	Release of sediment during excavation and movement of earthen material. Construction activity (concrete pouring / re-fuelling etc.) at sites in proximity to drainage ditches and natural	Moderate

Site / Feature	Evaluation	Description of Impact Source	Assessment of Potential Impact
		watercourses. Few drainage features occur in proximity to works areas.	
Site / Feature	**Evaluation**	**Description of Impact Source**	**Assessment of Potential Impact**
Protected Species			
Whooper Swans	Annex I EU Birds Directive	Construction related noise and activity may cause temporary disturbance to foraging Whooper Swans.	Temporary Imperceptible
Badger	Wildlife (amendment) Act 2000	Disturbance on resident Badger population associated with construction activity.	Temporary Moderate
Otter	Annex II of Habitats Directive; Annex IV of Habitats Directive	Construction related activity that may give rise to disturbance. Absence of suitable habitat in proximity of works areas means this impact is extremely unlikely to occur.	Temporary Moderate
Bats	Wildlife (amendment) Act 2000; Annex IV of Habitats Directive	Tree felling and vegetation management may impact temporary roost sites. Impact is deemed unlikely due to the rare occurrence of mature trees that could potentially provide roost sites. Loss of foraging habitat in those areas where hedgerows / treelines are to be removed (at eight tower locations, totalling 240m in length).	Temporary Moderate Permanent Imperceptible

6.5.3 Operational Impacts

283 Key identified impacts during the operational phase are discussed throughout this section. The main features of the operational phase of the proposed development that could give rise to ecological impacts include:

- The presence of the line (conductors and earthwires) presents a collision risk to vulnerable bird species;
- Ongoing trimming of tall vegetation where the line crosses hedgerows; and
- Ongoing maintenance of equipment as may be required.

6.5.3.1 Direct Impacts (Habitats)

6.5.3.1.1 Habitat Loss and Disturbance

284 There will be a requirement for ongoing trimming of hedgerow, treeline and woodland vegetation that occur between towers over a cycle of approximately five years. This is to ensure adequate clearance beneath the OHLs is maintained throughout the operational phase

of the project. Such trimming will only be carried out on those individual trees that exceed approximately 6m in height (depending on local topography and ground elevation) at each crossing point and will therefore only be carried out at a selection of sites during each cycle. The value of hedgerows as wildlife corridors for dispersing and feeding birds and mammals, and as commuting corridors for bats, will not be adversely affected. This impact is therefore deemed to be an ongoing (every five years), short term imperceptible impact.

285 There may also be minor disturbance impacts to mammals and birds associated with vegetation management. This impact is deemed to be a temporary imperceptible negative impact.

6.5.3.2 Secondary (Indirect) Impacts to Habitats

6.5.3.2.1 Habitat Alteration

286 The operational phase will lead to potential localised ecological changes around tower locations due to any changes in land management associated with the presence of the tower. In many instances grazing in the area surrounding tower locations may be reduced (controlled) and as a result, scrub may become established in areas that were formerly improved pasture. In this regard there is a potential local increase in semi-natural habitat. This is regarded as an imperceptible impact.

287 Elsewhere, towers that occur within agricultural grassland tend to be targeted by grazing livestock for shelter and scratching. Increased grazing and soil poaching can have local impacts on the grassland habitat. Where a tower is located within a hedgerow gap, such grazing and increased presence of grazing livestock may impair the re-establishment of the hedgerow. This is considered a permanent imperceptible negative impact.

6.5.3.2.2 Water Quality (Aquatic Receptors)

288 There is potential for impacts to water quality in particular where works are proposed close to streams and rivers during operational maintenance. Potential impacts may arise to downstream aquatic receptors. This is predicted as a short term, minor, localised impact.

6.5.3.3 Direct and Indirect Impacts on Fauna (Birds and Mammals)

6.5.3.3.1 Birds

289 Electrocution has been highlighted in literature as a potential issue for large raptors (e.g. Golden Eagles). The design of the proposed transmission line has removed this possible issue as raptor species in the study area (e.g. Buzzard and Kestrel) are too small to reach the distance between phase to phase or conductor to conductor. Therefore the development is not

considered a significant electrocution issue for birds generally. Electrocution is not an identified significant issue for Whooper Swan and Wildfowl.

6.5.3.3.1.1 Whooper Swans

290 The assessment of potential impacts on Whooper Swans was informed by the following:

- An extensive desktop study was conducted to inform this evaluation, refer to Winter Bird Study in **Appendix 6.6, Volume 3C Appendices** of the EIS and refer to reference list in the **Bibliography,** in this volume of the EIS).

- Seven years of winter bird studies conducted to gather evidence on flightlines, numbers, local concentrations and evidence of ringed birds (which can be used to identify bird movements).

- Potential displacement and collision impacts were informed by observed interactions of swans (Mute, Whooper and Bewick) and geese (species) with powerlines and wind turbines, existing published scientific information, EISs for similar type developments and consultation with relevant experts (including Royal Society for Protection of Birds and BirdWatch Ireland).

- Swans are identified as a species group susceptible to collision with powerlines (EirGrid (2012); Becker & Lichtenberg (2005)). There are likely to be increased collision risks to juvenile and less experienced birds in particular during poor visibility (e.g. at night and during misty conditions).

- Geese species including Greylag and Pink footed were subject of a specific transmission line interaction study by the author, refer to MBEC[17] (2006b). The ecology assessment in this chapter of the EIS was informed by surveys conducted of bird collision mortalities along an existing 400 kV line in Scotland. The sites surveyed were locations where geese (species) concentrated, and fly regularly over 400 kV and 220 kV transmission lines. Sites surveyed support internationally important numbers of Greylag and Pink Footed Geese (relatively similar species in terms of potential susceptibility to collision with transmission lines). No signs were ever noted of geese or indeed swans (present in the area) colliding with transmission lines, despite regular flights observed across transmission lines in this study. Species recorded as colliding

[17] The author of this chapter of the EIS was a co-author of the MBEC McKenzie Bradshaw (2006b). *Bird - Power Line Collision Field Study.* Prepared for Scottish and Southern Energy plc.

with transmission lines during these surveys included common species such as Grey Heron and species not present in the MSA e.g. Guillimot (sea bird).

- Whooper Swan (and Mute Swan) interaction with existing transmission lines has been recorded by the author in counties Mayo, Monaghan and at Toome Bridge in Northern Ireland. Whooper Swan have been observed flying over and foraging close by, beside and under transmission lines. These observations and surveys serve as an indication that Whooper Swans may habituate to transmission lines.

- A number of observed sites in Northern Ireland support internationally important numbers of Whooper Swan (e.g. Toome Bridge area – near Lough Neagh SPA). Toome Bridge in particular, supports internationally important numbers of Whooper Swan which regularly forage and flyover a 275 kV transmission line which was constructed between 1963 and 1978 (source Northern Ireland Electricity). While occasional collisions occur, these areas have been recently marked with flight diverters and the area continues to support a thriving population of Whooper Swan (Hall et al, 2012).

- Studies conducted in the Netherlands (Fijn et al., 2012) on wintering swans found low levels of collision mortality within wind farm developments (and associated electricity infrastructure), even in sites with a high degree of transit flights through operational wind farms and relatively high numbers (>500) of birds regularly present. In a review of swan and goose fatalities at wind farms only two Whooper Swans were recorded as fatalities from monitoring undertaken at 46 different wind farms across eight countries (Rees 2012). Wind farms similarly to transmission lines present an identifiable collision risk to birds including Whooper Swan. Available research such as the above indicates that actual collision risk from wind farms is low even where wintering Swans concentrate and regularly fly over.

- During the course of the Whooper Swan study conducted in Meath and Monaghan (2007–2014), signs of Whooper Swan and or Mute Swan collisions with distribution lines were observed at various locations (including two sites near Ballybay and the Cruicetown site in the MSA). This is consistent with general (non-published) observations that low and mid voltage lines close to concentrations of wintering swans are a localised collision hazard.

- The Icelandic Whooper Swan population (population which winters in Ireland) is considered to be at favourable conservation status (source: JNCC) and populations in Ireland increased between 2000 and 2005 by 11% (Crowe et al. 2005) and by 6% between 2005 and 2010 (Boland *et al.* 2010), notwithstanding the already extensive transmission and distribution line infrastructure which they may potentially collide with.

- Observations of Whooper Swan flocks (between 2007 and 2014) by the author in MSA and CMSA, noted good recruitment of juveniles to flocks observed with regular observations of adults with larger broods (3+ fledged juveniles) in recent years indicating that the population is recruiting. Whooper Swans continue to concentrate in areas even where distribution and transmission line infrastructure cross nationally or county important sites.

- A submission received from NPWS as part of a previous application for approval for this proposed project identified and acknowledged that collision impacts on Whooper Swan may arise at a local level, however, it is unlikely that the national population or any SPA population will be impacted, refer to Appendix 6.6.

291 In summary the impact assessment is informed by:

- High conservation importance of the species;

- Likely habituation to the proposed development;

- Occurrence in small scattered flocks (sub populations) at specific locations identified; and

- Scientific and anecdotal observations of Whooper Swan interactions with transmission lines (and other similar developments).

292 It is considered highly unlikely that the proposed development will give rise to substantial or profound impacts to Whooper Swan populations and sub populations in the MSA during the operational phase. The key approach therefore in the assessment is to identify local areas where a moderate or less adverse impact could arise.

Collision Impacts

293 The approach in this evaluation was to identify areas with relatively regular yearly and inter year Whooper Swan flight lines which are bisected by the route of the proposed alignment and also to consider the location of observed flocks relative to the proposed alignment. Typical observed flight heights during surveys were generally at heights at or just above hedgerow / treeline height (under 15m). This height would be at the typical height of the lowest conductors. Based on the scientific literature Whooper Swan flight behaviour is such that they will fly over the highest conductors, and in this regard the greatest risk of collision is associated with collision with the earth (shield) wire (APLIC 2012). This is located above the highest conductors.

294 APLIC, 1994 cites that collisions with transmission lines "*are not a biologically significant source of mortality for thriving bird populations*". The Whooper Swan population in Ireland is increasing based on current data can be considered as being at favourable conservation status.

295 Based on the field survey conducted, potential collision risks are identified as being at specific key areas along the proposed development. These areas include:

- At Ballintra (500m west of Tower 153) a regular flight line was confirmed between this feeding area and two small lakes namely Loughs Tonyscallan and Toome or Crinkill which are located approximately 1.5km and 2km east and south-east of Ballintra respectively. This flight line crosses the alignment.

- Whooper Swans disperse between Loughs Comertagh, Mill and Raferagh (section of alignment between Towers 197 and 200) throughout the winter. They also occasionally use two further lakes close by – Loughs Greaghlone and Corvally (observed in 2013/2014 only). Hence unconfirmed relatively irregular flight lines cross the alignment.

- Loughs Morne and Egish (section of alignment between Towers 161 and 163). Very few Whooper Swans irregularly utilise these lakes though these lakes are bisected by the alignment. It is considered that risks to Whooper Swans are relatively low at this location though occasional flights do occur.

- Figure 6.3.2, **Volume 3C Figures** of the EIS details a summary of all flightlines observed over the course of the baseline studies including those at these locations which are considered relevant for consideration of potential impacts. The key locations where a collision risk has been identified are highlighted below for further consideration. The assessment is based on the methodology described in Section 6.2.6. The assessment of impact significance is detailed below for identified sub-populations of Whooper Swan at relevant locations identified:

- **Ballintra Area (Whooper Swan):**

  Sensitivity = High. Annex 1 listed, Site used in some years (2007 / 2008, 2008 / 2009, 2009 / 2010 and 2013 / 2014). An irregular County important population requires consideration in this area.

  Magnitude Description = Low. Minor shift away from baseline. Visibility and flight activity potentially affected at this location by alignment (in association with irregular topography) which bisects a roost site at Tooncrinkell Lough and the forage area at Ballintra. Whooper Swans will continue to use area and will habituate (fly over) the alignment. Some collisions may occur with conductors/ earth wire in particular during the short term.

Significance = Low.

- **Lough Comertagh (Whooper Swan)**

  Sensitivity = High. Annex 1 listed. Lakes in this area were recorded as being used in all years and on a regular basis with very irregular (unrecorded) flightlines likely. A regular County important population requires consideration in this area.

  Magnitude Description = Low. Flight activity potentially affected at this location by alignment which bisects lake sites used. The sub-population in this area is dispersed and very sedentary with very few and irregular flights minimising collision risk. Whooper Swans will continue to use area and will habituate (fly over) the alignment. Some collisions may occur with conductors/ earth wire in particular during the short term.

  Significance = Low.

- **Loughs Morne and Egish (Whooper Swan)**

  Sensitivity = Medium. Annex 1 listed. Lakes in this area to the west of Lough Morne were recorded as being used in all years and on a regular basis. The Lough Egish and Morne area which is bisected by the alignment is very irregularly used by low numbers and in this regard this sub-population is avoided though occasional flights are likely (refer to Appendix 6.6, Volume 3C of the EIS). An irregular locally important population requires consideration in this area.

  Magnitude Description = Very Low. Visibility and flight activity potentially affected at this location by alignment (in association with irregular topography) which bisects lake sites used. Whooper Swans will continue to use area and will habituate (fly over) the alignment. The main sub-population in this area is dispersed to the west of the alignment. They are very sedentary with very few and irregular flights minimising collision risk (refer to Appendix 6.6, Volume 3C of the EIS). Some collisions may possibly occur with conductors/ earth wire in particular during the short term.

296 Site specific mitigation is required to reduce this identified collision risk as much as possible. Refer to **Section 6.6.2**.

Displacement Impacts

297 The route of the alignment avoids observed foraging and roost sites (refer to Appendix 6.6, Volume 3C of the EIS). Sites where Whooper Swans were observed are located away from the alignment including the most regularly used and most important sites. The closest site regularly used is Raferagh Pond (approximately 130m). Lough Morne is an irregularly used site and is

located approximately 220m from the alignment. Other sites are over 500m from the alignment. It is considered that displacement impacts are very low as no direct habitat loss will occur to roost and lakeside forage habitat observed.

6.5.3.3.1.2 Other Birds

298 A number of bird species are identified in **Table 6.11** which may potentially collide with the OHL. The key species requiring consideration are those with high susceptibility to collision. These include Mute Swan, Cormorant and Great Crested Grebe.

299 Golden Plover and Lapwing flocks are regular during spring and autumn passage periods around Lough Egish. These species will not be measurably impacted by the proposed development, the significance of potential impact is therefore considered imperceptible.

300 Mute Swan are scattered throughout a large number of lake sites in the study area. A key area where there may be a low potential impact is between Lough Egish and Lough Morne which are bisected by the alignment. Non breeding individual numbers can build up on these lakes in some years. A Mute Swan flight line between Lough Egish and Lough Morne has been confirmed. These species will not be measurably impacted (collision / displacement / loss habitat) by the proposed development and therefore the significance of the potential impact is considered imperceptible.

301 Most other lakes, other than those highlighted for Whooper Swans, typically are utilised by low densities of Mute Swan and Great Crested Grebe. Significance of potential impact is considered imperceptible.

302 Occasional trimming of hedgerows beneath lines may cause temporary disturbance to common breeding bird species that utilise the relevant hedgerows. This impact is deemed to be on-going temporary imperceptible negative impact that will recur at intervals of approximately every five years.

6.5.3.3.2 Mammals

6.5.3.3.2.1 Disturbance

303 No significant disturbance impacts are expected to protected mammals including badger, otter or bat species.

304 The level of operational traffic and ongoing maintenance is expected to be sufficiently low so as to avoid any disturbance impacts on birds and mammals that utilise the CMSA.

6.5.3.4 Operational Impacts on Key Ecological Receptors

305 A summary of potential impacts associated with the operational phase is presented in **Table 6.19**. The magnitude of the predicted impacts range from imperceptible to moderate in significance.

Table 6.19: Summary of Potential Operational Phase Impacts on Identified Key Ecological Receptors within the CMSA

Site / Feature	Evaluation	Description Impact Source	Assessment of Potential Impact
Designated Conservation Areas			
Lough Egish pNHA (Towers 161-163)	National	Possible collision during operation	Very Low
Non-designated Ecological Sites (listed as they occur along alignment from South to North)			
Cordoagh Scrub (Towers 227-228)	Local Importance (Higher Value)	Any maintenance works may cause disturbance to Badgers resident in the area (known sett occurs approximately 60m from tower location).	Temporary Minor
Corglass Stream (Towers 221-222)	Local Importance (Higher Value)	Ongoing tree trimming will be required.	Imperceptible
Lisagoan Stream (Towers 213-214)	Local Importance (Higher Value)	Ongoing tree trimming will be required.	Imperceptible
Corlea Bog (Tower 206	National	N/A	None foreseen
Cornalaragh Marsh (Tower 201)	Unknown (unsurveyed)	N/A	None foreseen
Comertagh and Raferagh Loughs (Towers 197-200)	County	Possible collision during operation.	Low negative impact
Tullynahinnera Bog (Towers 158-159)	Unknown (unsurveyed)	Possible deterioration in water quality due to surface water run-off in the event of maintenance of tower (sediment / accidental spillages). Drainage ditch and wetland approximately 20m west of Tower 158.	Imperceptible
Greagh Marsh (Towers 156-157)	Local Importance (Higher Value)	N/A	None predicted
Drumhawan (Towers 150-151)	Local Importance (Higher Value)	Any maintenance works may cause disturbance to badgers resident in the area (known sett occurs approximately 100m from tower location). Ongoing tree trimming will be required.	Temporary Moderate. Long term imperceptible
Clogher Marsh	Local Importance	Ongoing tree trimming will be	Long term imperceptible

Site / Feature	Evaluation	Description Impact Source	Assessment of Potential Impact
(Towers 144-146)	(Higher Value)	required.	
Ballintra (500m west of Tower 142)	County	Possible collision during operation.	Low
Terrygreeghan Marsh (Towers 142-143)	Local Importance (Higher Value)	Maintenance works may cause disturbance to badgers resident in the area (known sett occurs beneath the line in vicinity of mature trees). Ongoing tree trimming will be required.	Temporary moderate Imperceptible
Cornanure Marsh (Towers 138-139)	Local Importance (Higher Value)	Ongoing tree trimming along northern boundary of site.	Imperceptible
Caraghramer Marsh (Towers 135 – 136)	Local Importance (Higher Value)	NA	None foreseen
Clarderry Bog (Towers 127-128)	County importance	Ongoing tree trimming along the southern boundary of site.	Imperceptible
Tassan Grassland (Towers 117-118)	National Importance	Lopping of some higher limbs of mature trees will be required along eastern boundary of site. Damage may be caused to grassland if heavy machinery is used.	Imperceptible
Farmland at Latnakelly (Towers 113-114)	Local Importance (Higher Value)	Maintenance works may cause disturbance to badgers resident in the area (known active main sett occurs approximately 70m from tower location in vicinity of mature trees beneath the line). Ongoing tree trimming will be required.	Temporary moderate Imperceptible
Annaglogh grassland and scrub (Towers 110-111)	Local Importance (Higher Value)	Maintenance works may cause short term cause disturbance to semi-natural grassland in southern part of site.	Imperceptible
Habitats			
Hedgerows / Treelines	Cumulatively the network of these habitats is of high value to wildlife by providing ecological corridors (Article 10 Habitats Directive).	Trimming of trees that occur beneath conductors. It is predicted that such trimming will be required on an ongoing basis at 92 hedgerows and 56 treelines during operation phase.	Imperceptible
Watercourses	Local Importance (Higher Value)	Maintenance works: Release of sediment during excavation and movement of earthen material. Construction activity (concrete pouring / re-fuelling etc.) at sites in	Moderate

Site / Feature	Evaluation	Description Impact Source	Assessment of Potential Impact
		proximity to drainage ditches and natural watercourses.	
Protected Species			
Whooper Swans	Annex I EU Birds Directive	Possible collision during operation.	Low negative impact
Badger	Wildlife (amendment) Act 2000	Disturbance to resident Badger population associated with maintenance works.	Temporary Moderate
Otter	Annex II of Habitats Directive Annex IV of Habitats Directive	Maintenance related activity may give rise to disturbance. Absence of suitable habitat in proximity of works areas means this impact is extremely unlikely to occur.	Temporary Moderate
Bats	Wildlife (amendment) Act 2000; Annex IV of Habitats Directive	NA	None predicted

Note 1: Collision risk assessment for Whooper Swan based on Percival (2003)

6.5.4 Decommissioning

306 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration.

6.6 MITIGATION MEASURES

6.6.1 Mitigation by Avoidance

307 Consideration of various design options has led to the current proposed design that is deemed to have the least ecological impact taking account all other location factors and constraints.

308 The alignment has been selected to avoid all designated areas.

309 Towers, temporary access routes and stringing areas avoid wetland sites that are common throughout the wider study area.

310 Where possible, towers (and indicative work areas), temporary access tracks and stringing areas have been located away from habitats and sites of ecological importance. Furthermore, where possible, access to tower locations will be via existing tracks used by farm machinery on a regular basis. Existing field access points (e.g. gaps / farm gates) to local roads will be used to avoid creating additional hedgerow gaps.

311 The alignment has avoided areas where Whooper Swans concentrate for foraging. Key roost sites are generally at least 500m from the alignment except at Raferagh Lough (regular site) and Lough Morne (irregular site).

312 It also avoids locally important breeding bird habitats such as semi-natural woodlands, wetlands and the vast majority of hedgerow / treelines.

313 The tower locations and temporary access routes will avoid potential breeding sites that protected mammals (such as otter, badger, bats) and birds typically use including: field boundaries (treelines / hedgerows), stream / rivers and associated riparian habitats, wetlands, woodlands, old buildings, caves, bridges and souterrains etc.

314 All towers are located a minimum of 20m away from major rivers and 5m away from other smaller natural watercourses.

315 Suitable breeding sites for amphibians such as drainage ditches will be avoided as far as possible.

316 During the construction phase, as part of the construction management plan, aquatic monitoring will take place by a suitably qualified Ecological Clerk of Works (ECoW) to confirm that pollution control measures are effective. Following detailed design consideration, and as required, temporary silt screens will be installed in drains / small streams, deemed to be possibly at risk of water pollutant discharge.

317 It is intended that excavated material will be used on site for landscaping or for re-instatement measures within managed farmland only. Semi-natural habitats such as wetlands and hedgerows will be avoided. Other wastes will be removed for disposal at an appropriate licensed waste disposal facility (refer to **Chapter 12** of this volume of the EIS).

318 The spread and introduction of invasive species and noxious weeds will be avoided by adopting appropriate mitigation measures as per guidance issued by the NRA (2010). Any invasive plant material noted on site will be removed off site and disposed of at appropriate licensed waste disposal facility. Any invasive species found to occur within 15m of working areas will require a specialist method statement for its eradication to avoid the spread of invasive species, this will

ensure compliance with the European Communities (Birds and Natural Habitats) Regulations 2011 [S.I. No. 477 of 2011]. The presence of non-native species and requirement for actions will be confirmed by the ECoW.

319 For all landscaping or tree planting / must ensure that only native species are utilised. All invasive species should be avoided, as *Communities (Birds and Natural Habitats) Regulations 2011* [S.I. No. 477 of 2011].

6.6.2 Mitigation by Reduction

320 The potential impacts detailed in **Section 6.5** can be reduced through careful mitigation. The key approach for minimising risks such as disturbance to wildlife and protection of water quality is the appointment of an appropriately experienced ECoW on site during construction, to advise on the detailed design approach and ecological mitigation as detailed in the EIS and as will be detailed in the CEMP. (refer to **Appendix 7.1, Volume 3B** of the EIS).

321 The role of the ECoW will include:

- Supervision of construction works and ensure compliance with legislation;
- Monitoring habitats and species during the course of construction works and effectiveness of mitigation;
- Provision of advice regarding the avoidance and minimisation of potential disturbance to wildlife;
- Provide recommendations on appropriate responses / actions to site specific issues (e.g. identification of previously unrecorded breeding sites during construction works); and
- Liaison with NPWS, IFI and other prescribed authorities, when required.

322 In addition to the construction phase, it is recommended that the ECoW will be appointed during the pre-construction (landowner liaison stage) and post construction phases (minimum two years) in particular, to monitor mitigation measures, refer to **Section 6.7.1**.

6.6.2.1 Construction Phase Mitigation

323 A CEMP will be implemented for the construction phase of the project with respect to all mitigation detailed in this EIS. The mitigation measures to be included in the CEMP in relation to flora and fauna will be implemented as part of the construction management.

324 Work method statements will be developed by construction and site contractors, agreed with statutory authorities and ECoW (where appropriate), and implemented by construction crews for all construction activities, these will be detailed in the CEMP.

6.6.2.1.1 Habitats

325 The works area will be clearly marked. Hedgerow, tree and scrub vegetation that are to be retained which are located in close proximity to working areas will be clearly marked and fenced off to avoid accidental damage during excavations and site preparation. No materials will be stored within 5m of hedgerows / trees / scrub. Materials, especially soil burden can prevent air and water circulating to the roots of trees / shrubs.

326 Where towers are to be located on field boundaries comprised of hedgerows, the vegetation will be removed to ground level. Works will be implemented in a manner to minimise soil disturbance and compaction outside of the tower foundations. Post construction, a wooden fence will be installed around the tower base to prevent livestock access and replanting carried out with low growing woody species of local provenance including Blackthorn, Hawthorn and Hazel. This will allow re-establishment of the hedgerow in the gap where the tower is located. It is expected that the hedgerows would be sufficiently robust within five years following construction that fencing could be removed. Where required, disturbed areas of grassland will be appropriately prepared and reseeded with a locally sourced grass mix, similar to that already occurring within the surrounding fields. Reseeding works will be undertaken within three weeks of construction works to avoid flushing of exposed soil downstream.

327 Tree cutting and lopping at linear woodland features under conductors will be undertaken in a manner which minimises the requirement for extensive tree lopping. Large mature trees will be pollarded by qualified foresters / tree surgeons so as to retain as much of the treeline / linear habitat structure and in a manner which retains ground flora species and which does not kill the tree. The trimming regime will involve a scalloping or profiling effect which will minimise the effect on vegetation. Overall, it will not change the structure and ecological function of these linear woodland features, and will not measurably affect associated fauna post construction.

328 There will potentially be a requirement of 74m corridors in woodland identified in **Table 6.17**. Machinery access to these areas will be minimised as much as possible to minimise soil compaction and damage to woodland ground flora. In consultation with landowners areas of dead wood will be retained so as to improve local biodiversity. Low growing scrub (woodland vegetation) habitat will be retained under the conductors.

329 Where construction work is required close to mature trees, the National Joint Utilities Group ‗*Guidelines for the Planning Installation and Maintenance of Utility Services in Proximity to* Trees‘ (NJUG 10) will be followed so as to minimise damage.

330 Tree cutting will be undertaken by a qualified foresters / tree surgeon and aimed at minimising the degree of cutting. The ECoW will provide input where necessary, to minimise the impact on surrounding habitats and / or species e.g. through suggesting the direction of tree fall. As part of this the ECoW will also advise on sensitive areas to avoid in particular at river crossings.

331 As noted, impacts to hedgerows and linear woodland caused by access requirements will be avoided by the selection of access routes via existing farm access points and gaps in hedgerows. Existing gates onto local roads will be used, rather than creating additional hedgerow gaps. Any alteration to temporary access routes will be agreed with the ECoW in advance to ensure avoidance of impacts to ecologically sensitive receptors.

332 Following the completion of construction any temporary material used to allow machinery access will be removed post works to allow for habitat regeneration.

6.6.2.1.2 Water Quality

333 A drainage and sediment control plan will be implemented by contractors during site works. The plan will detail specific mitigation measures (taken from mitigation measures, outlined in this chapter and **Chapter 8** of this volume of the EIS to address site specific issues. This will be implemented as part of the CEMP (.

334 Risks of significant amounts of potential pollutants from construction activities reaching local watercourses are considered minimal due to the strict pollution control measures which will be taken. The CEMP will be prepared at detail design stage which will include measures for works in the vicinity of watercourses based on mitigation measures detailed in **Chapter 8** of this volume of the EIS. This approach has referred to relevant requirements for the *Protection of Fisheries Habitats during Construction and Development Works at River Sites* (Eastern Regional Fisheries Board, 2006).

335 Potential impacts caused by spillages, drip and or spills during the construction phase will be reduced by the maintenance of an adequate supply of spill kits and hydrocarbon adsorbent packs at labelled stations at all working areas, with all vehicles on site carrying spill kits. All personnel will be fully trained in the use of the equipment. Any used spill kits will be disposed of appropriately off site.

336 As part of the CEMP, a spill method statement will be drawn up which all personnel will adhere to.

337 A 24 hour, 7 day per week Emergency Response protocol for leaks / spill of hydrocarbons and / or chemicals will be drawn up and implemented. This must be implementable in the unlikely

event of an accidental spillage of chemicals, hydrocarbons or release of sediment to the surface or ground water system.

338 No infilling or storage of soil cleared for construction works will take place within 5m of drainage ditches and other identified wetlands or other habitats of ecological value as identified by the ECoW. Excavated materials from construction works will be deposited within the works area where there is no significant risk of run-off into local watercourses.

339 During the excavation and removal of soil for construction works, fuel oil interceptors and silt traps or sedimentation ponds will intercept surface water run-off in particular at tower locations close to (within 5m of smaller streams and drainage ditches). As part of their environmental and works requirements, the contractor will establish a maintenance schedule and operational procedure / method statement for silt and pollution control measures during the construction period. This will be monitored for effectiveness by the contractor and ECoW.

340 Oil, petrol and other fuels containers will be double-skinned and bunded to be able to contain 110% volume. Bund specification will conform to the current best practice for oil storage such as Enterprise Ireland's *Best Practice Guide BPGCS005 Oil Storage Guidelines*. All waste oil, empty oil containers and other hazardous wastes will be disposed of in conjunction with the requirements of the *Waste Management Acts 1996 to 2008*, as amended.

341 Pouring of concrete will only take place in designated locations and concrete washings will be treated off site following current best practice guidelines including *Pollution Prevention Guidelines for Northern Ireland and Scotland SEPA PPG 5* (2007). Concrete washings will not be discharged to surface water and poured concrete will be allowed to cure for a minimum of 48 hours in the dry.

342 Raw or uncured waste concrete or similar will be disposed of by removal to approved / licensed disposal site. It is noted that there will be a concrete truck wash out at the batching plant area. This washout will be directed to the three bay water recycler provided at this location.

343 Water courses which have been identified as potentially at risk of pollution from construction activities, will have appropriately designed silt traps (based on drain and potential runoff characteristics) installed in consultation with IFI (where necessary).

344 Refuelling of machinery, will be carried out on level, hard surfaced designated areas where possible, at least 20m from watercourses and drainage ditches. In the event that refuelling is required outside of this area, fuel will be transported in a mobile double skinned tank and a spill tray will be employed during refuelling operations.

345 All machinery will be regularly maintained and checks for leaks. Services will not be undertaken within 50m of aquatic features, including dry drainage ditches. Servicing must be undertaken on level, hard surfaced designated areas where possible.

346 Construction materials such as hydrocarbon, cement and grout will be stored in bunded areas or silos which will be regularly inspected by the site manager. General construction practices will adhere to the requirements for the protection of fisheries habitat during construction and development works at river sites published by IFI (Eastern Regional Fisheries Board 2006).

347 Weather conditions will be taken into account when planning construction activities to minimise risk of extreme run-off from works areas.

6.6.2.1.3 Fauna (Birds and Mammals)

348 Scrub, hedgerow or tree removal / trimming should be undertaken outside of the bird nesting period, which begins on March 1st and continues until August 31st, in order to protect nesting birds. All birds and their nesting places are protected under the *Irish Wildlife Act 1976* (as amended 2000), though there are exceptions for exempted developments.

349 Given the intervening timescale between planning approval and actual site clearance and construction, and once exact felling requirements of the project are known; bat surveys of specific mature trees identified for felling will be undertaken by a bat specialist prior to tree cutting, in order to verify and update the conclusion set out in this EIS. This pre-construction verification survey will aim to re-confirm the number and location of bat roosts that would be impacted by felling (no bat roosts were confirmed as part of field surveys for the proposed development). In order to proceed with the felling of trees that may be identified as bat roosts, it will be necessary to acquire a derogation license from NPWS. NRA, (2006a) guidance in relation to tree felling and hedgerow removal will be followed throughout the site clearance phase of the project. These measures will be outlined in detail in the CEMP that is to be drawn up for the construction phase of the proposed development.

350 Pre-construction surveys will be undertaken at watercourses and adjacent habitats that occur in close proximity to tree felling areas to confirm the conditions which are anticipated to be encountered in this EIS and the presence / absence of otter breeding sites. This is required due to the strict legal protection of otters (and their resting or breeding places) and given the likely timescale between planning consent and construction (likely to be greater than two years). Details of the pre-construction survey methodology and the approach to be taken will be outlined in the CEMP that is to be drawn up for the construction phase of the development with reference to relevant guidance documents (NRA 2006c). No direct impacts are expected to arise as works will require an agreed method statement and be monitored by the ECoW.

351 Pre-construction surveys for badger setts, to confirm the conclusion set out in this EIS, will be conducted at woody vegetation required for cutting. This is required to inform site clearance activities given the legal protection of badger breeding sites and expected extensive timescale between planning consent and construction (likely to be greater than two years). A buffer zone will be established around any known badger setts through the erection of temporary posts and wires with 'no entry' signs erected. No direct impacts are expected to arise as works will require an agreed method statement and be monitored by the ECoW (NRA 2006b).

6.6.2.2 Operational Phase Mitigation

6.6.2.2.1 Water Quality

352 During maintenance works, consideration will be given regarding works to ensure ongoing protection of water quality. Depending on the nature of proposed maintenance works, there will be a requirement for risk assessments of potential impacts to surface waters and appropriate mitigation will be implemented where a risk is identified.

6.6.2.2.2 Fauna (Birds)

353 The key operational impacts identified are associated with the potential collision risk to Whooper Swans at locations identified in **Table 6.19**.

354 Mitigation by avoidance of feeding and roosting sites has been implemented as far as possible in the selection of the alignment. However, given the geographic spread of Whooper Swans in this area and other significant non-ornithological constraints, it will not be possible to avoid crossing regular Whooper Swan flightlines between roost and feeding sites. In this regard there is potential for collisions in particular with the earth wire component of the alignment.

355 Mitigation measures to reduce impacts at specific sites are required in the form of earth wire marking with bird flight diverters. Based on available information and research based studies reviewed, this will reduce potential collision risks associated with the new alignment. Studies where a reduction in swan collisions was observed on transmission lines include Frost (2008) and Slater (2006). Barrientos *et al*. (2011) in a review of 21 line marking studies concluded that line marking reduced bird mortalities by 55-94% where an observed effect was noted pre-line marking. In this regard, precautionary line marking is a best practice approach to minimise the collision risk of the proposed alignment. Swan flight diverters type, effectiveness and configuration are discussed in detail in APPLIC (2012) and this informed the proposed mitigation. As with all line marking mitigation, the success of this will require ongoing monitoring, as specified in **Section 6.7.1**.

356 The type of flight diverters recommended are swan flight diverter markers constructed from high impact grey PVC (UV stabilised) fitted approximately 5m apart along each earth wire. This line marking is proposed for the earth wires to increase visibility of the earth wires to flying birds.

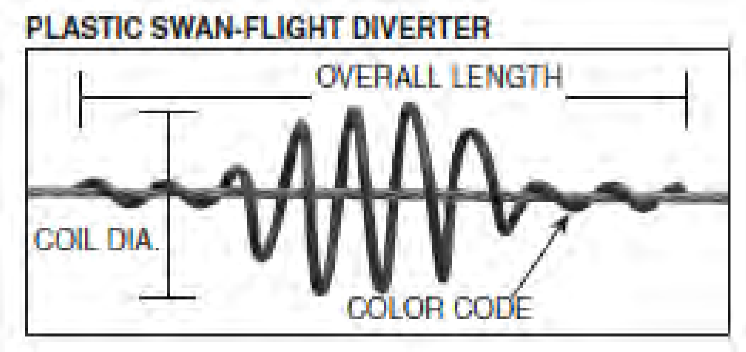


Figure 6.1: Swan Flight Diverter

357 Areas identified as requiring line marking are defined as: ~~“L~~*ocations in which the alignment bisects observed relatively regular flight paths by Whooper Swan between feeding and roosting areas”.*

358 Areas and lengths of alignment proposed for marking with flight diverters are highlighted in Figures 6.3.3 and 6.3.4, **Volume 3C Figures** of the EIS, and described as follows:

- Between Towers 196 and 203 in the vicinity of Comertagh and Raferagh Loughs, it is recommended that 2.5km of the earth wires are marked with swan flight diverters (see Figure 6.3.4, **Volume 3C Figures** of the EIS). Key target bird species identified which may collide with the alignment include Whooper Swans which were recorded using flightlines that cross the alignment at this location during the winter bird surveys (see Figure 6.3.2, **Volume 3C Figures** of the EIS).

- Between Towers 160 and 169 where the alignment passes to the west of Lough Egish it is recommended that 2.95km of the earth wires are marked with swan flight diverters (see Figure 6.3.3, **Volume 3C Figures** of the EIS). Key target bird species identified which may collide with the alignment include Whooper Swan which were recorded using flightlines that cross the alignment at this location during the winter bird surveys (see Figure 6.3.2, **Volume 3C Figures** of the EIS).

- Between Towers 139 and 147 where the alignment passes to the east of Ballintra it is recommended that 2.86km of the earth wires are marked with swan flight diverters (see Figure 6.3.3, **Volume 3C Figures** of the EIS). Key target bird species identified which may collide with the alignment include Whooper Swan which were recorded using flightlines that cross the alignment at this location during the winter bird surveys (see Figure 6.3.2, **Volume 3C Figures** of the EIS).

359 Scrub, hedgerow or tree trimming should be undertaken outside of the bird nesting period, which begins on March 1^{st} and continues until August 31^{st}, in order to protect nesting birds. All birds and their nesting places are protected under the *Irish Wildlife Act 1976* (as amended 2000), though there are exceptions for exempted developments.

6.6.3 Mitigation by Remedy

360 The following remedial mitigation is proposed:

- Hedgerow re-establishment success will be checked two years after construction at tower locations by the ECoW. Where poor or no hedgerow re-growth has occurred, replanting with similar native hedgerow species will be carried out so as to ensure linear habitats are retained / re-established. If new fencing is required or maintenance works are required then this will be implemented in consultation with the landowner.

361 Monitoring will be undertaken to confirm the effectiveness of proposed flight diverter mitigation (see Section 6.7.1 for further information).

6.7 RESIDUAL IMPACTS

362 The post mitigation residual impacts for each Key Ecological Receptors identified as potentially impacted during the construction and operational phases are detailed below in **Tables 6.20** and **6.21** respectively.

363 In summary the residual adverse impacts of the proposed development on ecological receptors identified within the study area range from imperceptible to minor in significance.

Table 6.20: Summary of Residual Impacts (following adoption of mitigation) Relevant to Specific Key Ecological Receptors Associated with the Construction Phase

Site / Feature / Area	Description of Impact Source	Potential Impact	Mitigation	Residual Impact
Designated Conservation Areas				
Lough Egish pNHA (Towers 161-163)	Construction related noise and activity may cause temporary disturbance to foraging Whooper Swans.	Temporary imperceptible	CEMP to outline construction stage monitoring by ECoW so as to confirm impacts as detailed and implement approaches for minimising impacts if relevant.	Imperceptible
Non-designated Ecological Sites (listed as they occur along alignment from South to North)				
Cordoagh Scrub (Towers 227-228)	Construction related noise and activity may cause disturbance to badgers resident in the area (known sett occurs approximately 60m of tower location) if construction undertaken in breeding season. Minor temporary habitat disturbance associated with erection of guard poles.	Temporary minor	Undertake land clearance and construction works outside of badger breeding season.	Imperceptible
Corglass Stream (Towers 221-222)	Lopping of some higher limbs of mature ash trees is likely to be required. Suitable mammal habitat is present. Minor temporary habitat disturbance associated with erection of guard poles.	Imperceptible	CEMP to include measures to minimise works area. Pollard rather than completely lop trees. Pre-construction monitoring by ECoW to inform if timing constraints on works activity regarding protected species breeding sites (see below).	Imperceptible
Lisagoan Stream (Towers 213-214)	Lopping of some higher limbs of mature ash trees is likely to be required. Minor temporary habitat disturbance associated with erection of guard poles.	Imperceptible	CEMP to include measures to minimise works area. Pollard rather than completely lop trees. Pre-construction monitoring by ECoW to inform if timing constraints on works activity regarding protected species breeding sites (see below).	Imperceptible
Corlea Bog (Towers 206	Minor temporary habitat disturbance associated with erection of guard poles.	Imperceptible	CEMP to include measures to minimise works area and limit disturbance.	Imperceptible
Cornalaragh Marsh (Tower	Minor temporary habitat disturbance associated	Imperceptible	CEMP to include measures to minimise	Imperceptible

Site / Feature / Area	Description of Impact Source	Potential Impact	Mitigation	Residual Impact
201	with erection of guard poles.		works area and limit disturbance.	
Comertagh and Raferagh Loughs (Towers 197-200)	Construction related noise and activity may cause disturbance to foraging Whooper Swans.	Temporary imperceptible	CEMP to outline construction stage monitoring by ECoW so as to confirm impacts as detailed and implement approaches for minimising impacts if relevant.	Imperceptible
Tullynahinnera Bog (Tower 158-159)	Possible deterioration in water quality due to surface water run-off (sediment / accidental spillages). Drainage ditch and wetland approximately 20m west of Tower 158.	Imperceptible	CEMP to include measures to control water pollution.	Imperceptible
Greagh Marsh (Towers 156-157)	Minor temporary habitat disturbance associated with erection of guard poles.	Imperceptible	CEMP to include measures to minimise works area and limit disturbance.	Imperceptible
Drumhawan (Towers 150-151)	Disturbance on resident badger population associated with construction activity. Known sett occurs beneath line (100m from tower). Trimming and lopping of mature treelines between tower locations.	Temporary moderate Imperceptible	CEMP to include measures to minimise works area. Pollard rather than completely lop trees. Pre-construction monitoring by ECoW to inform if timing constraints on works activity regarding protected species breeding sites (see below).	Imperceptible
Clogher Marsh (Towers 144-146)	Trimming and lopping of mature trees between tower locations.	Imperceptible	CEMP to include measures to minimise works area. Pollard rather than completely lop trees. Pre-construction monitoring by ECoW to inform if timing constraints on works activity regarding protected species breeding sites (see below).	Imperceptible
Ballintra (500m west of Tower 143)	Construction related noise and activity may cause temporary disturbance to foraging Whooper Swans.	Imperceptible	CEMP to outline construction stage monitoring by ECoW so as to confirm impacts as detailed and implement approaches for minimising impacts if relevant.	Imperceptible

Site / Feature / Area	Description of Impact Source	Potential Impact	Mitigation	Residual Impact
Terrygreeghan Marsh (Towers 142-143)	Disturbance on resident Badger population associated with construction activity. Known sett occurs at treeline beneath line. Trimming and lopping of mature ash between tower locations. Minor temporary disturbance associated with erection of guard poles.	Temporary moderate Imperceptible	CEMP to include measures to minimise works area. Pollard rather than completely lop trees. Pre-construction monitoring by ECoW to inform if timing constraints on works activity regarding protected species breeding sites (see below).	Imperceptible
Cornanure Marsh (Towers 138-139)	Lopping of some higher limbs of mature ash trees is likely to be required along northern boundary of site.	Imperceptible	CEMP to include measures to minimise works area. Pollard rather than completely lop trees. Pre-construction monitoring by ECoW to inform if timing constraints on works activity regarding protected species breeding sites (see below).	Imperceptible
Caraghramer Marsh (Tower 135 – 136)	Minor temporary habitat disturbance associated with erection of guard poles.	Imperceptible	CEMP to include measures to minimise works area and limit disturbance.	Imperceptible
Clarderry Bog (Towers 127-128)	Lopping of some higher limbs of mature ash trees is likely to be required along southern boundary of site.	Imperceptible	CEMP to include measures to minimise works area. Pollard rather than completely lop trees. Pre-construction monitoring by ECoW to inform if timing constraints on works activity regarding protected species breeding sites (see below).	Imperceptible
Tassan Grassland (Towers 117-118)	Lopping of some higher limbs of larger trees will be required in southern part of site. Potential damage to grassland surface if heavy machinery used to access trimming / lopping site.	Imperceptible	Undertake felling from western side of boundary fence thereby avoiding the requirement to traverse to grassland with heavy machinery.	Imperceptible
Farmland at Latnakelly (Towers 113-114)	Disturbance on resident Badger population associated with construction activity. Known sett located 70m from tower at hedgerow beneath alignment. Trimming and lopping of mature ash between	Temporary moderate Imperceptible	CEMP to include measures to minimise works area. Pollard rather than completely lop trees. Pre-construction monitoring by ECoW to inform if timing constraints on works	Imperceptible

Site / Feature / Area	Description of Impact Source	Potential Impact	Mitigation	Residual Impact
	tower locations.		activity regarding protected species breeding sites (see below).	
Annaglogh grassland and scrub (Towers 110-111)	Short term habitat loss and disturbance affecting approximately 0.1ha of dry calcareous (GS1).	Imperceptible	CEMP to include measures to minimise works area and soil compaction. Reinstate grassland using appropriate seed mix of local provenance.	Imperceptible
Habitats				
Hedgerows / Treelines	Vegetation clearance at construction sites. Trimming and lopping of trees that occur beneath conductors. It is predicted that 180m of hedgerow (6 locations) and 60m of treelines (two locations) will need to be removed to facilitate the development. A further 92 hedgerows and 56 treelines will be affected by trimming and lopping of trees.	Moderate	CEMP to include measures to minimise works area and soil compaction. Fence area post works so gap with tower is not accessible to livestock. Replant with low growing native woody species similar to surrounding species. Monitor success re-growth and additional replanting as required. In the case of hedgerows / treelines that are oversailed, the CEMP will include measures to minimise works area. Pollard rather than completely lop trees. Pre-construction monitoring by ECoW to inform if timing constraints on works activity regarding protected species breeding sites (see below).	Minor
Watercourses	Release of sediment during excavation and movement of earthen material. Construction activity (concrete pouring / refueling etc.) at sites in proximity to drainage ditches and natural watercourses. Few drainage features occur in proximity to works areas.	Moderate	CEMP to include measures to control water pollution.	Imperceptible

Site / Feature / Area	Description of Impact Source	Potential Impact	Mitigation	Residual Impact
Protected Species				
Whooper Swans	Construction related noise and activity may cause temporary disturbance to foraging Whooper Swans.	Temporary imperceptible	CEMP to outline construction stage monitoring by ECoW so as to confirm impacts as detailed and implement approaches for minimising impacts if relevant.	Imperceptible
Badger	Disturbance on resident badger population associated with construction activity.	Temporary moderate	Known badger setts avoided by design of project. Pre-construction surveys to confirm the conditions which have been anticipated to be encountered in the EIS will be undertaken by ECoW to confirm findings of current assessment and advise on appropriate mitigation for inclusion in the CEMP.	Imperceptible
Otter	Construction related activity that may give rise to disturbance. Absence of suitable habitat in proximity of works areas means this impact is extremely unlikely to occur.	Temporary moderate	Tower locations avoid potentially suitable habitat. Pre-construction surveys to confirm the conditions which have been anticipated to be encountered in the EIS will be undertaken by ECoW to confirm findings of current assessment and advise on appropriate mitigation for inclusion in the CEMP.	Imperceptible
Bats	Tree felling and vegetation management may impact temporary roost sites. Impact is deemed unlikely due to the rare occurrence of mature trees that could potentially provide roost sites. Loss of foraging habitat in those areas where hedgerows / treelines are to be removed (at eight tower locations, totalling 240m in length).	Temporary moderate Permanent imperceptible	Pre-construction surveys to confirm the conditions which have been anticipated to be encountered in the EIS will be undertaken by ECoW to confirm findings of current assessment and advise on appropriate mitigation for inclusion in the CEMP following guidance as outlined in NRA (2005).	Imperceptible

Table 6.21: Summary of Residual Impacts (following adoption of mitigation) relevant to Specific Key Ecological Receptors associated with the Operational Phase

Site / Feature / Area	Description of Impact Source	Potential Impact	Mitigation	Residual Impact
Designated Conservation Areas				
Lough Egish pNHA (Towers 161-163)	Collision with earth and conductor wires.	Very Low	Earth wire marked with flight diverters.	Imperceptible
Non-designated Ecological Sites (listed as they occur along alignment from South to North)				
Cordoagh Scrub (Towers 227-228)	Any maintenance works may cause disturbance to badgers resident in the area (known sett occurs approximately 60m from tower location).	Temporary minor	Should maintenance works be required then mitigation applied during construction phase will be implemented.	Imperceptible
Corglass Stream (Towers 221-222)	Ongoing tree trimming will be required.	Imperceptible	Works should be undertaken outside of bird breeding season.	Imperceptible
Lisagoan Stream (Towers 213-214)	Ongoing tree trimming will be required.	Imperceptible	Works should be undertaken outside of bird breeding season.	Imperceptible
Comertagh and Raferagh Loughs (Towers 197-200)	Collision with earth and conductor wires.	Low	Earth wire marked with flight diverters.	Imperceptible
Tullynahinnera Bog (Towers 158-159)	Possible deterioration in water quality due to surface water run-off in the event of maintenance of tower (sediment / accidental spillages). Drainage ditch and wetland approximately 20m west of structure 158.	Imperceptible	In the event of maintenance works measures to control water pollution in line with those applied during construction phase will be implemented.	Imperceptible
Drumhawan (Towers 150-151)	Any maintenance works may cause disturbance to Badgers resident in the area (known sett occurs approximately 100m from tower location). On-going tree trimming will be required.	Temporary moderate Long term imperceptible	Should maintenance works be required then mitigation applied during construction phase will be implemented. Tree trimming should be undertaken outside of bird breeding season.	Imperceptible
Clogher Marsh (Towers 144-146)	Ongoing tree trimming will be required.	Long term imperceptible	Tree trimming should be undertaken outside of bird breeding season.	Imperceptible
Ballintra (500m west of Tower 143)	Collision with earth and conductor wires.	Low	Earth wire marked with flight diverters.	Imperceptible

Site / Feature / Area	Description of Impact Source	Potential Impact	Mitigation	Residual Impact
Terrygreeghan Marsh (Towers 142-143)	Maintenance works may cause disturbance to badgers resident in the area (known sett occurs beneath line in vicinity of mature trees). On-going tree trimming will be required.	Temporary moderate Imperceptible	Should maintenance works be required then mitigation applied during construction phase will be implemented. Tree trimming should be undertaken outside of bird breeding season.	Imperceptible
Cornanure Marsh (Towers 138-139)	Ongoing tree trimming along northern boundary of site.	Imperceptible	Tree trimming should be undertaken outside of bird breeding season.	Imperceptible
Clarderry Bog (Towers 127-128)	Ongoing tree trimming along southern boundary of site.	Imperceptible	Tree trimming should be undertaken outside of bird breeding season.	Imperceptible
Tassan Grassland (Towers 117-118)	Lopping of some higher limbs of mature trees will be required along eastern boundary of site. Damage may be caused to grassland if heavy machinery is used.	Imperceptible	Undertake felling from western side of boundary fence thereby avoiding the requirement to traverse to grassland with heavy machinery.	Imperceptible
Farmland at Latnakelly (Towers 113-114)	Maintenance works may cause disturbance to badgers resident in the area (known active main sett occurs approximately 70m from tower location in vicinity of mature trees beneath line). Ongoing tree trimming will be required.	Temporary moderate Imperceptible	Should maintenance works be required then mitigation applied during construction phase will be implemented. Tree trimming should be undertaken outside of bird breeding season.	Imperceptible
Annaglogh grassland and scrub (Towers 110-111)	Maintenance works may short term cause disturbance to semi-natural grassland in southern part of site.	Imperceptible	Should maintenance works be required then mitigation applied during construction phase will be implemented.	Imperceptible
Habitats				
Hedgerows / Treelines	Trimming of trees that occur beneath conductors. It is predicted that such trimming will be required on an ongoing basis at 92 hedgerows and 56 treelines during operation phase.	Imperceptible	Should maintenance works be required then mitigation applied during construction phase will be implemented. Tree trimming should be undertaken outside of bird breeding season.	Imperceptible

Site / Feature / Area	Description of Impact Source	Potential Impact	Mitigation	Residual Impact
Watercourses	Maintenance works: Release of sediment during excavation and movement of earthen material. Construction activity (concrete pouring / refueling etc.) at sites in proximity to drainage ditches and natural watercourses.	Moderate	In the event of maintenance works measures to control water pollution in line with those applied during construction phase will be implemented.	Imperceptible

Site / Feature / Area	Description of Impact Source	Potential Impact	Mitigation	Residual Impact
Protected Species				
Whooper Swans	Collision with earth and conductor wires.	Low	Earth wire marked with flight diverters.	Imperceptible
Badger	Disturbance to resident Badger population associated with maintenance works.	Temporary moderate	Should maintenance works be required then mitigation applied during construction phase will be implemented.	Imperceptible
Otter	Maintenance related activity may give rise to disturbance. Absence of suitable habitat in proximity of works areas means this impact is extremely unlikely to occur.	Temporary moderate	Should maintenance works be required then mitigation applied during construction phase will be implemented.	Imperceptible
Bats	N/A	None foreseen	N/A	None foreseen

6.7.1 MONITORING

364 The effectiveness of the mitigation measures will require monitoring, specifically regarding Whooper Swan bird flight diverters. This monitoring will be conducted by an appropriately qualified and experienced ornithologist in consultation with NPWS.

365 A clearly defined monitoring programme will be implemented for Whooper Swans to assess the effectiveness of line marking. All locations where flightlines were identified will be surveyed during the pre-construction stage, construction and operation stages (up to 5 years). Surveys will be conducted at all sites identified, monthly between October and April when Whooper Swans are present in the area. Throughout the lifetime of the proposed monitoring works, additional areas where flightlines or collisions are recorded will be added to the list of areas to be surveyed. Landowners with towers on their land will be engaged with and encouraged to get in touch with the bird surveyor regarding observed Whooper Swan or other bird species

collisions. The results of winter monitoring studies and engagement with landowners will inform further actions to minimise risks as highly transient species (in terms of distribution and flightlines) like Whooper Swans require ongoing consideration after the planning stage. Yearly monitoring reports for the construction and operational phases will detail required actions and will be drafted in consultation with NPWS or other relevant experts as appropriate.

366 Hedgerow reestablishment at all tower locations will be monitored to ensure robust hedgerow re-establishment. Further replanting of hedgerow species and fencing will be implemented in agreement with landowners as may be required.

6.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS

367 Interrelationships have been identified between impacts on flora and fauna and impacts on human beings and land use (see **Chapter 3** of this volume of the EIS). The approach of locating towers in areas of low ecological interest (mostly managed grassland) has had the effect of minimising the impacts on ecology while at the same time potentially increasing the impact on agricultural production. Some towers located, in particular, on arable farmland will lead to small permanent areas under towers where intensive agriculture will not take place. There is a potential for interactions between EMF (see **Chapter 5** of this volume of the EIS**)** and fauna species. However, the operating conditions for the proposed development will ensure that EMF will remain below the restriction levels specified in EMF guidelines for Ireland and the EU. A review of scientific research on topics relating EMF to health of animal species did not show that EMF at these levels would have adverse effects on these populations.

368 Interrelationships have been identified between flora and fauna and soils, geology and hydrogeology (see **Chapter 7** of this volume of the EIS) and between flora and fauna and water (see **Chapter 8** of this volume of the EIS). This chapter should be read in conjunction with both these chapters for a full understanding of the main interrelationships between these environmental topics.

369 The transport of soil or vegetative material during construction works could potentially facilitate the spread of invasive alien species such as Japanese Knotweed (*Fallopia japonica*). Appropriate controls will be in place to ensure that the proposed works do not result in the spread of invasive alien species. The mobilisation and transport of soil via surface water runoff could potentially impact ecologically sensitive receptors that occur within watercourses downstream of the proposed development. Soil water runoff controls during construction are also a key consideration relevant to downstream aquatic species and habitats and suitable mitigation controls are detailed. Construction works will not be undertaken within wetland sites and no significant impacts on the eco-hydrology of wetlands are foreseen.

370 The conclusions of the water chapter (see **Chapter 8** of this volume of the EIS) are that based on a review of the construction methodology, flora and fauna and soils, geology and hydrogeology chapters; there are no significant cumulative (interrelated) impacts as a result of the proposed development. Any impacts on surface or ground water quality could impact on water dependant habitats and species that occur within the CMSA. In this regard appropriate mitigation is detailed to protect water quality which is adequate for protecting such water dependant ecological receptors.

371 There are also interrelationships between ecological impacts and landscape (see **Chapter 11** of this volume of the EIS) in the case where the removal or trimming of wooded features (including woodlands, hedgerows and treelines) may have adverse effects on both flora and fauna and landscape. As mentioned throughout this chapter, the impacts on such wooded features has been minimised by, where possible, locating towers away from hedgerows and other wooded areas. The use of bird flight diverters may also increase the visual impact of the alignment at specific location.

6.9 CONCLUSION

372 This chapter presents an evaluation of the potential ecological impacts (direct, indirect and cumulative) of the proposed development on the flora and fauna of the CMSA and details appropriate mitigation where an impact is predicted.

373 The project design has sought to minimise impacts on flora and fauna as far as possible insofar as not locating towers in semi-natural habitats of ecological value (including hedgerows) and away from rivers / streams (and associated riparian habitats). This is a key approach and best practise for avoiding and minimising impacts to ecological receptors. The context of the study area a highly managed landscape dominated by habitats of low ecological value is a key fact which has informed the overall evaluation. The key ecological features considered are rivers, boundary hedgerows / treelines and Whooper Swans. The EIS has carried out extensive studies to inform the assessment of impacts and appropriate mitigation has been identified.

374 The development and implementation of a CEMP, which will include monitoring of construction by an ECoW, is a key instrument in ensuring the implementation of all mitigation measures during construction. Operational phase monitoring is a key recommendation regarding the success of mitigation of impacts on Whooper Swans.

375 It is concluded that the impacts of the construction and operation of the proposed development on the flora and fauna of the study area are likely to range from imperceptible to minor, provided construction, reinstatement and management follow best practice procedures and the proposed mitigation measures are adopted.

7 SOILS, GEOLOGY AND HYDROGEOLOGY

7.1 INTRODUCTION

1 This chapter evaluates the impacts on soils, geology and hydrogeology arising from the proposed development as set out in Chapter 6**, Volume 3B** of the Environmental Impact Statement (EIS). The information contained within this chapter is concerned with the description of the geological and hydrogeological character of the Cavan Monaghan Study Area (CMSA).

2 The soils, geology and hydrogeology evaluation of the CMSA considers an area in excess of 500m either side of the proposed route alignment. The geological material existing along the alignment has been generated by the deposition of detritus over millions of years. The geological material underlying the study area, both the glacial mineral subsoil and the bedrock are concealed below ground. The nature, extent and complexity of the geological material are detailed, from the surface downwards through the mineral subsoil to the bedrock.

3 The potential impacts on the ground conditions and on the existing soil, geology and groundwater conditions are considered for both the construction, operational and decommissioning phases of the proposed development. Mitigation measures that will form part of the proposed development are described and any residual environmental impacts identified and their significance evaluated.

4 Chapter 6**, Volume 3B** of the EIS describes the full nature and extent of the proposed development including elements of the overhead line (OHL) design and the towers. It provides a factual description, on a section by section basis, of the entire line route. The principal construction works proposed as part of the development are set out in Chapter 7**, Volume 3B** of the EIS and are included in the outline Construction Environmental Management Plan (CEMP) (refer to Appendix 7.1, **Volume 3B Appendices** of this EIS).

7.2 METHODOLOGY

5 This chapter has been prepared using the recommendations set out in the Environmental Protection Agency's (EPA) *Guidelines on the Information to be contained in Environmental Impact Statements* (March 2002). The guidelines and recommendations of the Institute of Geologists of Ireland (IGI) publication *Geology in Environmental Impact Statements – A Guide* (IGI 2002) and *Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements* (IGI 2013) were also taken into account in the preparation of this chapter.

6 The information contained in this chapter has been divided into sub-sections, so as to describe the various aspects pertaining to soil, geology and hydrogeology. In the preparation of this chapter, relevant information was collated and evaluated. The information sources are detailed further in this chapter.

7 The principal objectives of this chapter are to identify:

- Geological and groundwater factors which might affect the technical viability of the proposed development;
- Impacts that the proposed development may have on soils, geology and groundwater, geological heritage and on contaminated land along the proposed route and in the adjacent area, including worst case scenario;
- Constraints that these features may place on the proposed development;
- Mitigation measures which may be required to minimise any adverse impacts related to the proposed development; and
- Evaluation of significance of any residual impacts.

8 The information included in this chapter is considered to meet the data requirements suggested in the EPA's *Guidelines on the Information to be contained in Environmental Impact Statements* (March 2002).

9 The following is a list of published geological references and data used in this chapter:

- An Foras Talúntais (1980). General *Soil Map of Ireland*;
- EPA and (GSI) (2009). *Historic Mine Sites - Inventory and Risk Classification;*
- GSI (1997), *1:100,000 scale Sheet 8 – Bedrock Geological Map of the Carboniferous of Monaghan–Carlingford*;
- GSI(2001), *1:100,000 scale Sheet No. 13–Bedrock Geological Map of County Meath*;
- Historical Geological 6 inch: 1 mile maps;
- Historical OSi 6" and 25" maps;
- Meehan, R.T., Warren, W.P. and Gallagher, C.J.D. (1997). *The sedimentology of a late Pleistocene drumlin near Kingscourt, Ireland*;

- Meehan, R.T. (1999). *Directions of ice flow during the last glaciation in counties Meath, Westmeath and Cavan, Ireland.* GSI, Dublin;

- Morris, J. (1984). *The Metallic Mineral Deposits of the Lower Palaeozoic Longford-Down Inlier, in the Republic of Ireland.* GSI, Dublin;

- Morris, J.H., Steed, G.M. and Wilbur, D.G., (1986). *The Lisglassan-Tullybuck Deposit, County Monaghan*. GSI, Dublin;

- OSi 1:50,000 scale maps, Sheets 28B, 35, 42 and 43; and

- Rudland, D.J., Lancefield, R.M. and Mayell, P.N. (2011). *Contaminated Land Risk Assessment, A Guide to Good Practice.* CIRIA C552 London.

10 Numerous online datasets were referenced in relation to the soil, subsoil and geology in the CMSA including data from the GSI, Department of Communications, Energy and Natural Resources (DCENR) and the EPA. Consultation was undertaken with statutory and non-statutory organisations, which include details on consultation with the GSI (refer to Chapter 3**, Volume 3B** of the EIS for details on scoping and statutory consultation).

11 The scoping opinion received from An Bord Pleanála (the Board) (refer to Appendix 1.3**, Volume 3B Appendices** of the EIS) identified the following issues as being relevant to this chapter of the EIS:

- An assessment of potential soil erosion, particularly where it affects priority habitats, designated conservation areas, and in the vicinity of surface water bodies; and

- Submission of a construction method statement, identifying areas of particular sensitivity which require specific construction mitigation measures, including areas of peat.

12 Site visits of the CMSA were conducted in February 2009, July 2009, April 2011 and June 2013 to September 2013. Site walkover and site investigation surveys were conducted where access was granted by the landowner. Fieldwork focused on verifying the accuracy of national datasets. Site specific details were recorded and included logging of subsoil types, vegetation indicators, springs, drainage details and general trafficability of soils. Where access was granted to proposed tower locations, subsoil deposits and selected exposures / sections were logged according to the British Standard Institute *Code of Practice for Site Investigations* (BS 5930:1999).

13 Whilst all projects and developments that require an Environmental Impact Assessment (EIA) are of a scale or nature that they have the potential to have an impact on the environment, with respect to the construction of a transmission line, and the use of temporary access routes and stringing areas, the impact on the soils, geology and hydrogeological environment is considered low in comparison to other linear projects such as road or pipeline developments.

14 In this chapter, the potential impact on the geological environment resulting from the proposed development is evaluated and mitigation measures are proposed to reduce any significant impacts. Based on the mitigation measures proposed, the significance of the predicted impact on the geological environment is determined.

15 Criteria for evaluating impact levels are shown in **Table 7.1**. Terminology for impact significance and duration follows that set out in the EPA's *Guidelines on the Information to be contained in Environmental Impact Statements* (March 2002). The magnitude of any effects considers the likely scale of the predicted change to the baseline conditions resulting from the predicted effect and takes into account the duration of the effect, i.e. temporary or permanent. Definitions of the magnitude of any effects are also provided in **Table 7.1**.

Table 7.1: Impact Magnitude Definitions

Magnitude	Criteria
Very High	An impact, which obliterates sensitive characteristics of the soil or geology environment.
High	Fundamental change to ground conditions, groundwater quality or flow regime.
Moderate	Measureable change to ground conditions, groundwater quality or flow regime.
Low	Minor change to ground conditions, groundwater quality or flow regime.
Negligible	No measureable impacts on ground conditions, groundwater quality or flow.

(Source: EPA's *Guidelines on the Information to be contained in Environmental Impact Statements* (March 2002))

16 Impact ratings may have negative, neutral or positive application where:

- Positive impact – A change which improves the quality of the environment;
- Neutral impact – A change which does not affect the quality of the environment; and
- Negative impact – A change which reduces the quality of the environment.

17 Terms relating to the duration of impacts are as described in the EPA's *Guidelines on the Information to be contained in Environmental Impact Statements* (March 2002) as:

- Temporary Impact - lasting one year or less;
- Short term Impact - lasting one to seven years;
- Medium term Impact - lasting seven to fifteen years;
- Long term Impact - lasting fifteen to sixty years; and
- Permanent Impact - lasting over sixty years.

18 A qualitative approach was used in this evaluation, generally following the significance classification in **Table 7.2** and through professional judgement. The significance of a predicted impact is based on a combination of the sensitivity or importance of the attribute and the predicted magnitude of any effect. Effects are identified as beneficial, adverse or negligible, temporary or permanent and their significance as major, moderate, minor or not significant (negligible).

Table 7.2: Assessment Criteria

Sensitivity	Magnitude				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

19 In order for a potential impact to be realised, three factors must be present. There must be a source or a potential effect, a receptor which can be adversely affected and, a pathway or connection which allows the source to impact the receptor. Only when all three factors are present can an effect be realised.

7.2.1 Legislative and Policy Context

20 An evaluation of the proposed development was carried out in relation to relevant European and National legislation and other statutory policies and guidance. The following legislation was considered as part of this consolidated impact evaluation:

- *Consolidated EIA Directive 2011/92/EU;*
- *European Communities (Water Policy) Regulations 2003* [S.I. No. 722 of 2003];

- *Waste Management Acts 1996-2014*;
- *European Communities Environmental Objectives (Groundwater) Regulations 2010* [S.I. No. 9 of [2010]; and
- *European Communities (Environmental Impact Assessment) (Amendment) Regulations, 2001 [S.I. No. 538/2001].*

7.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

21 The main potential impacts on the soils, geology and hydrogeology in the CMSA occur during the construction phase. Details of the potential impacts are included in **Section 7.5**. Overall, the construction programme is anticipated to last approximately three years. The proposed development entails the construction of towers as individual sites separated by approximately 340m. In general the phases of construction can be broken down into the following: site preparation works (including laying of temporary access tracks, removal of fences and erection of temporary fencing where required), establishment and operation of materials storage yard, installation of tower foundations, erection of tower, guard poles, tree lopping, stringing of conductors, commissioning of the line and reinstatement of land.

7.4 EXISTING ENVIRONMENT

7.4.1 Topography and Geomorphology

22 Refer to Figures 7.1 – 7.4, **Volume 3C Figures** of the EIS. The topography of the alignment varies approximately from:

- 150m and 180m Above Ordnance Datum (AOD) in the northern section (Towers 103-153);
- 180m and 205m AOD in the central area (Towers 154 - 169); and
- 100m to 180m AOD in the southern section (Towers 170 - 236).

23 The morphology was shaped principally during the last glacial cycle (the Midlandian), with subsequent modification throughout the post glacial Holocene period. Most of the Quaternary sediments in the CMSA were deposited during the glaciation, directly from the huge ice sheets.

24 The geomorphology of the CMSA is predominantly made up of drumlins and ribbed (Rogen) moraines. Drumlins take a variety of forms with the majority elongated in the direction of ice

flow. Some drumlins have sharp crests, whereas others are more whaleback in profile. These drumlins typically have a steeper stoss[18] than leeside due to the retreating ice. Although most drumlins are composed of glacial till or tills, a small number are rock-cored. The majority of drumlins on the route are diamation[19] drumlins with occasional rock cored drumlins to the south of Tower 200.

25 Rogen ‗ribbed' moraines underlie the drumlins and are aligned transverse to the ice flow direction. Some of ridges were streamlined and overprinted by subsequent drumlin development, while others remained unaffected.

26 Lakes, alluvial flats, lacustrine deposits and peaty soils occur, in the interdrumlin hollows, and occupy the lowest points of the landscape.

7.4.2 Soils

27 The CMSA varies in terms of its soil, subsoil and bedrock geology. There are a range of soils in the CMSA between the townlands of Clonturkan and Lemgare.

28 The principal soil groups are:

- AminPD – Deep poorly drained mineral soil, derived from mainly non-calcareous parent materials. Surface water gleys and groundwater gleys are included in this category;
- AminDW – Deep well drained mineral soil, derived from mainly non-calcareous parent materials. Acid brown earths and Brown podzolics will be included in this category; and
- AminSW – Shallow well drained mineral soil, derived from mainly non-calcareous parent materials. Lithosols and regosols are included in this category.

29 The following soil groups also occur but are less widespread and found in minor formations:

- AminPDPT – Poorly drained mineral soils with peaty topsoil, derived from mainly non-calcareous parent materials. Peaty gleys are included in this category;
- AminSP – Shallow poorly drained mineral soil, derived from mainly non-calcareous parent materials. Surface water and groundwater gleys are included in this category;
- AlluvMIN – Alluvial undifferentiated; and

[18] Stoss – The up-ice side of the hill from which an advancing ice-sheet moved.
[19] Diamation –Poorly / unsorted sorted material i.e. boulder clay or till.

- Lac – Lacustrine deposits (undifferentiated).

30 Alluvial soils are evident along the course of the main surface water features in the CMSA. In particular, alluvial soils are evident along the River Dromore and its tributaries. Cutover peat (Cut) is evident in the CMSA. Small areas of cutover peat are distributed throughout the CMSA and correspond with inter drumlin hollows.

7.4.3 Geology

7.4.3.1 Quaternary Geology

31 The Quaternary geological period extends from about 1.5 million years ago to the present day and can be sub divided into the Pleistocene Epoch, which covers the ice age period to 10,000 years ago, and the Holocene Epoch, which extends from 10,000 years ago to the present day. Refer to Figures 7.1 – 7.4, **Volume 3C Figures** of the EIS.

32 The Pleistocene Epoch in Ireland began when there was a significant cooling of the Earth's climate. It was characterised by alternating extended periods of very cold conditions during which time much of the country was covered by an ice sheet. The ice sheet in Ireland was formed by a number of coalescing ice domes, from which the ice flowed outwards in a radial pattern. As the ice travelled over the ground, it eroded the underlying bedrock, which resulted in the formation of sediment beneath and within the ice sheet. The particle size distribution of the sediment varied greatly and ranged from clay particles to large boulders. This material has been labelled glacial till or boulder clay and is the most widespread soil type in Ireland. If conditions were suitable, sediment was also deposited as distinct bands of sand, gravel, silt and clay. Glacial till can range in thickness from less than 1m thick to tens of metres in depth.

33 The CMSA was glaciated on at least two occasions but the majority of the sediments present today are as a result of the last glaciation, which was at its maximum some 24,000 years ago. Most of the Quaternary sediments were deposited during the Ice Age itself, either directly from the huge ice sheets or by meltwater from the ice sheets. Ice sheets in the study area moved from north-west to south-east.

34 Till derived from various rock formations is the principal material encountered along the alignment. Till is an unsorted sediment derived from the transportation and deposition of, by, or from a glacier. Glacial till is composed of a heterogeneous mixture of clay, sand, gravel and boulders. With reference to the EPA online mapping (http://maps.epa.ie/), the subsoils comprise primarily of tills derived from Lower Palaeozoic shales / sandstone (TLPSsS) are also present. Areas of outcrop / sub-outcrop along the alignment are delineated as bedrock at the surface as shown on Figures 7.1 - 7.4, **Volume 3C Figures** in the EIS.

35 The following subsoil groups also occur along the alignment, but are less dominant:

- A – Alluvial undifferentiated;
- Rck – Bedrock at or near surface; and
- CUT – Cutover Peat.

36 A summary of the proposed towers locations within each subsoil group is outlined in **Table 7.3** and shown in Figures 7.1 – 7.4, **Volume 3C Figures** of the EIS.

Table 7.3: Subsoil Classifications at Towers Locations

Subsoil Group[20]	No. of Towers within subsoil category	% of Towers within subsoil category
Alluvium (Undifferentiated)	2	1.49%
Bedrock at or near surface	23	17.16%
Cutover Peat	7	5.22%
Till	102	76.12%
TOTAL	**134**	**100%**

7.4.3.2 Bedrock Geology

37 Refer to Figures 7.5 – 7.8, **Volume 3C Figures** of the EIS. Reference to the relevant geological information in the *Bedrock Geological Map of Monaghan – Carlingford* (GSI, 1997) *Bedrock Geological Map of County Meath* (GSI, 2001), indicates that the bedrock geology along the alignment is varied.

38 Reference to the published geological map for this area including the 1:100,000 scale *Sheet No. 13 – Bedrock Geological Map of County Meath* (GSI, 2001) indicates that this area is by Ordovician-Silurian age deposits (510 million years to 410 million years ago) located between the townlands of Lemgare and Clonturkan (Towers 103 - 236).

[20]Based on GSI Data www.gsi.ie.

39 The Lower Palaeozoic (Ordovician-Silurian) rocks form part of a stretch of rocks that extend from the County Down coast to County Longford and are known as the ‗Longford Down Inlier‘. These rocks are a series of sandstones, siltstones and shales with small amounts of volcanic tuffs and lavas. The rocks of the Longford-Down Inlier are deformed into tight isoclinal folds with associated strong cleavage, thrust faults and shear zones.

40 The Ordovician / Silurian rocks are part of the ‗Central Belt‘ which comprises of greywacke and mudstone varying in age from the Ordovician (Llanvirn) to Silurian (Llandovery). Volcanic and intrusive dolerite dykes occur within the Ordovician / Silurian deposits. The dolerite dykes are orientated north-west south-east through the CMSA.

41 The different geological formations that make up the CMSA include the following:

- The Slieve Glah Formation (Towers 103–104) is comprised of grey / dark grey slaty siltstone, mudstone, and thin bedded turbidite with occasional thicker bedded greywacke and pale grey metabentonite beds.
- The Lough Avaghon Formation (Towers 105-154 and 157) is comprised of grey, fine to coarse-grained massive quartz intermediate and quartz-felsic igneous rich turbiditic greywacke, microconglomerate and amalgamated beds.
- The Mullanalt Member (Towers 155 - 156) of the Lough Avaghon Formation is comprised of very finely laminated grey coloured laminated siltstone, siltstone-mudstone and non-laminated siltstone with interspersed thicker fine grained buff to pale grey greywacke.
- The Oghill Formation (Towers 158-162) is comprised of grey / grey green massive greywacke, microconglomerate and amalgated beds and subordinated turbiditic greywacke and local infaulted dark grey and black pyritic, occasionally graptolitic shale / mudstone.
- The Shercock Formation (Towers 163-193) is comprised of grey to green-grey quartz felsic igneous, white mica rich, fine to coarse grained medium thick bedded turbidite and massive sandstone.
- The Laragh Formation (Towers 194-195) is comprised of olive-green, pale to dark grey and black, pyritic, graptolitic shale/mudstone/slate with dark grey / black chert / silicified mudstone.
- The Taghart Mountain Formation (Towers 196–198 and 221-229) is comprised of pale grey to dark grey, quartz-mica rich turbiditic greywacke, massive sandstone and amalgamated beds. The formation is unfossiliferous.

- The Castlerahan Formation (Towers 199-220 and 230-236) is comprised of dark grey to black massive quartzo-greywacke, with micro conglomerates.

42 Finer grained variety of gabbro (type of rock), were intruded as thin sheets (dykes and sills), associated with the Slieve Gullion central intrusive complex. Areas of dolerite are not identified underlying tower locations but may be unmapped and encountered during site works.

43 The distribution of geological units, along the alignment is based on published information from the GSI. They are shown on Figures 7.5 – 7.8, **Volume 3C Figures** of the EIS. The composition and the characteristics of the various rock units are discussed herein.

7.4.3.3 Karst Features

44 The Karst database held by the GSI was consulted. This database holds records of locations and types of reported Karst features. No recorded Karst features from the GSI database exist within 1km of the proposed route alignment. No pure limestones are mapped along the line route.

7.4.3.4 Depth to Bedrock

45 Rock outcrop or close to surface rock occurs in a number of areas (17% of towers) north of Castleblayney and north-east of Shercock. Deeper quaternary deposits occur on the backslopes and crests of drumlins. Additional information was obtained from the GSI well database which is included in **Appendix 7.1, Volume 3C Appendices** of the EIS.

7.4.4 Hydrogeology

46 The evaluation of the groundwater environment is concerned with water contained below the ground surface, within the soil and bedrock environment. Soils and bedrock along the CMSA are widely variable in their hydrogeological characteristics. Ordovician greywackes and shales beneath the northern end of the OHL route are generally of low permeability, and lack groundwater except at shallow depth in the transition zone / upper weathered bedrock. The alluvial and sand and gravel parent materials that occur along parts of the CMSA are moderately permeable. Glacial clays are generally of low permeability, although they may be locally interspersed with more permeable granular deposits.

47 The CMSA is underlain by Ordovician and Silurian greywacke, shale, sandstone and mudstone. These strata generally have a low permeability and are of negligible importance for groundwater supplies. Groundwater is present in these strata but it is likely that quantities are low and groundwater generally is limited to fractures and to the upper weathered zone of the strata. There are no existing public water supply boreholes in close proximity to the proposed

development. Additional information was obtained from the GSI well database which is included in **Appendix 7.1, Volume 3C Appendices** of the EIS.

7.4.4.1 Aquifer Classification

48 Silurian Metasediments and Volcanics along the line route between the townlands of Clonturkan and Lemgare are classified mainly as Poor Aquifers (Pl) – unproductive except for local zones and Poor Aquifers (Pu). A summary of the aquifer classification is included in **Table 7.4**. Refer to Figures 7.9 - 7.12, **Volume 3C Figures** of the EIS for aquifer maps.

49 The Quaternary sediments play an important role in the groundwater flow regime of the region. The permeability of the glacial tills, which occur along the alignment, is variable but generally of poor permeability.

7.4.4.2 Groundwater Flow Direction

50 In general terms it would be expected that the groundwater gradient would follow the topographic variation in an area. Flow paths and distance is dependent on the characteristics of the aquifer type. Most groundwater flow is confined to the upper 10m of weathered bedrock and will discharge to the nearest watercourse. An evaluation of the topographic contours displayed on the Ordnance Survey 1:50,000 scale Discovery Series Map for the region indicates that the predominant groundwater flow direction in the CMSA is likely to be towards the local streams.

7.4.4.3 Water Usage

51 Water usage within the CMSA is primarily supplied by Monaghan County Council from their surface water abstractions at the Lough Bawn, Lough Namachree, Lough Graghlone, Lough Toome and Muckno Lough. There are no public water supplies within 200m of the proposed line route.

52 Along the alignment a number of private wells are used by individual landowners. A search of the GSI well database shows there are a number of wells in the area with uses varying from private to agricultural use. The GSI Well Database is a record of reported wells drilled in Ireland. Refer to **Appendix 7.1, Volume 3C Appendices** of the EIS.

Table 7.4: Aquifer Definitions

Aquifer Code[21]	Aquifer Description	% of Towers located within Aquifer type
Pl	Poor Aquifer Bedrock which is generally unproductive except for local zones	100%

53 The GSI Well Card Index is a record of wells drilled in Ireland. This index shows a number of wells in the vicinity of the proposed development. While much useful information can be obtained from this index, it is important to note that it is by no means exhaustive, as it requires individual drillers to submit details of wells in each area.

54 The well card shows the occurrence of recorded wells within the CMSA, information regarding the depth to bedrock, and hence the depth of overburden is noted for each well. See **Appendix 7.1, Volume 3C Appendices** of the EIS, for locations.

55 The well card data shows there are a large number of wells in the CMSA with uses varying from domestic to agricultural use. It shows that the wells recorded in the CMSA range from 0.2m to generally 121.9m Below Ground Level (BGL). The groundwater yield also varies throughout the CMSA; the majority of yield is poor to moderate. More detail on the depth to bedrock in the vicinity of each route is provided in the **Appendix 7.1, Volume 3C Appendices** of the EIS**.**

7.4.4.4 Groundwater Vulnerability

56 The formerly entitled DoEHLG, EPA and GSI have produced guidelines on groundwater vulnerability mapping that aim to represent the intrinsic geological and hydrogeological characteristics that determine how easily groundwater may be contaminated by human activities. Vulnerability depends on the quantity of contaminants that can reach the groundwater, the time taken by water to infiltrate to the water table and the attenuating capacity of the geological deposits through which the water travels.

57 The DoEHLG, EPA and GSI vulnerability mapping guidelines allow for the assignment of vulnerability ratings from ‗extreme‘ to ‗low‘, depending upon the subsoil type and thickness. With regard to sites where low permeability subsoils are present, the following thicknesses of unsaturated zone are specified in **Table 7.5**.

[21] Based on GSI Data www.gsi.ie.

Table 7.5: Groundwater Vulnerability Categories

Vulnerability Rating[22]	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High Permeability (Sand and Gravel)	Medium Permeability (Sandy Subsoil)	Low Permeability (Clayey Subsoil/ Peat)	Sand and Gravel aquifers only	<30 radius
Extreme	0 – 3.0m	0 – 3.0m	0 – 3.0m	0 – 3.0m	-
High	>3.0m	3.0 -10.0m	3.0 – 5.0m	> 3.0m	N/A
Moderate	N/A	>10.0m	5.0-10.0m	N/A	N/A
Low	N/A	N/A	>10m	N/A	N/A

Notes: N/A Not Applicable; Precise Permeability values cannot be given at present; Release point of contamination is assumed to be 1-2m below ground surface. The principal vulnerability classes included are high and moderate. All sand and gravel subsoils are classified as high.

58 The principal vulnerability class is extreme. Refer to Figures 7.13 – 7.16, **Volume 3C Figures** of the EIS.

[22] Based on GSI Classification system.

Table 7.6: Groundwater Vulnerability along the Line Route

Groundwater Vulnerability[23]	Number of Towers	% Towers in each Vulnerability category
Extreme Vulnerability with rock at Surface (<1m)	26	19.40%
Extreme	46	34.33%
High	14	10.45%
Moderate	34	25.37%
Low	14	10.45%
TOTAL	**134**	**100**

7.4.5 Areas of Geological Heritage Importance

59 The GSI provides scientific appraisal and interpretative advice on geological and geomorphological sites, and is responsible for the identification of important sites that are capable of being conserved as Natural Heritage Area (NHA). The National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht (DAHG) have the responsibility of designation and management of sites, with appropriate advice from GSI.

60 At present, the GSI has compiled a list of sites proposed for designation as Natural Heritage Areas (pNHAs). The GSI has also determined a secondary list of County Geological Sites (CGS), which may be considered for protection at local authority functional control level (i.e. may be included in county development plans).

61 The GSI was consulted as part of the route selection process with regard to areas that may have geological or geomorphological importance. According to the GSI, there are three sites of geological interest in County Monaghan, which lie near the line route (see **Table 7.7**). Refer to Figures 7.17– 7.20, **Volume 3D Figures** of the EIS.

[23] Based on GSI Data www.gsi.ie.

Table 7.7: Geological Heritage Areas along the Line Route

Site Name[24]	Location	Distance from Tower location	IGH Theme
Carrickatee Hill CGS	Grid Ref. 273400, 314800)	2.35km west of line route	IGH4 Cambrian-Silurian Theme
Lemgare CGS	Grid Ref. 280400, 328100	60m north-east of line route	IGH 6 Mineralogy Theme
Tassan CGS	Grid Ref. 279100, 326100	0.15 km south-east of the line route	IGH 6 Mineralogy Theme

62 **Carrickatee Hill** with excellent and most extensive exposures of andesitic agglomerate of the Carrickatee Formation. The site represents the best exposed example of mid / late Ordovician volcanism within the Moffat Shale Group south of the Orlock Bridge Fault in Ireland. The site is proposed for CGS designation under the Irish Geological Heritage (IGH) 4 Cambrian-Silurian Theme. The site is located approximately 2.35 km west of Tower 154.

63 The **Lemgare** site presents pits and an adit with disseminated ankerite/ siderite in arenite or in veins, also quartz, galena, sphalerite and barite. The Lemgare site is potentially the most easily accessible representative of the lead mines in this region, though it was never very productive. Pyromorphite and wolfenite were also found making this site one of few localities for this mineralogy. The site is proposed for CGS designation under the IGH 6 Mineralogy Theme. The site - boundary is located approximately 60 m north-east of Tower 108. Based on the IGH site audit, the mine features are poorly preserved and insufficiently interesting to require any designation for the site. However, the presence of rare wulfenite means Lemgare warrants CGS status.

64 **Tassan** was the largest and most productive of the Monaghan district lead mines. Production appears to have commenced in the late 1840s from two NNW-SSE-trending, east-dipping lodes. The ore consisted of argentiferous galena (PbS) and sphalerite (ZnS) in a quartz-calcite matrix. The site is largely grassed over apart from a large solid waste heap that marks the eastern boundary of the site on the west shore of Tassan Lough. The site is proposed for CGS designation under the IGH 6 Mineralogy Theme. The site boundary is located approximately 170 m south-east of Tower 117.

7.4.6 Current and Historical Mining Sites

65 A number of historical mines are located along the line route in County Monaghan. These relate to number of small metallic mineral deposits located in the Monaghan – Castleblayney

[24] Based on GSI Data www.gsi.ie.

area of County Monaghan detailed in the EPA‘s *Historic Mine Sites - Inventory and Risk Classification* (2009) as follows:

> *–Most are lead deposits though one, near Clontibret, is unique in Ireland in having produced mainly antimony. Most were short-lived operations, exploited mainly in the 19th century, while others amounted to little more than prospects abandoned after limited exploration. Morris (1984) produced the first comprehensive review of the mines of the district, including site descriptions. The latter have been used as a basis for selecting sites for work under the HMS-IRC project. Only those sites with potentially significant remaining mine waste or mine structures were considered, namely Clontibret, Coolartragh, Hope Mine, Lemgare and Tassan. The site at Coolartragh has largely disappeared in recent years after expansion of a working quarry. The Lemgare site includes the traces of adits and the heavily overgrown ruins of some buildings but no mine waste of significance”.*

66 No other major mines were noted in the CMSA. The nearest historical mine is located at Lemgare (see **Section 7.4.5**). There are no active mines, quarries or sand and gravel pits located under the alignment.

7.4.7 Contaminated Land

67 An evaluation was undertaken to determine the presence and extent of potentially contaminated land which is based on the identification of potential sources pathways and receptors along the line route. If all three elements (source, pathway and receptor) are present, there is a contaminant linkage and there is a potential for the contamination to represent a risk to the receptor(s) and for the site to be considered as contaminated.

68 A number of sites have been identified as having a potential for land contamination in the immediate area of the proposed alignment. The identified sites have not been validated and it is considered likely that they represent worst case conditions, i.e. where a potential for contamination has been identified but no evidence of actual contamination has been confirmed, such as a former mineral working / quarry which may or may not have been infilled. The evaluation has been undertaken on the assumption that all of the sites are contaminated unless there is evidence to the contrary.

69 The distance to the nearest tower has been used, as the OHL will have no impact on the underlying ground conditions. On a precautionary basis, sites within 200m of the route of the proposed development have been considered, refer to **Table 7.8** .

Table 7.8: Potential Contaminated Land Sites within 200m of the Proposed Overhead Line Route

Tower and Associated Development	Approximate Distance (m) and Direction From Nearest Tower	Description
107	120m south-east of Tower 107	Reclaimed land (borrow pit) – Possibly related to Disused Lead Mine (Lemgare)
108	125m north-east of Tower 108	Disused Lead Mine (Lemgare) and associated infrastructure
117	170 m south-east of Tower 117.	Disused Lead Mine (Tassan) and associated infrastructure
131	70m north-west of Tower 131	Reclaimed land (gravel pit)
153	120m south of Tower 153	Reclaimed land (gravel pit)
172	170m west of Tower 172	Reclaimed land (borrow pit)
180	Tower Base for Tower 180	Reclaimed land (borrow pit)
182	120m west and south-west of Tower 182	Reclaimed land (borrow pit)
140	200m north of Tower 140	Railway land Ballybay to Castleblayney (Great Northern Railway)
199	Tower Base for Tower 199	Reclaimed land (quarry)
216	100m west of Tower 216	Reclaimed land (quarry)

(Source: Aerial Sources and Historical Maps)

70 A review was undertaken of potentially contaminated land sites located in close proximity to the route of the proposed development. The detailed reviews are based on an evaluation of historical Ordnance Survey plans of the sites; LiDAR (Light Detection and Ranging) and aerial photographs of all the sites listed in **Table 7.8** and, a site walkover in July / August 2013 where access was granted.

71 In addition to specific sites, it should be noted that there is a general potential for pollution from agricultural chemicals on present and past agricultural land, and from buried material which may occur almost anywhere along the proposed development.

7.4.7.1 Former Mining Areas –Towers 107, 108 and 117

72 Towers 107, 108 and 117 are located near former mines, adjacent to the Monaghan/ Armagh border. The metal deposits in the Monaghan District are epigenetic vein deposits, typically containing lead and zinc but also including antimony-arsenic-gold deposits detailed in *The Metallic Mineral Deposits of the Lower Palaeozoic Longford-Down Inlier, in the Republic of Ireland* (Morris 1984). Galena (PbS) is the dominant sulphide in lead vein deposits, accompanied by sphalerite (ZnS), barite (BaSO4) and chalcopyrite (CuFeS2). The host vein is generally composed of ferroan carbonate. The antimony-gold deposits consist of veins with isolated pods of stibnite (SbS2) in altered andesitic greywacke that contains disseminated pyrite

(FeS2) and gold-bearing arsenopyrite (FeAsS2) detailed in *The Metallic Mineral Deposits of the Lower Palaeozoic Longford-Down Inlier*, *in the Republic of Ireland* (Morris 1984). Most veins dip steeply and trend north north-west as detailed in the *Historic Mine Sites - Inventory and Risk Classification* (EPA, 2009). Most of the mining sites were abandoned by the 1900s. The 25" OS maps from 1927 indicates the presence of an abandoned lead mine over 200m to the north of Tower 108.

73 The soil map indicates rock near surface at the site is underlain by Silurian/ Ordovician metasediments, a sequence of thick greywacke with thin bands of slate and mudstone. Contaminants associated with mines typically include heavy metals, hydrocarbons and sulphates. Whilst there are plausible contaminant linkages, such linkages have existed ever since the mines were operational in the 1900s. Since the closure of the mines, there have been no additional contaminant sources and impacts. If there are any present this would be limited to residual contaminants from the operation of the mines. A study of historical mines *Historic Mine Sites - Inventory and Risk Classification (EPA, 2009)* was undertaken by the EPA between 2006 and 2009 into the historic mines in Monaghan including Lemgare. No spoil heaps at the Lemgare site were identified during the EPA sampling.

7.4.7.2 Former Railway - Tower 140

74 Tower 140 is located close to an abandoned railway embankment which runs west to east, less than 200m north of the proposed tower location. The railway is marked as level with the surrounding topography and the former railway has since been removed from the field. The former railway was a branch off the Great Northern Railway serving the Castleblayney to Ballybay area.

75 The geological map shows that the site is underlain by superficial deposits consisting of till derived from sandstones and shales. The superficial deposits are underlain by Ordovician/ Silurian Metasediments. The thickness of the superficial deposits as mapped by the GSI are >3m in this location (high vulnerability, low permeability).

76 The earliest OS 6" plan for 1841 shows the site undeveloped. The railway was not constructed until 1864. The OS 25" map dated 1927 shows that the line had been developed as a single track railway. The section was decommissioned in 1953.

77 Contaminants associated with railway lines typically include ash (heavy metals), hydrocarbons, creosote from sleeper treatment and sulphates from track ballast and herbicides. Many of the contaminants associated with railway land are volatile and are likely to have evaporated, and the heavier fractions such as metals and Polycyclic Aromatic Hydrocarbons (PAHs) are sealed within the track route by organic matter.

78 Whilst there are plausible contaminant linkages, such linkages have existed ever since the railway was constructed in the 1860s. Since the closure of the railways in the 1950s and 1960s there have been no additional contaminant sources and impacts, if any, would be limited to residual contaminants present from the operation of the railway. It is likely that the majority of the mobile contaminants would have migrated from the site over the past 50 years and that any residual contaminants are present in immobile forms. Accordingly, it is considered unlikely that there are any sources of significant residual contamination associated with the former railway line remaining on the site.

79 Tower 140 will be located to the south of the former railway lines and the footprint of the tower will not include the former railway line.

7.4.7.3 Disused Quarries and Soil Excavation areas - Towers 131, 153, 172, 180, 182, 199 and 216

80 The excavations appear to be minor excavations undertaken in the last 20 years for use in construction activities in the local area. Pits appear to be localised and limited in real extent (<0.5 acres) with the exception of Tower 182. The excavations shown appear to be disused and due to the distance from the tower locations, it is considered that they will not be disturbed by and do not pose a contamination risk to the proposed development. Potential sources of contaminants include the disposal of agricultural related waste material in the excavations. Contamination has occurred in Ireland where open excavations were backfilled with waste materials. Based on the site walkovers and aerial photographs there is no visual evidence of contamination. In the absence of excavation of the former quarries/ pits (the potential ‗source‘ of any contamination) for the tower construction, it is concluded that the construction works will not disturb any potential contamination and that the works will not alter the existing ground conditions. As the construction of the tower would not affect the excavations, it is considered that any contaminant pathways will not be realised as part of the proposed development.

7.5 POTENTIAL IMPACTS

7.5.1 Do Nothing

81 The Do Nothing alternative describes the circumstance where no development occurs. Under a ‗Do-Nothing‘ scenario, no likely significant implications arise in respect of soil, geology or hydrogeology.

7.5.2 Construction Phase

82 During the preparation of the EIS, there were a number of constraints in terms of site access, however, notwithstanding these constraints, a robust evaluation of the likely significant effects of all aspects of the proposed development, both in respect of the line and the towers, has been

undertaken for the purpose of preparing this EIS. This section should be read in conjunction with the construction methodology as outlined in Chapter 7, **Volume 3B** of the EIS. The proposed development will have potential impacts on the soil, geology and hydrogeology of the CMSA. Impacts of the construction works on the surface water environment in relation to silt runoff are considered in **Chapter 8** of this volume of the EIS.

83 The significance of potential impacts associated with contaminated land has been evaluated broadly based on guidelines in *Contaminated Land Risk Assessment, A Guide to Good Practice (CIRIA,* 2011). Potentially contaminated land has been identified along the proposed development. However, no significant potential contamination risk was identified along the line route. The potentially contaminated land sites identified along the line route do not pose a significant risk of contamination or a constraint to the proposed development. Accordingly, it is concluded that the sites of potentially contaminated land in proximity to the proposed development would not be disturbed by the construction process and do not pose a constraint to the proposed development. If contamination is unexpectedly encountered mitigation measures are incorporated (See **Section 7.6**).

84 The construction phase of the proposed development will impact on the ground and geological conditions through the use of temporary access routes and excavations required for the tower bases. The extent of the excavations required for the tower bases will vary depending on the precise geological conditions at each tower. The working area for construction of a 400 kV tower will extend to 30 x 30m all around the footprint of the base of the tower. As noted in Chapter 7, **Volume 3B** of the EIS, tower foundations typically range from 2m to 3.5m in depth to the invert level of the foundation and anywhere from 2 x 2 metres squared, to 9 x 9 metres squared, in plan area depending on tower type. Each of the four corners of the tower stubs (i.e. lower part of the tower leg) will be separately anchored below ground in a block of concrete. The standard ESB practice is to use a concrete pipe lining in the foundation holes as an integral part of the foundation. Approximately 10,500m^3 of material will be excavated as part of the proposed development in the CMSA.

85 It is considered that the construction works only, would have minor effects on the geomorphology of the area, as the tower and the material storage yard construction would not materially change the local slopes and topography.

86 The tower locations have been selected to avoid known areas of lacustrine deposits, intact peat and cutover peat, where possible. Intact peat was not identified at any tower location along the line route. Cashel Bog and other intact / high ecological value peatlands have been avoided. Accordingly, it is considered that the excavations required for the construction of the principal elements of the proposed development (towers bases) would have no adverse impacts on the more sensitive peat ecosystem. Cutover peat is mapped at seven tower locations (Towers 104,

105, 119, 120, 122, 163 and 187) with most areas reclaimed for agricultural land use. In the unlikely event that piled foundations may be required at these locations; the potential soil geology and hydrogeology impacts are not significant. Mitigation measures are outlined in **Section 7.6** .

87 It is considered that the vast majority of excavated material will consist of subsoil and naturally excavated soils and rock. The surplus excavated material from tower excavations will be approximately 10,500m^3. Assuming a worst case scenario, all material will be taken off site and deposited at an appropriately licensed/ permitted waste management site. As it is anticipated that the excavated materials would comprise natural uncontaminated soils, there would be no contamination restrictions on the ability of licensed/ permitted waste management sites to accept the materials. Mitigation measures will be in place should contamination be encountered as outlined in **Section 7.6**.

88 The ground conditions in the vicinity of the proposed development are considered to be of low sensitivity with no Groundwater Dependent Terrestrial Ecosystem (GWDTE) in close proximity of the line. Impacts on the existing ground conditions would be restricted to the tower locations. The magnitude of the impacts at the tower locations is considered to be low.

89 Impacts on the existing ground conditions will be restricted to the tower locations, temporary access routes, guarding locations and stringing locations. The magnitude of the impacts at the tower locations is considered to be low. Temporary access tracks will comprise of aluminium tracks or rubber matting. Placing of temporary access routes will be required at a number of tower locations. Potential impacts may arise where temporary access routes cross areas of cutover peat and alluvial soils. Approximately 19 type 2 temporary access tracks may be required on the CMSA line route where temporary access routes traverse cutover peat, lacustrine or alluvial soils and if weather conditions are very poor (refer to Chapter 7, **Volume 3B** of the EIS). It is not proposed to use stone roads or timber sleepers as part of the proposed development. Mitigation measures are detailed in **Section 7.6**.

90 The OHL alignment passes close to two proposed County Geological Sites (CGSs) namely the former Lemgare Mine and Tassan Mine. The alignment does not go through the sites and hence these sites will not be affected by the proposed development. The nearest tower is located approximately 60m from the Lemgare CGS within an agricultural field. The geological interest at the site is the bedrock exposures, mine audits and spoil heaps however many of the features have been removed during the ensuing 100 years. The potential impacts were discussed with the GSI and mitigation measures are proposed in **Section 7.6**. No significant impact was identified in consultation with the GSI.

91 During the construction phase, the digging of foundations for the towers may lead to an increase in soil erosion. In addition topsoil, subsoil removal and rock excavation will be required. Topsoil removal has the potential for silt and clay to be removed by rainfall and surface water runoff. Siltation of nearby watercourses may be a potential impact and careful removal and storage of subsoil should be considered. Any topsoil that is removed will be used for regrading at a later stage. Potential impacts and mitigation measures in relation to soil erosion are addressed in **Sections 7.6** and **7.7**.

92 During the construction phase, machinery on site will include diesel powered trucks, excavators and the use of either a derrick or mobile crane. The potential impacts to the underlying soil and geology from the proposed development could derive from accidental spillages of fuels, oils and solvents, which could impact the soil, bedrock and groundwater quality, if allowed to infiltrate to ground during construction.

93 The proposed development has the potential to impact locally on groundwater flow and quality. All impacts that are realised would be of a temporary nature for the construction period. The principal potential impacts include a reduction in groundwater level and modification in groundwater flow as a result of dewatering, deterioration in groundwater quality as a result of suspended solids and contaminant (oils and chemicals), spills/ leaks during construction and operation.

94 The evaluation of the significance of potential impacts on groundwater is based on the source-pathway-receptor approach and is determined from a combination of the sensitivity of the receptor and the magnitude of any impact. Groundwater receptors include poorly productive aquifers, GWDTE and water abstraction boreholes. No tower is located within 200m of a public water supply or the inner source protection of public groundwater supply schemes.

95 The tower excavations will vary between approximately 2m and 3.5m in depth, subject to the precise ground conditions at each tower location. In low lying areas groundwater may be encountered in excavations. If excavations for tower bases encounter groundwater, such inflows may need to be pumped, resulting in short term localised drawdown of the water table and discharges to the surface water channels.

96 Due to the limited drawdown and pumping required, it is considered that any significant impacts on the groundwater level will be realised only in close proximity to the point of abstraction. Any impacts will be restricted to the short period of pumping. Drawdown decreases exponentially away from the point of abstraction. The majority of the tower locations are remote from properties and hence it is unlikely that any dewatering of the excavations would impact on existing wells and boreholes as these tend to be located in close proximity to the user's property however, a precautionary approach will be followed where groundwater is encountered in

excavations. The need for dewatering to construct the tower footings will be confirmed at the construction stage. Where groundwater is identified in excavations within 100m of houses, monitoring and evaluation of groundwater and water levels will be undertaken.

97 Water pumped from the excavations may contain suspended solids and contaminants. In the absence of any treatment, the disposal of this water to ground or to the surface water system could cause deterioration in water quality of the receiving system. Mitigation measures are outlined in **Section 7.6** .

98 There may be a risk of soil and groundwater pollution from site traffic through the accidental release of oils, fuels and other contaminants from vehicles. Mitigation measures are outlined in **Section 7.6**.

99 The significance of potential impacts associated with contaminated land has been evaluated based on guidelines in *Contaminated Land Risk Assessment, A Guide to Good Practice (CIRIA,* 2011). No significant potential contamination risk was identified at the proposed construction materials storage yard based on site observations and soil sampling.

7.5.2.1 Construction Material Storage Yard

100 The construction phase of the proposed development will impact on the ground and geological conditions through the use of construction material storage yard however only minor excavations are proposed at the site. It is considered that the construction works would have minor effects on the geomorphology of the area, as the construction materials storage yard would not materially change the local slopes and topography. The site was extensively modified as part of the N2 by pass. While a potential turlough was marked near the site (Sheedy-Skeffinton et al, 1996), no evidence of a turlough was noted at the site or in the surrounding area in January 2014 or during the *Wetland Survey County Monaghan* (Foss & Crushell, 2011). It should be noted that the entire low lying area to the east was also modified to accommodate the N2 by-pass.

101 During the construction phase, machinery on site will include diesel powered trucks, excavators and a crane. The potential impacts to the underlying soil and geology from the proposed development could derive from accidental spillages of fuels and oils, which could impact the soil, bedrock and groundwater quality, if allowed to infiltrate to ground during construction. The proposed construction materials storage yard is located within a Regionally Important Karst Aquifer however the site is underlain by deep subsoil and made ground and does not pose a significant risk to the groundwater. Mitigation measures are proposed in **Section 7.6.**

102 During the construction phase, the construction materials storage yard may lead to an increase in soil erosion. Siltation of nearby watercourses may be a potential impact and careful removal and storage of subsoil will be completed to mitigate against this. Topsoil will be used for regrading at a later stage.

7.5.3 Operational Phase

103 Due to the nature of the proposed development, there will be machinery periodically on the site at a given time. This may lead to occasional accidental emissions, in the form of oil, petrol or diesel leaks, which could cause contamination if they enter the soil and bedrock environment.

104 It is not proposed to discharge wastewater to groundwater and therefore potential impacts do not arise.

7.5.4 Decommissioning

105 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration.

7.6 MITIGATION MEASURES

106 In identifying the route of the proposed development, ‗avoidance of impact‘ measures were employed.

7.6.1 Construction Phase

107 Measures to minimise the impact of the proposed development on local geology include reuse of in situ material and importation of additional material from local sources. The placement of towers has avoided areas of intact peat, therefore the hydrology of peat masses in the general vicinity of the alignment will not be affected.

108 It is proposed to mitigate the potential impacts on the Lemgare CGS, which is located approximately 60m from the nearest tower. Soils and bedrock will be encountered during the site investigation works / construction of the towers. The GSI have been consulted at all stages of the application. The mitigation measures include the following;

- Continued consultation with the GSI;
- Limiting excavation by only excavating the required footprint;
- Maintaining an adequate distance from Lemgare CGS; and
- The GSI will be notified about any significant new section / feature that is exposed within the tower footprint.

109 All construction waste will be stored, managed, moved, reused or disposed of in an appropriate manner by appropriate contractors in accordance with *Waste Management Acts 1996-2013* (refer to Chapter 7, **Volume 3B** of the EIS). Excess soils / subsoils will be disposed of at licensed / permitted waste management facilities. Excess steel will be disposed of / recovered offsite at a licensed waste disposal site. All waste material will require the necessary waste permits and documentation as part of the construction programme and the CEMP.

110 Excavated soil and subsoil will be stored adjacent to the excavation area. Excavated material will be reused in situ where possible. Typically $34m^3$ of soil / rock will be excavated at each intermediate tower location with approximately $230m^3$ of soil / rock excavated from angle towers. In the event no material is suitable / wanted for reuse by landowners, subsoil will be disposed of at a licensed / permitted facility, in accordance with the *Waste Management Acts* and associated regulations. Where subsoil is retained, an evaluation by the onsite ecologist is required to minimise potential ecological impacts. Typically subsoil is reused by landowners, however, assuming a worst case scenario, surplus material will be disposed of at licensed / permitted facility. Further details of the facilities considered are provided at **Appendix 7.2, Volume 3C Appendices** of the EIS.

111 All excavated materials will be visually evaluated for signs of possible contamination such as staining or strong odours. In the event that any unusual staining or odour is noticed, samples of this soil will be analysed for the presence of possible contaminants in order to ensure that historical pollution of the soil has not occurred. Should it be determined that any of the soil excavated is contaminated, this will be disposed of pursuant to the provisions of the *Waste Management Acts* and associated regulations.

112 To minimise any potential impact on the underlying subsurface strata from any material spillages, all oils and fuels used during construction will be stored on a temporary proprietary bunded surface (i.e. contained bunded plastic surface). These will be moved to each tower location as construction progresses. Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles will take place away from surface water gullies or drains. No refuelling will be allowed within 50m of a stream / river. Spill kits and hydrocarbon

absorbent packs will be stored in this area and operators will be fully trained in the use of this equipment.

113 Controlling working practices by, for example, minimising land take, avoiding repetitive handling of soils, minimising vehicle movements off road and limiting the size of stockpiles will reduce the compaction and erosion of material. Once all works are complete, the access route and the construction areas which have been disturbed around the towers during the tower foundation installation and tower erection phases are reinstated. Any impacts are considered likely to be minor and of short term nature.

114 Any vehicles utilised during the operational phase will be maintained on a weekly basis and checked daily to ensure any damage or leakages are corrected. The potential impacts are limited by the size of the fuel tank of the largest plant / vehicles used on the site. Precautions will be taken to avoid spillages. These include:

- Use of secondary containment e.g. bunds around oil storage tanks;
- Use of drip trays around mobile plant;
- Supervising all deliveries and refuelling activities; and
- Designating and using specific impermeable refuelling areas isolated from surface water drains.

115 The majority of the tower locations are remote from dwellings and hence it is unlikely that short term dewatering of the excavations would impact on existing wells and boreholes. Where it is necessary to dewater to construct the tower foundations in close proximity of wells, monitoring will be carried out of wells within 100m of the tower locations.

116 Water pumped from the excavations may contain suspended solids. Standard methods of dewatering including ejectors, well points or submersible pumps will be used. Settlement may be required to reduce the suspended solids concentrations to protect the quality of the receiving water system. Settlement will be undertaken by a standard water filtration system to control the amount of sediment in surface water runoff. Direct discharge to stream or rivers will not be permitted.

117 The mitigation measures outlined in relation to soils, geology and hydrogeology will be implemented as part of the CEMP. This plan will incorporate the mitigation measures indicated in the EIS, and any others deemed necessary, and shall provide details of intended construction practice for the proposed development (see Chapter 7, **Volume 3B** of the EIS). An outline CEMP can be found in Appendix 7.1, **Volume 3B Appendices** of the EIS.

7.7 RESIDUAL IMPACTS

118 The nature of the development dictates that the greatest potential impact for geological impact (including soil, subsoil and bedrock) associated with the proposed development will be in the construction phase. It is predicted that the geological impacts associated with the construction phase of the development is negligible and short term.

119 With regard to the operational phase of the development, no significant impacts on the local geological or hydrogeological environment are predicted. Application of the identified mitigation measures for the predicted impact on soils geology and hydrogeology will ensure that the residual impact is negligible.

7.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS

120 The potential for interrelationships arises with the environmental topics of water and flora and fauna. Soils, geology and hydrogeology have an important interrelationship with the water and ecological environment, as a determinant of water chemistry, river flow regimes, water storage capacity and watercourse location. It also has an impact on water quality through the ability of bedrock and surface deposits to filter potential pollutants. Potential ecological impacts could occur through the mishandling of soils or through the deposition of excavated soils in ecologically sensitive areas. These potential impacts have been identified in **Section 7.5** and mitigation measures have been proposed in **Section 7.6**.

121 An evaluation was undertaken based on the identification of potential sources, pathways and receptors along the line route. If all three elements (source, pathway and receptor) are present, there is a linkage and there is a potential impact to the receptor(s). In terms of surface water and ecology, there are no cSACs or groundwater dependent terrestrial ecosystems (GWDTE) in close proximity to the line route.

122 This chapter should be read in conjunction with **Chapters 6** and **8** of this volume of the EIS and Chapter 7, **Volume 3B** of the EIS.

7.9 CONCLUSIONS

123 The subsoil underlying the alignment is primarily composed of unsorted till deposits while minor quantities of soft sediments including peat and alluvial deposits are also located along the proposed alignment. The construction phase of the proposed development will impact on geological conditions through the use of temporary access routes and excavations required for the tower bases.

124 The nature of transmission line development dictates that the greatest potential impact for geological impact (including soil, subsoil and bedrock) associated with the development will be in the construction phase. During construction the potential impacts to the underlying soil and geology from the proposed works could derive from accidental spillages of fuels, which could impact the soil, bedrock and groundwater quality, if allowed to infiltrate to ground.

125 The tower locations have been selected to avoid known areas of lacustrine deposits, intact peat and cutover peat where possible. Intact peat was not identified at any tower location along the line route including Cashel Bog. Accordingly, it is considered that the excavations required for the construction of the principal elements of the proposed development will have no adverse impacts on the more sensitive peat ecosystem.

126 No significant adverse effects are predicted on the geological or hydrogeological environment as a result of the construction and operational phases of the proposed development.

127 The predicted impact on the soils and geology is considered to be long term and negligible.

8 WATER

8.1 INTRODUCTION

1 This chapter of the Environmental Impact Statement (EIS) evaluates the impacts on the water environment arising from the proposed development as set out in Chapter 6, **Volume 3B** of the EIS. The information contained within this chapter is concerned with the description of the hydrological character of the Cavan Monaghan Study Area (CMSA) as defined in Chapter 5**,** **Volume 3B** of the EIS.

2 The evaluation for the CMSA considers an area in excess of 500m either side of the line route.

3 The potential impacts on the surface water (rivers, lakes, etc.) conditions and on the environment are considered for both the construction and operational phases of the proposed development. Mitigation measures that will form part of the proposed development are described and any residual environmental impacts identified and their significance evaluated.

4 Chapter 6, **Volume 3B** of the EIS describes the full nature and extent of the proposed development including elements of the overhead line (OHL) design and the towers. It provides a factual description, on a section by section basis, of the entire line route. The principal construction works proposed as part of the development are set out in Chapter 7, **Volume 3B** of the EIS along with the outline Construction Environmental Management Plan (CEMP) in Appendix 7.1, **Volume 3B Appendices** of the EIS.

5 This chapter should be read in conjunction with **Chapters 6** and **7** of this volume of the EIS.

8.2 METHODOLOGY

6 This chapter has been prepared using the recommendations set out in the Environmental Protection Agency's (EPA) document *Guidelines on Information to be contained in Environmental Impact Statements* (March 2002). The guidelines and recommendations of the National Roads Authority (NRA) *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (*2009) were also considered in the preparation of this chapter.

7 The information contained in this chapter has been divided into sub-sections, so as to describe the various aspects pertaining to the water environment. In the preparation of this chapter the following sources of information were used in order to evaluate the regional and site specific context and character of the CMSA:

- EPA water quality monitoring data for watercourses in the area, www.epa.ie;

- EPA (2006). *Water Framework Directive* (WFD) *Monitoring Programme*;
- EPA (2005). *The Characterisation and Analysis of Ireland‟s River Basin Districts* (RBDs);
- *Neagh Bann International River Basin District* (2012) and *River Basin Management Plan* (2009-2015);
- *North Western International River Basin District* (2012) and *North Western River Basin Management Plan* (2009-2015);
- Inland Fisheries Ireland (IFI) *Sampling Fish for the Water Framework Directive (2008-2012);*
- EPA (2011). *Integrated Water Quality Report Monaghan & Louth*;
- Office of Public Works (OPW) flood mapping data, www.floodmaps.ie;
- OPW *Guidelines for Planning Authorities, The Planning System and Flood Risk Management (2009);*
- Natura Environmental Consultants in association with the National Roads Authority (NRA) (2005). *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*;
- *Guidelines for Planning Authorities, The Planning System and Flood Risk Management (2009);*
- CIRIA 532 (London, 2001). *Control of Water Pollution from Construction Sites,* Guidance for Consultants and Contractors;
- CIRIA 648 (London, 2006)*Control of Water Pollution from Linear Construction Projects;*
- Site visits of the CMSA; and
- Consultation with prescribed authorities.

8 The evaluation the CMSA is considered detailed and sufficient to adequately evaluate the hydrological setting.

9 All projects and developments that require an EIS are of a scale or nature that they have the potential to have an impact on the environment. With respect to the construction of a transmission line, the impact on the water environment is considered low in comparison to other linear projects such as road or pipeline developments.

10 In this chapter the potential impacts on the water environment resulting from the proposed development is evaluated and mitigation measures are proposed to reduce any significant impacts. Based on the mitigation measures proposed, the significance of the residual impact on the water environment is determined.

11 Criteria for evaluating impact level have been derived and are shown in **Table 8.1**. Terminology for impact significance and duration follows that set out in the EPA's *Guidelines on Information to be contained in Environmental Impact Statements* (March 2002). The magnitude of any effects considers the likely scale of the predicted change to the baseline conditions, resulting from the predicted effect and takes into account the duration of the effect i.e. temporary or permanent. Definitions of the significance and magnitude of any effects are provided in **Tables 8.1** and **8.2**.

Table 8.1: Significance Criteria and Examples

Importance	Criteria	Selected Examples
Very High	Attribute has a high quality and rarity on a regional or national scale.	Site protected under EU/ Irish legislation (SAC, cSAC, SPA, pSPA, NHA, pNHA)
High	Attribute has a high quality and rarity on a local scale.	Large rivers, important social or economic uses such as water supply or navigation. Good quality rivers (Q4 to Q5). May be designated as a local wildlife site.
Medium	Attribute has a medium quality and rarity on local scale.	May support a small / limited population of protected species. Limited social or economic uses. Regionally important aquifer. Inner source protection for locally important water source.
Low	Attribute has a low quality and rarity on a local scale.	No nature conservation designations. Low aquatic fauna and flora biodiversity and no protected species. Minimal economic or social uses.

Table 8.2: Magnitude Criteria and Examples

Magnitude	Criteria	Examples
Major Adverse Impact	Fundamental change to water quality or flow regime.	Calculated risk of serious pollution incident >2% annually.[25] Loss of protected area. Pollution of potable sources of water abstraction. Deterioration of water body leading to a failure to meet Good Status[26] under the WFD and reduction *in class (or prevents the successful implementation of mitigation measures for heavily* modified or artificial water bodies).
Moderate Adverse Impact	Measureable change to water quality or flow regime.	Loss in production of fishery. Discharge of a polluting substance to a watercourse but insufficient to change its water quality status (WFD class) in the long term. No reduction in WFD class, but effect may prevent improvement (if not already at Good Ecological Status) or the successful implementation of mitigation measures for heavily modified or artificial water bodies. Calculated risk of serious pollution incident >1% annually.[27]
Minor Adverse Impact	Minor change to water quality or flow regime.	Measurable changes in attribute but of limited size and / or proportion, which does not lead to a reduction in WFD status or failure to improve. Where the proposed development provides an opportunity to enhance the water environment but does not result in an improvement in class, status, output or other quality indicator.
Neutral or Negligible Impact	No measureable impacts on water quality or flow.	Calculated risk of serious pollution incident <0.5% annually. No effect on features, or key attributes of features, on the Protected Areas Register. Discharges to watercourse but no significant loss in quality, fishery productivity or biodiversity. No effect on WFD classification or water body target.

[25] NRA guidelines (2009.)
[26] Good Status as defined under the Water Framework Directive (2000/60/EC).
[27] NRA guidelines (2009).

12 Impact ratings may have negative, neutral or positive application where:

- Positive impact – A change which improves the quality of the environment;
- Neutral impact – A change which does not affect the quality of the environment; and
- Negative impact – A change which reduces the quality of the environment.

13 Terms relating to the duration of impacts are as described in the EPA's *Guidelines on Information to be contained in Environmental Impact Statements* (March 2002) as:

- Temporary Impact - lasting one year or less;
- Short term Impact - lasting one to seven years;
- Medium term Impact - lasting seven to fifteen years;
- Long term Impact - lasting fifteen to sixty years; and
- Permanent Impact - lasting over sixty years.

14 A qualitative approach was used in the evaluation, generally following the significance classification in **Table 8.3** and through professional judgement. The significance of a predicted impact is based on a combination of the sensitivity or importance of the attribute and the predicted magnitude of an effect. Effects are identified as beneficial, adverse or negligible, temporary or permanent and their significance as major, moderate, minor or not significant (negligible).

Table 8.3: Impact Assessment Criteria Matrix

Importance/ Sensitivity	**Magnitude**			
	Major Adverse	**Moderate Adverse**	**Minor Adverse**	**Negligible**
High/Very High	Major/ profound	Major	Moderate	Negligible
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible
Negligible	Minor	Minor	Negligible	Negligible

15 In order for a potential impact to be realised, three factors must be present. There must be a source or a potential effect, a receptor which can be adversely affected, and, a pathway or connection which allows the source to impact the receptor. Only when all three factors are present can an effect be realised.

16 Baseline conditions have been established through a detailed desk study and consultation with relevant prescribed bodies, including the EPA, Monaghan and Cavan County Council and the Inland Fisheries Ireland (IFI). (Refer to Chapter 3, **Volume 3B** of the EIS for details on scoping and statutory consultation).

17 The scoping opinion received from An Bord Pleanála (refer to **Appendix 1.3, Volume 3B** of the EIS) identified the following issues as being relevant to this chapter of the EIS:

- Identification and assessment of the potential water quality impacts of excavation and construction activities proximate to or across watercourses along the route corridor, inclusive of the effects of nutrient release from site clearance or vegetation decomposition.

- An assessment of the potential hydrogeological impacts, including potential impacts on wetlands and drinking water sources.

- Submission of a construction method statement and management plan addressing potential impacts on water quality, including measures to protect water quality when diverting field drains or pumping groundwater which may impact on watercourses some distance away.

8.2.1 Legislative Context

18 The following legislation was considered as part of this impact evaluation:

- *Consolidated EIA Directive 2011/92/EU*;

- *Environmental Liability Directive* (2004/35/EC);

- *European Communities (Quality of Salmonid Waters) Regulations, 1988* [S.I. No. 293/1988]*;*

- *European Communities (Drinking Water) Regulations 2014* [S.I. No. 122/2014];

- *European Communities (Water Policy) Regulations 2003* [S.I. No. 722/2003];

- *European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2014* [S.I. No. 31 /2014];

- *Fisheries (Consolidation) Acts, 1959-2003*;

- The *Local Government (Water Pollution) Acts 1977-2007* provide for the prevention of water pollution in Ireland;

- *Wastewater Discharge (Authorisation) (Amendment) Regulations 2010* [S.I. No. 231/2010]; and

- *Water Framework Directive* (2000/60/EC).

8.2.2 Scope of Evaluation

19 This water impact evaluation focuses principally on the construction phase, as it is during this phase of the proposed development that there is the greatest potential for adverse effects to occur to surface water bodies. The evaluation has considered the construction methodology associated with the installation of each tower, together with any associated temporary infrastructure, including temporary access routes, stringing activities, guard poles and tree lopping.

20 Although the ecological sensitivity of watercourses has been considered in this chapter, **Chapter 6** of this volume of the EIS provides an evaluation of interrelationships with receptors of ecological sensitivity which includes information on European protected sites and habitats.

21 Determining the appropriate spatial study area is important to ensuring that this water quality impact evaluation is robust and accurately predicts the potential effects on surface water bodies. There is no formal published guidance on this matter and thus the zone within which there is the potential for significant effects has been determined based on the description of the development and the construction methodology outlined in Chapter 7, **Volume 3B** of the EIS and professional judgement.

22 Due to the nature of the hydrological environment, it is necessary to consider the upstream and downstream effects of the proposed development, with particular attention on the main surface water streams in the area.

8.2.3 Design Summary

23 Construction working areas and stringing areas are all relevant design details when determining the risk posed to any nearby water features. Wherever possible, temporary access routes, tower locations and stringing areas have been located away from watercourses, or the working area orientated to avoid watercourses. Where this is not possible, recommendations have been proposed to prevent pollutants running off into the watercourse.

24 Chapter 7, **Volume 3B** of the EIS details how the proposed development will be constructed and outlines the phasing of construction. The result of this phasing is that multiple towers may be constructed simultaneously close to the same watercourse, or within the same river

catchment. The construction of the OHL will be undertaken in five general stages, according to the following sequence, on a rolling programme of estimated durations:

- Stage 1 – Preparatory Site Work (1 – 7 days);
- Stage 2 – Tower Foundations (3 – 10 days);
- Stage 3 – Tower Assembly and Erection (3 – 4 days);
- Stage 4 – Conductor/ Insulator Installation (7 days); and
- Stage 5 – Reinstatement of Land (1 – 5 days).

25 All site works including temporary access routes, tower foundations, guarding locations, tree lopping and stringing will be conducted in an environmentally responsible manner, so as to minimise any adverse impacts to watercourses that may occur as a result of works associated with the construction phase. A CEMP will be prepared to ensure adequate protection of the water environment (incorporating all mitigation measures detailed in this chapter).

26 Where possible, existing farm and field access routes will be used to avoid disruption to local landowners as outlined in Chapter 7, **Volume 3B** of the EIS. Where these pass close to watercourses or drainage ditches, mitigation will be required to ensure that the water body is protected from erosion or pollution. The principal concern regarding temporary access routes with respect to water quality, are the physical effects that may occur during any stream crossings that are required, and the potential for particulates and oils to runoff into watercourses. This evaluation adopts a precautionary approach, so where there is a risk, appropriate mitigation measures are provided.

8.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

27 The main potential impacts on the water environment occur during the construction phase. Details of the potential impacts are included in **Section 8.5**. Overall the construction programme is anticipated to last approximately three years. The proposed development entails the construction of towers with individual sites separated by 340m on average. In general the phases of construction can be broken down into the following: site preparation works including minor civil works such as placing of temporary access routes, removal of fences and erection of temporary fencing, installation of tower foundations, erection of towers, guard poles, tree lopping, stringing of conductors, commissioning of the line and reinstatement of land.

8.4 EXISTING ENVIRONMENT

28 The regional setting of the proposed development in relation to the surface water environment is shown in Figures 8.1 – 8.4, **Volume 3C Figures** of the EIS.

29 Baseline conditions have been established through a detailed desk study, field study and consultation with relevant prescribed bodies, including the EPA, Monaghan County Council, Cavan County Council and the IFI. (Refer to Chapter 3, **Volume 3B** of the EIS for details on scoping and statutory consultation). Where such information has been available, the desk study included the following:

- Review of Ordnance Survey Ireland (OSi 1:50,000 Discovery Mapping Series) maps to identify the locations of surface water bodies;
- Review and collation of EPA (www.epa.ie) and WFD (www.wfdireland.ie) quality data in relation to surface water close to the proposed development;
- Identification of surface waters containing salmonid and/or cyprinid fish species; and
- Identification of sensitive waters.

30 Site visits of the CMSA were carried out between March 2009 and July 2009, in April 2011 and between July and September 2013 by TOBIN Consulting Engineers (by suitably qualified scientists / engineers) in order to visually evaluate the water environment in the vicinity of the proposed development in the CMSA. The site visits comprised recording of drainage patterns, drainage ditches, recording of hydrological conditions and visual evaluations of watercourses and watercourse crossings.

8.4.1 Hydrology

31 The proposed line route traverses the Hydrometric Area 06 (River Dee/ River Glyde / River Fane and their tributaries), Hydrometric Area 36 (River Erne and its tributaries), and Hydrometric Area 03 (River Bann and its tributaries). A large number of small rivers and streams traverse the CMSA (see **Table 8.4**). No major rivers are crossed by the proposed line route (3rd order river or above). The Stream / River Order was obtained from the EPA website (www.epa.ie) and based on stream order classification (Strahler, 1952).

32 Towers 103 and 109 are located in the Clontibert River Catchment. The Clontibret River and its tributary, the River Moy flows in a north-westerly direction along the border between Northern Ireland and Ireland. The Clontibret River discharges into the Cor River, which ultimately flows into the River Bann.

33 The headwater of the River Fane is located along the Armagh / Monaghan Border (Towers 109-130) and drains towards Lough Muckno. The River Fane flows to the south-east before eventually discharging to Dundalk Bay and the Irish Sea.

34 The Annalee River and its tributaries which are part of the River Erne catchment, flows through the central section of the proposed development.

35 The Dromore River and Annalee River flow in a westerly direction towards Butlers Bridge and Lough Erne before entering Donegal Bay at Ballyshannon.

36 The Dee / Glyde / Lagan River and their tributaries are crossed at the southern section of the proposed line route between Towers 185 and 237.

37 A number of smaller tributary streams and rivers are located adjacent to but removed from the proposed line route. There is a high drainage density throughout due to the low permeability soils and bedrock. Additionally, a number of lakes are located in the inter-drumlin hollows.

Table 8.4: Surface Water Features and Hydrometric Areas along the Alignment

Hydrometric Area	River	Tributaries	Towers	% of towers in each hydrometric area
Hydrometric Area 03	Neagh Bann – Clontibert River	River Moy	103-108	5
Hydrometric Area 06	Fane (and tributaries)	Fane River and Dunfelimy Stream	109-130	16
Hydrometric Area 06	Glyde River	Glyde Upper and River Lagan	190-194, 201-226	23
Hydrometric Area 06	Dee River	Dee Upper and Ervy Lough Stream	227-237	7
Hydrometric Area 36	River Erne – (and tributaries)	Knappagh River	156-188	49
		Annalee River	189, 195-200	
		Dromore River	131-155	

8.4.2 Water Framework Directive Requirements

38 European Communities Directive 2000/60/EC, which established a framework for community action in the field of water policy (commonly known as the WFD), requires ‗good status' for European waters by 2015. This is to be achieved through a system of river basin management planning and extensive monitoring. In 2004, a characterisation and analysis of all River Basin Districts (RBD) in Ireland was undertaken as required by article 5 of the WFD. In this characterisation study, the impacts of a range of pressures were evaluated including diffuse and point pollution, water abstraction and morphological pressures (e.g. water regulation structures). The purpose of this exercise was to identify water bodies at risk of failing to meet the objectives of the WFD by 2015, 2021 and 2027. Measures to address and alleviate these pressures are to be included in a formal programme of measures to be submitted to the European Commission.

Table 8.5: Selection of WFD Classifications for the Major Rivers along the Alignment

EPA River Name EPA River Code	**River RBD Status**	**If not at good status, the reason for not achieving good status**	**RBD Surface Water Catchment Name**	**Good Status by**
Ervy Lough Stream NB_06_733	Poor	Overall ecological status including macroinvertebrate status and Hydromorphology status	NB_Dee96_DeeTRIB_ErvyLoughStream	2021
Glyde Upper NB_06_484	Good	-	NB_Glyde95_Glyde3_Upper	2015
Glyde Magheracloone NB_06_246	Good	-	NB_Glyde95_GlydeTRIB_Magheracloone1_Lower	2015
Glyde Magheracloone NB_06_886	Poor	Overall ecological status	NB_Glyde95_GlydeTRIB_Magheracloone2_Upper	2021
Annalee Upper NW_36_1947	Moderate	Overall ecological status	NW_Erne123Annalee_Annalee5_Upper	2021
GlydeTRIB_Rahans 2 NB_06_158	Poor	Overall ecological status	NB_Glyde95_GlydeTRIB_Rahans2_Upper	2021

EPA River Name EPA River Code	**River RBD Status**	**If not at good status, the reason for not achieving good status**	**RBD Surface Water Catchment Name**	**Good Status by**
Knappagh NW_36_1559	Moderate	Overall ecological status	NW_Erne123Annalee_KnappaghTRIB_ShantonaghLough	2015
Knappagh Lower NW_36_1068	Poor	Overall ecological status including macroinvertebrate status	NW_Erne123Annalee_AnnaleeTRIB_Knappagh1_Lower	2021
Knappagh NW_36_684	Moderate	Overall ecological status	NW_Erne123Annalee_KnappaghTRIB_Aghmakerr	2015
Dromore NW_36_1691	Poor	Overall ecological status	NW_Erne123Annalee_DromoreTRIB_Corrybrannan	2021
Major Lough Stream NW_36_1050	Good	-	NW_Erne123Annalee_MajorLoughStreamTRIB_Toome	2015
Dromore NW_36_895	Good	-	NW_Erne123Annalee_DromoreTRIB_MajorLoughStream1_Lower	2015
Major Lough Stream NW_36_1334	Poor	Overall ecological status	NW_Erne123Annalee_MajorLoughStreamTRIB_Corfin	2021
Fane – Dunfelimy Stream NB_06_406	Bad	Overall ecological status and General physico-chemical status	NB_Fane94_FaneTRIB_DunfelimyStream	2021
Blackwater-Clontibret Stream NB_XB_03_9	Poor	Overall ecological status and General physico-chemical status	NB_Blackwater	2021

NOTE – Status: By ‗Status' it is meant the condition of the water in the waterbody. It is defined by its chemical status and its ecological status, whichever is worse. Waters are ranked in one of 5 status classes: High, Good, Moderate, Poor, Bad. However, not all waterbodies have been monitored, and in such cases the status of a similar nearby waterbody has been used (extrapolated) to assign status.

39 In relation to protected areas under the WFD, it indicates the following:

- There are no ‗Registered Protected Areas' (RPA) nutrient sensitive rivers along the proposed line route, with the exception of the River Proules, located 1km east of the construction material storage yard;

- There are no RPA habitat rivers along the proposed line route;
- There are no RPA nutrient sensitive lakes and estuaries along the proposed line route; and
- There are no RPA shellfish areas along the proposed line route.

40 Based on the available information, the majority of the Erne, Fane, Glyde and Dee catchments are ‗at Risk of not achieving Good Status‘ in relation to Surface Water (1a status).

41 The Erne, Glyde, Fane and Dee catchments are located in predominantly agricultural land. The catchments are comprised primarily of pastureland with substantial areas of arable crops. The causes of the high number of ‗At Risk‗ Category Rivers on the Dee, Glyde and Fane catchments are due to the following areas:

- Diffuse Pollution (i.e. Agriculture);
- Point Source Pollution (Wastewater);
- Morphological Pressures;
- Water Abstraction; and
- Tourism and Recreation.

42 Agriculture, Wastewater Treatment Plants (WWTP) and septic tanks are thought to contribute over 95% of the total polluting matter. Agricultural sources are the suspected causes in all cases with the exception of the River Glyde and River Proules where WWTP point source pollution is suspected.

8.4.3 Surface Water Quality

43 The EPA monitors the quality of Ireland‘s surface waters and assesses the quality of watercourses in terms of four quality categories; ‗unpolluted‘, ‗slightly polluted‘, ‗moderately polluted‘, and ‗seriously polluted‘. These water quality categories and the water quality monitoring programme are described in the EPA publication *Water Quality in Ireland, 2001-2003* (2005).

44 The water quality assessments are largely based on biological surveys. Biological Quality Ratings or Biotic Indices (Q values) ranging from Q1 to Q5 are defined as part of the biological river quality classification system. The relationship of these indices to the water quality classes defined, are set out in **Table 8.6**.

Table 8.6: Relationship between Biotic Indices and Water Quality Classes

Biotic Index	Quality Status	Quality Class
Q5, 4 - 5, 4	Unpolluted	Class A
Q3 - 4	Slightly Polluted	Class B
Q3, 2 - 3	Moderately Polluted	Class C
Q2, 1 - 2, 1	Seriously Polluted	Class D

45 A review of monitoring station results suggests that, in general, the majority of the rivers along the alignment of the proposed development in the CMSA are slightly to moderately polluted.

46 Data from EPA monitoring stations indicates that the majority of the surface water in the Dromore River catchment is slightly to moderately polluted. Examples of monitoring station data closest to the proposed line route are included with water quality results from 1997 - 2013. Refer to Appendix 8.1, **Volume 3C Appendices** of the EIS.

47 The, majority of the Annalee River stations are classified as slightly polluted to unpolluted. Water quality in the River Fane is poor with the majority of stations classified as seriously polluted. Examples of these stations are included in **Table 8.7** with the water quality results from 1997-2013.

48 The River Glyde and its tributaries, had a higher proportion of unpolluted stretches of waterways when surveyed by the EPA in 2012, compared to the rivers in the northern part of the CMSA.

Table 8.7: Selection of Biotic Indices (1997-2013) for the Major Rivers along the Proposed Alignment

River	Monitoring Location	Biotic Index					
		1997/ 1998	2000/ 2001	2003/ 2004	2006/ 2007	2009/ 2010	2012/ 2013
River Glyde	Cormey Bridge	4-5	4-5	4	4	4	3-4
	Lagan Br	3	4	4	4-5	4-5	4
	Aclint Br	-	4	4	-	4	4
River Dee	Br u/s Ervy Lough	4	3-4	4	3-4	3-4	3-4
	Br to North of Every Crossroads	4	4	4	4	-	-
	Tom's Bridge	3	3-4	3	3	3-4	3
River Fane	South Br Dunfelimy	2-3	2-3	2-3	2/0	3	3
	2nd Br u/s Laragh L (Malin Road)	3	3	3	3	-	-
	Derrycreevy Br	3-4	3	3	3-4	3-4	3
	Clarebane Br	3	3-4	3	3	3	3
	Ballynacarry Br	4	4	3-4	3-4	4	4
Annalee River	2nd bridge u/s L Sillan	3-4	4-5	3-4*	4	3-4	4
	Annafarney Br	3	3	3	3	3	3
	Br nr Ann's Fort	4	3-4	4	4	4	4
Knappagh (tributary of the Annalee	Bridge u/s Bellatrain Lr	3	3*	4	3	3-4	-
	Lackan Br	3	3-4*	3-4*	-	3	-
	Br u/s Annalee River Confluence	3	3-4*	4	3-4	3-4	-
Dromore	Br NE of Corryloan L	4	4	4-5	4	4	-
	Br d/s Ballintra	3-4	3-4	3-4	4	4	-

River	Monitoring Location	Biotic Index					
		1997/ 1998	2000/ 2001	2003/ 2004	2006/ 2007	2009/ 2010	2012/ 2013
River	Br SW of Bartley's	3	3	4	3-4	3-4	-
	Br SE of Edenaferkin	3-4	3	3-4	-	3-4	-
	Br in Ballybay	3-4	-	3	3-4	3-4	-
	Br d/s L Major	3	3	3-4	-	3	-
	Balladian Br	3	3	3	3	3	-
Clontibret Stream	Bridge in Clontibret	3	3	3	3	3	2-3
	Bridge SW of Clerran	-	-	3	3	-	3
	Bridge E of Killyneill Crossroads	4	3	3	3	3	3

(Source: EPA data (www.epa.ie))

49 Outlined below is an summary of the recent water quality data from the EPA website (www.epa.ie):

- *"The Fane River continued to be in a generally unsatisfactory ecological condition in its upper section in September 2012, with poor ecological condition recorded at South Bridge at Dunfelimy (0150), Derrycreevy Br (0200) and Ballynacarry Br (0400). The lower section of the Fane River retained its good ecological condition at Inniskeen Br (0650) and at Stephenstown Br (0900)."*

- *"The dominance of pollution tolerant species continues to indicate unsatisfactory conditions at all sites on the Knappagh River in 2010. Signs of moderate pollution such as paucity of pollution sensitive macroinvertebrates, excessive weed and algal growth, excessive siltation and low DO (77%) were apparent at Lacken bridge (0400), exacerbated by lake effects."*

- *"Once again the Dromore River remains in a generally unsatisfactory ecological condition in 2010. Only the two uppermost sites (0015 and 0036) of the ten stations surveyed were in a satisfactory ecological condition. Signs of nutrient enrichment such as dominance of tolerant macroinvertebrate species, paucity of pollution sensitive macroinvertebrates, excessive weed and/ or algal growth, depressed DO and excessive siltation were apparent at all sites surveyed largely due to the effects of sewage and* *agriculture on the lakes along the rivers course, and the further effects of these lake outflows on the biota of the river itself."*

- *"There was a noticeable overall welcome improvement in ecological quality in the Annalee in 2013, with only one out of eleven sites sampled classed as unsatisfactory. This site occurs immediately downstream of Lough Sillan (0150), with excessive macrophyte growth a feature."*

- *"Macroinvertebrate fauna indicated a general overall deterioration in the condition of the Glyde River since 2009. Despite satisfactory ecological conditions recorded at all sites assessed in 2009, currently only the middle reaches of the river (Lagan Br (0400), Aclint Br (0500) and Br W Mullacrew (0600)) merited good ecological condition in 2012. Disappointingly, the other five sites were downgraded to moderate ecological condition."*

- *"There has been no change in the ecological condition of the Clontibret Stream for over a decade, with moderate pollution noted again in July 2010. This once great brown trout stream continues to come under pressure from suspected agricultural and sewage sources."*

50 **Water Quality Summary** Most Rivers (with the exception of the River Glyde / Dee) along the proposed alignment are suffering from water quality problems, principally eutrophication from suspected agriculture sources and WWTP. The Fane River remained in a less than satisfactory condition due to widespread eutrophication, the most obvious symptom of which was the abnormally luxuriant growth of filamentous algae which can seriously upset the dissolved oxygen (DO) regime and stimulate the precipitation of calcium carbonate (marl) on the river bed thus obliterating essential niches for a variety of mayfly and stonefly indicator species. Most of the rivers in the Dromore catchment are moderately to slightly polluted.

8.4.3.1 Lakes

51 The proposed alignment is within the catchment of a number of lakes. Lakes are generally located in inter-drumlin hollows. A number of these lakes have wetland edges and are considered further in **Section 8.8**. The EPA carried out water quality monitoring on Irish lakes between 2007 and 2012. **Table 8.8** sets out the EPAs lake classification system.

Table 8.8: Trophic Classification System for Lakes

Lake Trophic Category	Target Trophic Status	Total Phosphorous Average Concentration (µg P/l)	Annual Max. Chlorophyll (mg/m^3)
Ultra-Oligotrophic	Ultra-Oligotrophic	≤ 5.0	< 2.5
Oligotrophic	Oligotrophic	> 5 ≤ 10	> 2.5 < 8
Mesotrophic	Mesotrophic	> 10 ≤ 20	≥ 8 < 25
Eutrophic	Mesotrophic	> 10 ≤ 20	≥ 8 < 25
Hypertrophic	Eutrophic	> 20 ≤ 50	≥ 25 < 75

52 The major lakes present in the CMSA include the following:

- Boraghy Lake (located approximately 200m north-west of Tower 163);
- Bocks Lough (located approximately 210m east of Tower 175);
- Lough Egish (H) (located approximately 600m south-east of Tower 161 and 162);
- Crinkill (Toome) Lough (south-east) (located approximately 500m north-east of Tower 146);
- Corlin Lough (located approximately 890m west of Tower 134);
- Lough Morne (located approximately 250m west of Tower 166); and
- Drumgristin, Coogan's and Ghost Lough (located approximately 220m east of Tower 130).

53 Of the lakes detailed above, the EPA carried out water quality monitoring at Lough Egish and Muckno Lough. The water quality of Lough Egish was found to be hypertrophic, which is classified by the EPA to be highly polluted and poor ecological status in 2011. The water quality of Muckno Lough was also found to be hypertrophic or highly polluted and poor ecological status in 2012. Historical data from Crinkill (Toome) Lough was found to be strongly eutrophic, which is also classified by the EPA as highly polluted. A number of minor and unnamed lakes/ ponds are also located along the proposed line route as follows:

- Tassan Lough (located approximately 300m south of Tower 115);
- Muff Lough (located approximately 265m south-east of Tower 226);
- Lough in Raferagh Townland (located approximately 100m west of Tower 198);
- Lough in Corvally Townland (located approximately 150m south, south-west of Tower

193 and approximately 150m north north-west of Tower 194); and

- Lough in Comertagh Townland (located approximately 200m south of Tower 201).

8.4.3.2 Protected Areas and Fisheries

54 There are no riverine SACs/ cSACs along the proposed alignment within the CMSA. Consultation was held with the National Parks and Wildlife Service (NPWS) and IFI designations department regarding the proposed line route. The rivers along the proposed line route are potential salmonid streams. In general, the potential for Salmonids (Atlantic Salmon and Trout) is greatly reduced where the Q values drops below Q3 or Q3 - 4. Non-salmonids or coarse (cyprinid) fish (Rudd, bream etc.) dominate the fish community at ‗poor'-quality (Q2 – 3) sites but decrease to <10% of the fish population at ‗high'- quality (Q4 – 5 and Q5) sites. Salmonids dominate the community at high-quality sites and decrease to <20% at poor-quality sites as outlined in the EPA's *Investigation of the Relationship between Fish Stocks, Ecological Quality Ratings (Q-values), Environmental Factors and Degree of Eutrophication*" (2000).

8.4.3.3 Importance of Surface Water Features

55 The importance of the relevant surface water bodies within the CMSA has been evaluated by applying the criteria presented in the methodology in **Section 8.2** to the baseline information presented throughout this section. The level of importance for each water receptor within the CMSA and the justification for their classification is set out in **Table 8.9**.

Table 8.9: Importance of Surface Water Features

Surface Water Feature	Justification	Level of Importance
N/A	SACs, cSACs, SPAs, pSPAs NHAs, pNHAs	Very High
Tributaries of the Glyde River, Dromore River, Glyde River, Knappagh River, i.e. Major Lough Stream NW_36_1050; Dromore NW_36_895; GlydeMagheracloone *NB_06_246;* *Glyde Upper NB_06_484* *Toome Lake*	Q4 Rivers Q4-5 Rivers Q5 Rivers Surface water abstraction lakes	High
Tributaries of the Glyde River, Dromore River, Dee River, Glyde River, Knappagh River, Fane River, Clontibret River,	2nd Order River, 1st Order River	Moderate
Streams	1st, 2nd and 3rd order streams	Low

Surface Water Feature	Justification	Level of Importance
Drainage Ditches and field drains	No data is available for these minor watercourses, some of which are ephemeral or have very limited flow. None are designated under the WFD, although they may contribute a small amount of flow to larger watercourses within the study area as identified above. In addition, although these minor watercourses may have some local importance in terms of land drainage and water supply for farm animals, during the site visit many were observed to be dry, heavily poached or eutrophic.	Negligible

8.4.3.4 Flooding Data

56 Substantial areas of the Glyde and Dee catchments have been artificially drained to improve agricultural land from the 1960s to 1980s. The Glyde catchment has been modified to prevent flooding, improve agricultural fields and allow for urban development. The River Dee and its tributaries have been artificially drained since the 1960s. Areas historically prone to flooding include areas of mapped alluvial sediments however OPW flood relief works have decreased the frequency of flood events.

57 The OPW ‗Flood Mapping Database' was used in order to obtain information on historical flooding events in the CMSA. This information was used to establish the current baseline conditions in terms of what sections of the area are liable to flood. No significant recorded floods have taken place within the CMSA along the alignment of the proposed line route or at tower bases. Tower sites may be subject to pluvial inundation in wet weather. Additional sources of information including internet searches, historical maps, data from Catchment Flood Risk Assessment and Management Studies (CFRAMs) and flood risk assessments were also consulted. The construction material storage yard is not located in a flood prone area (Flood Zone C) based on the preliminary flood risk assessment (PFRA) maps.

58 Data on historical flooding are limited but the records indicate that flooding has occurred in the following areas:

- Flooding of the Bocks Lough and Tullyglass (low lying ground between Towers 176 and 177 and Bocks Lough to the north-east; and
- Flooding along Dromore River north of Ballintra Bridge (located approximately 0.2km to the west of Tower 140).

59 The proposed towers are not located on any major flood plain and will not interfere with either the water levels or flow of the Dromore River, Glyde River and its tributaries or Dee River.

8.5 POTENTIAL IMPACTS

8.5.1 Do Nothing

60 In the case of no development occurring, there would continue to be changes in water environment as a result of ongoing land management within the CMSA. It is most likely that the area would continue to be managed intensively for agriculture and commercial forestry. Possible changes in management could include further land drainage and land use change, all of which would have a potential impact on water quality of the CMSA. However, it is not expected that these changes in land use would be influenced by whether the proposed development proceeds or not.

8.5.2 Construction Phase

61 Further details on the proposed construction methodology which will directly influence potential construction impacts to the water environment are discussed in Chapter 7, **Volume 3B** of the EIS. Based on the nature of the proposed development and the baseline water data collected, the following activities warrant specific attention in the water impact evaluation and hence in the design of the proposed development:

- Felling of forestry;
- Placing of temporary access routes, where necessary;
- Construction of tower foundations and towers;
- Works near watercourses;
- Construction materials;
- Stockpiling material; and
- Stringing of conductors.

62 These activities may impact on the water environment by having the potential to cause:

- Flow Alterations;
- Sediment Discharges; and
- Contaminant Discharges.

63 The installation of guard poles and tree lopping activities will not have a significant impact on the water environment based on methodologies outlined.

8.5.2.1 Flow Alterations

64 During construction, there is potential for increased runoff due to the introduction of temporary access routes, soil disturbance, soil compaction and stockpiling of soils. This may increase the rate and volume of direct surface runoff. The potential environmental impact of this is to increase flow rates, leading to increases in channel erosion and sediment loading reaching watercourses. It may be necessary to divert sections of dry drains / drainage ditches or underground services where encountered, thereby increasing potential sediment runoff. If excavations for tower bases encounter groundwater, such inflows may need to be pumped, resulting in short term localised drawdown of the water table and discharges to the surface water channels.

65 A review of baseline information on historical flooding and flood risk has been presented in **Section 8.4**. The proposed line oversails a number of watercourses with floodplains and known areas of historical inundation, however the towers are located away from these floodplains and it is not predicted to have significant adverse effects on flooding. Tower foundations and temporary access routes are not predicted to significantly affect the capacity of floodplains through which they pass or the hydrological character of these areas.

66 Temporary flooding, either pluvial or fluvial, at the bases of the towers will not have a detrimental effect on the operation of the proposed development. The proposed construction material storage yard was historically pluvially inundated, however the construction of the N2 has altered the flow in the vicinity of the site. Based on the present site layout the site is not a flood risk.

8.5.2.2 Sediment Discharge

67 Suspended solids can potentially impact on surface water quality by clogging the gills of fish, covering spawning sites, leading to loss of habitats on the riverbed, and stunt aquatic plant growth by limiting oxygen supplies, shelter and food sources.

68 Site preparation works for OHL construction include the use of temporary access routes to the tower positions (refer to Chapter 7, **Volume 3B** of the EIS for further details) and may include minor civil works around the tower location including, *inter alia*:

- Clearing the site works area;
- Levelling of the tower foundation area (if required);
- Diversion of field drains where existing drainage is present at the location of a tower foundation;

- Delineation of any on site working area (e.g. erection of temporary fencing etc.);
- Diversion of any existing utilities (e.g. underground water pipes, cables etc.); and
- Erection of guarding positions.

69 Additionally, felling of commercial forestry will be undertaken along the line route. During the elements of the construction works, potential exists for discharge of sediment from the works area, to adjacent watercourses. Tower foundations (per tower leg) typically range from 2m to 3.5m in depth to the invert level of the foundation and anywhere from 2 x 2 metres squared, to 9 x 9 metres squared in plan area depending on tower type. Details of foundation types are included in Chapter 7, **Volume 3B** of the EIS.

70 There is the potential for the release of sediments into watercourses as a consequence of the following activities:

- Soil stripping for tower foundations works area and other infrastructures;
- Felling of forestry, where necessary;
- Soil excavation for tower foundations;
- Run-off and erosion from soil stockpiles (prior to reinstatement); and
- Dewatering of excavations for tower foundations.

71 No significant areas of mature forestry are located on the CMSA line route.

72 The potential result of increased sediment (suspended solids) loading to watercourses is to degrade water quality of the receiving waters and change the substrate character. Potential impacts relates to the following sensitive locations where towers are located near rivers:

- Q4 Rivers – Major Lough Stream NW_36_1050; Tower 223 located approximately 0.25km to the river;
- Dromore NW_36_895; Towers 139-140 located over 0.15km to the river;
- GlydeMagheracloone NB_06_246; Towers 204 located approximately 130m to the stream;
- Glyde Upper NB_06_484; Towers 224 and 219 located approximately 20m to the stream;

- Toome Lake – Surface water abstraction; Towers 145-149 located approximately 0.5km to the lake, (Towers 145 – 154 are located in Toome Lake catchment); and

- Lough Egish – Surface water abstraction; Towers 161–163 located approximately >0.5km to the lake, (Towers 156 – 164 are located in Lough Egish catchment).

73 Chapter 6, **Volume 3B** of the EIS and **Chapter 13** of this volume of the EIS outline the approach to be taken to the widening of access points. Existing accesses could be temporarily enlarged to accommodate the larger types of construction vehicles. Widening of these crossings may require the increasing in length of existing bridges. If temporary structures are required, IFI approval will be sought regarding the specification and timing of installation. Short sections of drainage ditches may need to be temporarily culverted with the potential for sediment discharge. It is not proposed to ford any streams or rivers as part of this proposed development.

74 The River Proules is a nutrient sensitive stream which is located approximately 0.6km to the east of the construction materials storage yard. The main pressures on the River Proules are nitrate and phosphates from suspected wastewater discharges and agriculture. It is not proposed to discharge wastewater from the site therefore the construction compound will not impact on the nutrient status of the River Proules.

8.5.2.3 Contaminant Discharges

75 During the construction of the proposed development, there is a risk of accidental fuel pollution incidences. The potential impact of accidental spillages is limited by the size of the machinery used and the limited scale of construction at any location. Potential sources include the following:

- Spillage or leakage of oils and fuels stored on site;

- Spillage or leakage of oils and fuels from construction machinery/ vehicles;

- Spillage of oil or fuel from refuelling machinery on site; and

- The use of concrete and cement for the tower foundation.

76 Concrete (specifically, the cement component) is highly alkaline and any direct spillage to a local watercourse could impact on water quality and flora and fauna in the short term. There is potential for runoff from concrete into drains and other watercourses close to the works area which are potentially linked to more ecologically important streams, rivers and lakes.

77 Stringing is a non- intrusive operation and the only risk to watercourses is from a spillage of plant oil or fuel. This will be limited by the size of the fuel tank of the largest plant / vehicles used on the site, thus there is a relatively low potential impact from these works.

78 A review of baseline information on historical flooding and flood risk has been presented in **Section 8.4**. The proposed alignment oversails a number of watercourses with floodplains and known areas of historical inundation, however the towers are located away from these floodplains and it is not predicted to have significant adverse effects on flooding. Tower foundations and temporary access routes are not predicted to significantly affect the capacity of floodplains through which they pass or the hydrological character of these areas.

79 Temporary flooding, either pluvial or fluvial, at the bases of the towers will not have a detrimental effect on the operation of the proposed development.

8.5.2.4 Summary Construction Impacts on Key Water Receptors

80 Key water receptors will largely be avoided by the proposed development. Potential impacts during the construction phase of the proposed development may arise from surface water runoff from tree felling activities and excavations works. Accidental spillage of material, such as fuel oil or solvents, has the potential to pollute water features. At the most sensitive locations, such accidental spillage could result in a temporary localised moderate adverse potential impact, as there is also an associated pollution risk. The temporary potential impact however can be managed with appropriate mitigation measures as outlined in this EIS. **Table 8.10** summarises the impact evaluation of the construction phase (pre mitigation).

Table 8.10: Summary of Construction Effects

Impact	Receptors	Evaluation of Impact with Mitigation		
		Duration of Effect	Magnitude of Effect	Potential Impact
Potential Impacts (unmitigated)	Construction compound	Short term	Negligible	Negligible
	Crossings of Q4 Rivers	Short term	Minor adverse	Localised Minor Adverse
	All other tower locations	Short term	Negligible	Negligible
	Forestry felling	Short term	Negligible	Negligible

8.5.3 Operational Phase

81 There will be no direct discharges to the water environment during the operational phase. No other potentially significant impacts are anticipated during the operational phase.

8.5.4 Decommissioning

82 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration.

8.6 MITIGATION MEASURES

83 The design of the proposed development has taken account of the potential impacts of the proposed development and the risks to the surface water environment. Measures have been developed to mitigate the potential effects on the water environment. These measures seek to avoid or minimise potential effects in the main through the implementation of best practice construction methods and adherence to all relevant legislation.

8.6.1 Construction Phase

84 In order to mitigate potential impacts during the construction phase, all works associated with the construction of the proposed development will be undertaken with due regard to the guidance contained within CIRIA Document C650 *Environmental Good Practice on Site*. In addition mitigation measures will be incorporated into the CEMP.

85 All site works including temporary access routes, tower foundations and stringing will be conducted in an environmentally responsible manner so as to minimise any adverse impacts on water that may occur as a result of works associated with the construction phase. A CEMP will be employed to ensure adequate protection of the water environment. All personnel working on the proposed development will be responsible for the environmental control of their work and will perform their duties in accordance with the requirements and procedures of the CEMP. In terms of wastewater generated during the construction phase, welfare facilities on site will include self-contained chemical toilets. Foul drainage will be collected and treated off site. Potable water will be delivered to the site during the construction period.

86 To minimise any impact on the underlying subsurface strata from material spillages, all oils and fuels used during construction will be stored on temporary proprietary bunded surface (i.e. contained bunded plastic surface). These will be moved to each tower location as construction progresses. Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles will take place away from surface water gullies or drains. No refuelling will be allowed within 50m of a stream / river. Spill kits and hydrocarbon absorbent packs will be stored in this area and operators will be fully trained in the use of this equipment.

87 Any vehicles utilised during the operational phase will be maintained on a weekly basis and checked daily to ensure any damage or leakages are corrected. The potential impacts are limited by the size of the fuel tank of the largest plant / vehicles used on the site. Precautions will be taken to avoid spillages. These include:

- Use of secondary containment e.g. bunds around oil storage tanks;
- Use of drip trays around mobile plant;
- Supervising all deliveries and refuelling activities;
- Designating and using specific impermeable refuelling areas isolated from surface water drains; and
- Oil water separators will be used at construction compounds.

88 The surface water drainage system at the construction materials storage yard will take into account the recommendations of the CIRIA c648 *Control of Water Pollution from Linear Construction Projects*. Runoff from the construction materials storage yard will be limited to greenfield runoff rates. Runoff will pass through a silt trap, oil interceptor and settlement lagoon before being discharged to the surface water.

8.6.2 Felling of Forestry

89 While the quantity of commercial forestry is limited along the line route in the CMSA, (approximately 0.4ha), the clearance of forested areas should take place in accordance with the *Forestry and Water Quality Guidelines* (Department of the Marine and Natural Resources, 2000). In areas where tree felling is to be undertaken, the use of buffer zones and drainage ditches will be employed during felling, particularly on sloping ground, in order to mitigate the effects of increased surface runoff and associated sedimentation.

90 Consultation will be undertaken with IFI and the NPWS before commencing felling operations in areas of importance to fisheries and wildlife. Sediment traps will be installed prior to felling and maintained on a daily basis throughout felling operations. Trees will be felled away from the aquatic zone. Machine extraction will not occur in the riparian zone.

91 On sites where risk of erosion is high (steep slopes and/ or adjacent to rivers), brash mats will be used to avoid soil damage, erosion and sedimentation. Brash mat renewal will take place when they become heavily used and worn. Provision should be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Felling will not occur during periods of high rainfall to prevent runoff. No refuelling or machinery maintenance will occur within 50m of an aquatic zone. Timber will be stored on dry areas away from the riparian zones. The forest felling effects of the overhead transmission line will be short term limited to the construction phase.

8.6.3 Works Near Watercourses

92 The line route has been designed in order to locate temporary access routes and tower locations away from sensitive rivers, where possible. It is not proposed to undertake any in stream works along the line route in the CMSA. Existing access tracks, where present, will be utilised. No refuelling or machinery maintenance will occur within 50m of an aquatic zone. Excavated material will be stored on dry areas away from the riparian zones.

93 In general all site works have the potential to pollute watercourses. Sediment and pollution control measures will be undertaken in all work areas but, in particular, where towers are located near rivers. While there are no major streams along the line route a number of rivers and streams are crossed. Additionally surface water abstraction occurs at Lough Egish and

Toome Lough. Stockpiles will be located away from the watercourses and drainage ditches. Stockpiles will be graded to a <1:4 profile. Topsoil and subsoils will be stored separately. Stockpiles of mineral soils and peat will be <2m and <1m respectively. Geotechnical supervision in combination with monitoring will ensure that peat is stored in suitable areas. Stockpile top surfaces shall be shaped and profiled to prevent erosion from runoff. Erosion protection mats will be applied to stockpile surfaces, as required.

Table 8.11: Distance from Towers to Sensitive Stream / Lakes

River/ Lough Name	Nearest Tower	Distance to River (m)
Major Lough Stream	223	250
Muff Lough	226	265
Glyde Upper	219 and 224	20
Magheracloone Lower	204	80
Bocks Lough	175 and 176	210
Lough Egish	161	>500
Toome Lough	146 147	>500

94 Silt barrier / silt curtains will be used where towers or works are undertaken near watercourses. Correct installation of silt fences is vital and will be supervised by the construction manager and on site ecologist. The silt barrier / silt curtain should be shaped and installed so that it will catch runoff, without the water flowing underneath or around the edge. The silt barrier will be located down gradient of the works and inspected on a regular basis as well as during and after rainfall events. For steep slopes, more than one silt curtain will be used. The edges of the silt curtain will be turned upslope to prevent water going around the edges. Grips, sumps, straw bales and sediment traps can be installed to capture silt where applicable. Each of these should be maintained daily by the contractor to ensure that they remain effective and do not increase the

likelihood of an incident occurring.[28] Rainfall can have a significant impact on the pollution of watercourses. Certain site activities including concrete pouring near watercourses will be postponed during heavy rainfall events (<5mm/hr) to prevent pollution entering watercourses.

95 Where groundwater dewatering is required the resultant water will be filtered before discharge. Dewatering if required will be limited in duration. Groundwater can be filtered using bunds/tanks filled with filter material. Single sized aggregates 5–10mm, geotextiles or straw bales can be used as a filter. Monitoring will be undertaken on the discharge water quality, so as to confirm the nature of the predicted residual impacts.

96 Precautions will be taken to avoid spillages. These include:

- Use of secondary containment, e.g. bunds around oil storage tanks;
- Use of drip trays around mobile plant;
- Supervising all deliveries and refuelling activities; and
- Designating and using specific impermeable refuelling areas isolated from surface water drains.

97 With regard to on site storage facilities and activities, any raw materials and fuels, will be stored within bunded areas, if appropriate, to guard against potential accidental spills or leakages. All equipment and machinery will have regular checking for leakages and quality of performance.

98 All site personnel will be trained and made aware of the appropriate action in the event of an emergency, such as the spillage of potentially polluting substances. Spill kits are retained to ensure that all spillages or leakages are dealt with immediately and staff will be trained in their proper use. Any servicing of vehicles will be confined to designated and suitably protected areas. In the extremely unlikely event of any pollution incident or spills, the incident will be reported to the appropriate regulator and the receiving watercourses remediated to its original condition.

8.6.4 Provision of Temporary Access Tracks and Tower Foundations

99 It is not envisaged that extensive provision of temporary access tracks will be required for the construction of the proposed development. Towers in the CMSA will be generally located in agricultural fields with good trafficability. Low bearing pressure vehicles are primarily used,

[28]CIRIA Document 650.

along with a Derrick pole to erect the metal structure. Over good quality land, the use of tracked machinery usually means that access to tower sites can be achieved with relative ease. Maximum use will be made of both existing farm entrances and also farm tracks or roads. Temporary access routes will comprise of aluminium tracks or rubber matting (refer to Chapter 7, **Volume 3B** of the EIS).

100 At certain locations, where very poor soft ground is encountered, a temporary access track (type 2) may have to be laid. Temporary access tracks will be no greater than 4m wide and routed away from drains where possible. In sensitive locations silt barriers will be used to prevent any runoff to local watercourses.

101 All temporary access tracks will be removed at the end of the construction phase and the land will be restored to its original condition. Further details are discussed in Chapter 7, **Volume 3B** of the EIS. The solution to maintaining low suspended solids is preventing silt / clay from entering the surface water at source. Preventative measures will ensure that input suspended solids concentrations will be minimised at source. This will be achieved by ensuring that all silt/ clay and topsoil is properly stored during the construction phase of the development and so a major source of fines, due to runoff will have been reduced.

102 Wash down and washout of concrete transporting vehicles will not be permitted at the location of construction. Such wash down and washout activities will take place at an appropriate facility offsite or at the location where concrete was sourced. The washing down area should be contained and washings channelled into a batcher washings treatment facility. For smaller machinery, local wash down areas should be created. These will take the form of a steel skip or tank. All approved washing areas will be documented with training provided for site workers.

103 Water quality monitoring will be undertaken prior to the commencement of construction to confirm baseline data and ensure there is no deterioration in water quality. This monitoring will be targeted on watercourses considered to be at a higher risk of pollution (i.e. towers where there are watercourses within 20m of the construction works). Water quality monitoring will include daily inspection of adjacent watercourses. Regular sampling for pH and conductivity will be undertaken with sampling for suspended solids and hydrocarbons if any change in the appearance is identified. Daily observations of watercourses close to construction works will be undertaken and detailed records of observations including photographs will be made. If pollution is suspected, samples will be collected upstream and downstream of this point, and sent to an appropriately accredited laboratory for analysis. All works will halt until the source has been identified, controlled and any remediation undertaken.

8.6.5 Stringing of Conductors

104 In general, it is not envisaged that temporary access tracks will be required for the facilitation of stringing of the conductors. Low bearing pressure vehicles are primarily used for the stringing of the line. Mitigation measures will be incorporated for the proper use of fuel on site. In addition, the risk can be effectively controlled by good working practices and conditions and the implementation of an effective pollution prevention plan as detailed in the outline CEMP.

8.7 RESIDUAL IMPACTS

105 The nature of the proposed development dictates that the greatest potential impact for the water environment will be in the construction phase. With the implementation of the mitigation measures set out in this EIS, a negligible impact on the aquatic environment is predicted for the construction phase of the proposed development. With regard to the operational phase of the development, negligible impact on the local water environment is predicted.

8.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS

106 Water has an important interrelationship with the soils and ecological environment, as a determinant of water chemistry, river flow regimes, water storage capacity and watercourse location. It also has an impact on water quality through the ability of bedrock and surface deposits to filter potential pollutants. Potential ecological impacts could occur through the mishandling of soils or through the deposition of excavated soils in ecologically sensitive areas.

107 These potential impacts and mitigation measures have been identified in **Chapters 6** and **7** of this volume of the EIS. This chapter should be read in conjunction with Chapters 6 and 7, **Volume 3B** of the EIS.

108 An evaluation was undertaken based on the identification of potential sources pathways and receptors along the line route. If all three elements (source, pathway and receptor) are present, there is a linkage and there is a potential impact to the receptor(s). In terms of water, there are no cSACs or groundwater dependent terrestrial ecosystems (GWDTE) in close proximity to the line route. Based on a review of the construction methodology, flora and fauna, and soils, geology and hydrogeology chapters, there are no significant cumulative impacts as a result of the proposed development. Intact peatlands and fens have been avoided and therefore there are no potential impacts on the ecohydrology of the peatland areas. A number of non-designated wetlands of varying value that occur in proximity to the alignment have been identified in **Chapter 6** of this volume of the EIS. These include Corlea Bog, Greaghlone Bog, Raferagh South, Corvally Lake, Bocks Lough, Tullyglass Woodland, Lough Nahinch (Cashel Bog), Clarderry Bog, Tassan Grassland, Dromore wetlands, Shantonagh Area wetlands lakes, Lough Morne and lakes to the west and Lough Egish.

109 No towers are proposed to be located within non-designated sites of ecological importance as these sites have been avoided through careful selection of the final route. The alignment does oversail five non-designated sites of known ecological importance. Measures outlined in **Section 8.7** and the CEMP will mitigate any potential impact.

8.9 CONCLUSIONS

110 A number of small streams/ river comprising of the tributaries to the River Dee, River Glyde, River Dromore, River Annalee, River Fane and the Clontibret River are located along the proposed line route. Additionally a number of lakes are located within the study area.

111 The construction phase of the proposed development could impact on the water environment through the use of temporary access routes and excavations required for the tower bases.

112 The nature of the transmission line development dictates that the greatest potential impact associated with the development will be in the construction phase. During construction the potential impacts to the underlying water environment from the proposed works could derive from accidental spillages of fuels.

113 The tower locations have been selected to avoid known areas of flood plains and river banks where possible.

114 A negligible impact is predicted on the water environment as a result of the construction phase of the proposed development.

115 With regard to the operational phase of the development, negligible impacts on the local water environment are predicted.

9 AIR – NOISE AND VIBRATION

9.1 INTRODUCTION

1 This chapter evaluates the noise and vibration impacts arising from the proposed 400 kV overhead transmission line and associated development as set out in Chapter 6, **Volume 3B** of this Environmental Impact Statement (EIS). That chapter describes the nature and extent of the proposed development, including elements of the overhead line (OHL) design and the towers. It provides a factual description, on a section by section basis, of the entire line route including that portion within the Cavan Monaghan Study Area (CMSA). The proposed line route is described in that chapter using townlands and tower numbers as a reference. The principal construction works proposed as part of the proposed development are set out in Chapter 7, **Volume 3B** of the EIS.

2 The information contained within this chapter is concerned with noise and vibration in the CMSA as defined in Chapter 5, **Volume 3B** of the EIS. This evaluation deals with ‗audible‘ noise and vibration.

3 This study area for the evaluation considers an area in excess of 100m either side of the proposed alignment. The evaluation will focuses on the construction, operation and decommissioning aspects of the proposed development.

4 This evaluation was prepared in accordance with the Environmental Protection Agency‘s (EPA) *Guidelines on the Information to be contained in Environmental Impact Statements* (March 2002) and *Advice Notes on Current Practice in the preparation of EIS* (September 2003).

5 This chapter should be read in conjunction with Chapter 7, **Volume 3B** of the EIS and **Chapter 13** in this volume of the EIS.

9.2 METHODOLOGY

6 This section of the EIS has been prepared in accordance with relevant EU and Irish Legislation and guidance, including the requirements of Annex IV of the Environmental Impact Assessment (EIA) Directive and in accordance with Schedule 6 of the *Planning and Development Regulations 2001* (as amended) and conforms to the relevant requirements as specified therein. The scope of the evaluation is based on a review of legislation, guidance documents, other EISs, feedback from public consultation, consultation with prescribed bodies, consultation with An Bord Pleanála (the Board) and on a consideration of the likelihood for significant impacts arising, having regard to the nature of the receiving environment and the nature and extent of the proposed development.

7 The scoping opinion received from the Board (refer to Appendix 1.3, **Volume 3B Appendices** of the EIS) identified the following issues as being relevant to this chapter of the EIS:

- Description and assessment of the noise environment at construction and operational phases, clearly measurable against the existing ambient noise environment.

8 A number of factors can influence the potential for noise impact from any proposed development such as the duration of the works, noise characteristics and perception. The impact and its effects is a subjective consideration. In order to minimise the impact on sensitive receptors, the potential for noise and vibration impact has been evaluated, and a range of mitigating measures, which will ensure that acceptable noise limits are met, have been provided.

9 Extensive background noise measurements were recorded in 2013 at 24 locations along the proposed line route, during daytime and night time. The locations of the noise monitoring surveys on the line route are shown in Figures 9.1 - 9.4, **Volume 3C Figures** of the EIS. The locations chosen are receptor locations near to the towers and OHLs along the proposed line route to represent the quiet rural area. The results from the 2013 background noise survey are provided in **Tables 9.2** and **9.3**.

10 All measurements were recorded in suitably calm conditions using appropriately calibrated Type 1 instrumentation which is in line with current appropriate standards and methodology (i.e. the British Standard BS4142 *Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas* (1997)). The sound level meter and the acoustic calibrator were at the time of measurement calibrated to the appropriate standards. No significant drift was noted during the field calibration process

11 Potential for noise and vibration impact in both the construction and operational phases of the proposed development have been evaluated and specific noise and vibration mitigation measures have been presented (see **Section 9.6**).

12 Various standards and guideline documents covering the impact of external noise sources and the introduction of industrial and construction noise have been used in this evaluation. The standards and guidelines appropriate for this appraisal are the: World Health Organisation's (WHO) *Guidelines for Community Noise (*1999), BS5228 *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise* (2009), and BS4142 *Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas* (1997).

9.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

13 The characteristics of the proposed development as relating to the potential for noise and vibration impacts to sensitive receptors will occur in the construction and operational phases of the proposed development. These potential impacts are considered in detail below (see **Section 9.5**). A description of the proposed development and how it will be constructed is presented in Chapters 6 and 7, **Volume 3B** of the EIS.

9.4 EXISTING ENVIRONMENT

14 The proposed development is located in a predominantly rural area. **Tables 9.2** and **9.3** will serve to quantify the typical noise levels encountered in the ambient environment. The values in **Tables 9.2** and **9.3** can be used to compare the predicted and measured noise levels presented in this chapter. Ambient noise levels at the properties located close to the majority of the route are characterised by rural environmental noise (i.e. wind in trees, agricultural activities and livestock) and transportation noise on the local supply roads. However, there are sections of the proposed route, near to busier roads, where transportation noise becomes the predominant noise source.

9.4.1 Baseline Noise Survey

15 The measurement locations along the proposed line route represent individual properties or clusters of residential properties along the route. The dB L_{A90} noise levels presented in **Tables 9.2** and **9.3** represent the existing ‗background‘ noise levels within the area. The levels presented in terms of ‗dB L_{A90}‘ are defined as the background noise level at a location according to BS4142 (*Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas*, British Standards Institute (1997)). A typical guide to environmental noise levels is presented in **Table 9.1**.

16 The baseline noise evaluation surveys were carried out along the proposed line route in order to establish expected noise levels for the operational phase. Baseline noise surveys were also carried out under the existing 400 kV OHL at Bogganstown County Meath. The locations of the noise monitoring surveys on the line route are shown in Figures 9.1- 9.4, **Volume 3C Figures** of the EIS.

17 Attended noise measurements were recorded during day time and night time at each noise monitoring location. The measurements taken were deemed to be representative of typical noise levels in the vicinity of the noise monitoring locations. The equipment used during this survey was a Bruel and Kjaer, 2250, Type 1 sound level meter.

Table 9.1: Guidance Note for Noise in Relation to Scheduled Activities, 2nd Edition, EPA 2006

Typical Noise Levels in our Environment	
Sound levels in decibels dB (A)	**Description of Activity**
0	Absolute silence
25	Very quiet room
35	Rural night time setting with no wind
55	Day time, busy roadway 0.5km away
70	Busy Restaurant
85	Very busy pub, voice has to be raised to be heard
100	Disco or rock concert
120	Uncomfortably loud, conversation impossible
140	Noise causes pain in ears

18 All measurements were carried out in accordance with the *International Organization for Standardization's (ISO) ISO 1996: Acoustics - Description and Measurement of Environmental Noise*. Measurements were made placing the microphone at a height of 1.5m above ground level, were free field and were measured >2m from reflecting surfaces.

19 Before and after surveys, the measurement apparatus was checked and calibrated using a calibrator to an accuracy of +/- 0.3dB. Weather conditions during all surveys conducted for the purposes of this evaluation were in line with the conditions described within ISO 1996*, Acoustics Description and Measurements of Environmental Noise* and the Environmental Protection Agency 2003, *Environmental Noise Guidance Document, as follows.*

- An average wind speed of less than 5m/ sec; and
- No precipitation was present during the survey periods.

20 The measurement results were logged onto survey record sheets immediately following each measurement and also stored in the instrument's internal memory for subsequent analysis. Notes were also taken in relation to the primary contributors to audible noise at each monitoring location.

21 The environmental noise paramerters measured are definded below:

- L_{Aeq} is the A-weighted equivalent continuous steady sound level during the measurement period and effectively represents an average ambient noise value;
- L_{Amax} is the maximum A-weighted sound level measured during the measurement period;

- L_{Amin} is the minimum A-weighted sound level measured during the measurement period;
- L_{A10} is the A-weighted sound level that is exceeded for 10% of the measurement period and is used to quantify road traffic noise;
- L_{A50} is the A-weighted sound level that is exceeded for 50% of the measurement period and in this assessment is used to quantify noise from OHL; and
- L_{A90} is the A-weighted sound level that is exceeded for 90% of the measurement period and is used to quantify background noise level.

22 A-weighting is the process by which noise levels are corrected to account for the non-linearity of human hearing. All noise levels quoted are relative to a sound pressure of $2x10^{-5}$ Pa.

23 No tangible vibration was observed at any of the noise survey locations evaluated as part of the proposed development.

9.4.2 Noise Survey Results

24 The 2013 background noise levels recorded for both daytime and night time at each of the 24 locations are presented in **Tables 9.2** and **9.3**, with noise monitoring locations shown in Figures 9.1 - 9.4, **Volume 3C Figures** of the EIS. Background noise monitoring was carried out in 2013 at 24 of the 27 original noise monitoring locations. Locations 25, 26 and 27 from the 2009 planning application (Reference PL02.VA0006, subsequently withdrawn) were to cater for a substation which is not part of this application for planning approval. The results from the 2009 surveys are presented in Appendix 9.1, **Volume 3C Appendices** of the EIS.

Table 9.2: 2013 Baseline Noise Levels Daytime

Baseline Noise Survey Results Daytime							
Location	**Date**	**Duration**	**L_{Aeq}**	**L_{Amax}**	**L_{Amin}**	**L_{A10}**	**L_{A90}**
N1	13/08/2013 12:36	15:00	42.2	65.1	26.9	38.5	30.3
N2	09/09/2013 10:54	15:00	35.6	64.5	24.5	36.6	27.5
N3	13/08/2013 12:57	15:00	50.1	71.6	27.7	52.0	31.9
N4	09/09/2013 11:16	15:00	72.3	92.0	38.5	72.9	42.4
N5	09/09/2013 11:33	15:00	56.1	79.0	36.2	58.0	43.0
N6	09/09/2013 11:52	15:00	49.9	76.7	33.6	45.0	36.6
N7	09/09/2013 12:16	15:00	48.9	73.1	27.5	49.9	32.0

Baseline Noise Survey Results Daytime							
Location	Date	Duration	L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
N8	13/08/2013 13:20	15:00	55.9	77.7	24.3	51.7	26.8
N9	09/09/2013 12:38	15:00	67.2	87.5	28.7	67.4	32.4
N10	13/08/2013 13:47	15:00	41.4	70.0	28.7	44.0	33.2
N11	09/09/2013 13:04	15:00	60.1	81.5	28.2	59.3	33.7
N12	13/08/2013 14:11	15:00	67.1	92.0	27.1	61.1	30.4
N13	09/09/2013 13:26	15:00	64.4	88.8	28.8	57.1	33.7
N14	13/08/2013 14:37	15:00	59.0	84.0	31.7	47.4	34.1
N15	09/09/2013 13:50	15:00	57.5	83.7	25.2	49.8	30.0
N16	09/09/2013 14:15	15:00	58.0	71.7	38.9	61.7	46.2
N17	13/08/2013 15:00	15:00	63.4	85.0	26.9	59.3	31.7
N18	13/08/2013 15:26	15:00	51.0	73.9	23.4	42.4	25.3
N19	09/09/2013 14:50	15:00	41.8	58.5	35.0	43.6	37.5
N20	09/09/2013 15:09	15:00	67.6	87.9	35.0	67.2	39.5
N21	13/08/2013 15:52	15:00	50.7	75.5	24.0	38.1	29.1
N22	09/09/2013 15:35	15:00	70.0	96.5	33.0	69.6	42.1
N23	13/08/2013 16:17	15:00	50.7	75.5	24.0	38.1	29.1
N24	09/09/2013 16:01	15:00	44.2	70.1	30.4	42.2	32.2

Table 9.3: 2013 Baseline Noise Levels Night Time

Baseline Noise Survey Results Night Time							
Location	Date	Duration	L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
N1	13/08/2013 23:09	10:00	36.9	57.5	22.0	33.8	24.3
N2	09/09/2013 23:05	10:00	28.3	52.2	23.5	29.7	25.2
N3	13/08/2013 23:34	10:00	57.0	85.2	19.2	35.8	22.7
N4	09/09/2013 23:26	10:00	66.2	88.5	24.8	62.4	33.9
N5	09/09/2013 23:44	10:00	45.2	60.4	25.2	49.0	32.1
N6	10/09/2013 00:03	10:00	36.4	51.5	26.3	39.1	30.7
N7	10/09/2013 00:26	10:00	51.1	81.1	20.1	29.0	22.7
N8	13/08/2013 23:55	10:00	55.5	80.5	18.1	33.0	19.6

Baseline Noise Survey Results Night Time							
Location	**Date**	**Duration**	L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
N9	10/09/2013 00:50	10:00	59.4	82.3	23.0	45.4	25.0
N10	14/08/2013 00:15	10:00	21.1	41.8	17.3	22.1	17.9
N11	10/09/2013 01:17	10:00	52.8	75.4	19.8	45.1	21.9
N12	14/08/2013 00:35	10:00	60.7	87.1	33.1	52.2	35.0
N13	10/09/2013 01:38	10:00	61.2	86.2	20.4	44.9	22.8
N14	14/08/2013 00:58	10:00	52.8	80.5	31.3	41.2	32.0
N15	10/09/2013 02:02	10:00	26.6	52.1	21.0	27.1	22.5
N16	10/09/2013 02:22	10:00	26.2	46.6	20.6	27.6	22.2
N17	14/08/2013 01:23	10:00	38.0	50.0	32.8	40.3	35.2
N18	14/08/2013 01:47	10:00	45.9	73.6	19.2	33.9	21.4
N19	10/09/2013 02:52	10:00	55.5	84.0	23.4	35.3	26.3
N20	10/09/2013 03:14	10:00	58.2	85.2	24.1	43.9	26.7
N21	14/08/2013 02:10	10:00	24.3	44.2	16.1	26.6	16.6
N22	10/09/2013 03:41	10:00	27.4	49.0	19.1	30.3	21.0
N23	14/08/2013 02:30	10:00	33.5	68.1	16.0	23.8	16.5
N24	10/09/2013 04:09	10:00	38.7	61.8	24.7	41.3	28.4

25 **Noise Monitoring Location N1**: This location is situated in the townland of Lemgare, near the Armagh Border. Distant road traffic noise, occasional passing traffic and cattle in the adjacent field were the main noise sources. A barking dog was audible throughout the night time survey.

26 **Noise Monitoring Location N2**: This location is situated in the townland of Lisdrumgormly. Infrequent passing traffic, distant traffic noise and birdsong were the main noise sources at N2. A con saw was in use at a distant house during the daytime survey.

27 **Noise Monitoring Location N3**: This location is situated in the townland of Tassan. A tractor working in the adjacent field (during daytime), occasional passing traffic and birdsong were the main noise sources at this location.

28 **Noise Monitoring Location N4:** This location is situated in the townland of Cashel with the main road (N2) nearby. Busy road traffic in the nearby N2 was the main noise source at this location. A tractor working in a nearby field was also audible during the daytime survey.

29 **Noise Monitoring Location N5**: This location is situated on the boundary of the townlands of Annagh and Cashel. Road traffic noise was dominant at this location. Aircraft overhead were also audible during the daytime survey.

30 **Noise Monitoring Location N6**: This location is on the boundary of the townlands of Annagh and Carrickanure. Distant road traffic noise and occasional passing local traffic were the main noise sources at this location. Cattle in the adjacent field were also audible.

31 **Noise Monitoring Location N7**: This location is situated on the boundary of the townlands of Lennan and Drumaroosk. Passing local traffic and agricultural machinery at work in the fields (during daytime) were the main noise sources at this location.

32 **Noise Monitoring Location N8**: This location is situated in the townland of Cornanure (Monaghan By). Cattle in the fields, passing traffic and foliage noise were the main noise sources at N8.

33 **Noise Monitoring Location N9**: This location is situated in the townland of Terrygreeghan. Distant agricultural plant at work in fields during daytime and passing local road traffic were the main noise sources at this location.

34 **Noise Monitoring Location N10:** This location is situated in the townland of Drumguillew Lower. A tractor working on an adjoining hillside during daytime, passing traffic and distant traffic noise were the main noise sources at this location.

35 **Noise Monitoring Location N11**: This location is situated on the boundary of the townlands of Greagh and Brackly. Passing traffic on the R180 was the main noise source at this location. Local road traffic and cattle in the fields were also audible.

36 **Noise Monitoring Location N12**: This location is situated in the townland of Brackly. Passing local traffic and distant road traffic noise were the main noise sources at N12. At night, a distant ventilation fan was audible in one of the adjacent farms, this was not audible during the day.

37 **Noise Monitoring Location N13**: This location is situated on the boundary of the townlands of Drumillard and Tooa. Passing local traffic and traffic on the nearby R181 were the main noise sources at this location.

38 **Noise Monitoring Location N14**: This location is situated on the boundary of the townlands of Tullyglass and Cornasassonagh. Passing traffic, birdsong and foliage noise were the main noise sources at this location.

39 **Noise Monitoring Location N15**: This location is situated in the townland of Ummearfree. Horses in the adjacent field, passing traffic and foliage noise were the main noise sources at this location.

40 **Noise Monitoring Location N16**: This location is situated in the townland of Sreenty. A tractor, hedge cutting in a nearby field and infrequent passing traffic were the main noise sources at this location. There was no hedge cutting during the night time survey.

41 **Noise Monitoring Location N17**: This location is situated in the townland of Corvally on the Carrickmacross to Shercock Road (R178). Passing local traffic, agricultural traffic and foliage noise were the main noise sources at this location.

42 **Noise Monitoring Location N18**: This location is situated on the boundary of the townlands of Raferagh and Cornnalaragh. Passing road traffic, birdsong and foliage noise were the main noise sources at N18.

43 **Noise Monitoring Location N19**: This location is situated in the townland of Scalkill. Distant road traffic, cattle in the adjacent field and foliage noise were the main noise sources at this location.

44 **Noise Monitoring Location N20:** This location is situated in the townland of Lisagoan on the main Kingscourt to Shercock Road (R162). Passing traffic on the R162, birdsong and foliage noise were the main noise sources at this location.

45 **Noise Monitoring Location N21**: This location is situated in the townland of Corlea (Clankee By). Passing local traffic, agricultural traffic during the day and cattle in the fields were the main noise sources at this location.

46 **Noise Monitoring Location N22**: This location is situated on the boundary of the townlands of Dingin and Corrycholman, on the main Kingscourt to Bailieborough Road (R165). Passing traffic on the R165 and a stereo in use in the driveway of a nearby house during the steam cleaning of a car, were the main daytime noise sources at this location. At night, passing traffic and foliage noise were audible.

47 **Noise Monitoring Location N23**: This location is situated in the townland of Cordoagh (ED Enniskeen) at a local crossroads known as the location of the 'Fair of Muff. Distant road traffic noise, cattle, foliage noise and a barking dog were the main noise sources at location N23.

48 **Noise Monitoring Location N24**: This location is situated in the townland of Clonturkan. Cattle in the adjacent field along with foliage noise and infrequent passing traffic were the main noise sources at this location.

49 There is some variation in background noise levels compared to June 2009 levels (shown in **Appendix 9.1, Volume 3C** Appendices of the EIS) as these were recorded in June 2009 and more recent noise levels were recorded in August and September 2013. The background noise levels recorded most recently in 2013 are considered to be similar marginally but lower than those measured previously. However, these recent measurements show no significant changes in the dominant noise sources in the existing noise environment. Background noise levels are influenced by constant traffic flows, agricultural activity, other significant noise sources in the area, and weather conditions.

9.5 POTENTIAL IMPACTS

50 During the preparation of this EIS, an extensive evaluation of the likely significant effects of all aspects of the proposed development has been undertaken.

51 The noise and vibration characteristics of the proposed development will be divided between the construction and the operational phases of the development. The majority of impacts will occur during the construction phase of the development.

52 The construction phase will involve excavation, piling (if required) and general construction activities and is discussed further below. The construction details for the proposed development are set out in Chapter 7, **Volume 3B** of the EIS. The operational phase will not have any vibration impacts and will only have the potential for minimal noise impact, as described later in this chapter.

9.5.1 Do Nothing

53 In the ‗Do Nothing‘ Scenario, the proposed development will not proceed. In this scenario the baseline noise and vibration climate, save for the potential for general development outside of the scope of this proposed development, will remain unchanged.

9.5.2 Construction Phase

54 The construction phase of the proposed development has the potential to temporarily increase noise levels at noise sensitive locations surrounding the proposed alignment i.e. at the construction phase of the towers. The nearest noise sensitive locations are located at least 50m from proposed tower locations.

55 Noise sensitive locations as referred to in this evaluation are comprised of houses, schools, hospitals, places of worship, heritage buildings, special habitats, amenity areas in common use and designated quiet areas. There are none of these sensitive receptors located within 50m of a proposed tower location.

56 Impact from the construction phase will depend on the number and types of equipment used during the construction of the proposed development. Construction noise sources will result in a temporary impact on the noise climate in the area. The temporary and transient nature of the construction phase on this type of development should not give rise to excessive construction noise levels. The list of machinery as detailed in **Table 9.4** will form the plant which will be in operation during the construction phase.

Table 9.4: Construction Phase Plant Noise Levels

CONSTRUCTION PHASE			
BS5228 Calculations	**Estimated Construction Noise Levels at Varying Distances $L_{Aeq,1hour}$**		
Machinery	**50m**	**75m**	**100m**
Wheeled loader	65	60	57
Winch	56	51	48
Line tensioner	56	51	48
Road lorry pulling up	49	44	41
Tracked excavator	65	60	57
Vibratory hammer	61	56	53
Tracked crane moving	66	61	58
Support crane moving	57	52	49
Lorry unloading	63	58	55
Diesel generator	54	49	46
Continuous flight auger	56	51	48
Combined Level LAeq,1hour	**71dB**	**67dB**	**64dB**

57 Predicted noise levels have been estimated using the methodology described in *BS: 5228: Noise and control on construction and open sites*, (1997). Predictions are based on typical equipment used during various construction phases of the proposed development. Predictions are based on a $L_{Aeq\ 1hour}$ value with all machinery listed in **Table 9.4** operating for a continuous period of 1 hour.

58 This may be considered a worst case scenario as this machinery will not operate simultaneously. Additionally, calculations are based on minimum distances between site activities and the nearest noise sensitive locations, with no allowance for screening of hedgerows, trees or buildings in between.

59 In Ireland, there are no statutory guidelines relating to noise limits for construction activities. These are generally controlled by local authorities and commonly refer to limiting working hours

to prevent a noise nuisance. The National Roads Authority (NRA) *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (2004) outlines recommended noise levels for construction noise during the construction of national road schemes.

60 Although these NRA's guidelines refer to road projects, they have been developed in line with typical construction noise limits on construction projects used previously in Ireland. The limits outlined represent a reasonable compromise between the practical limitations during a construction project and the need to ensure an acceptable ambient noise level for local residents. As a result, these limits have become the most acceptable standard for construction noise limits for EIS assessments in Ireland to date. The NRA does note, however, that where pre-existing noise levels are particularly low, more stringent levels may be more appropriate. **Table 9.5** details these recommended limits.

61 The predicted values are a worst case evaluation, and as such the impact is likely to be moderate, with regard to the nearest noise sensitive locations. The evaluation is considered worst case as the temporary nature of the construction period and the variety of machinery used should ensure that no construction activity is operational for long periods. Similarly, all the plant listed in **Table 9.4**, will not be in use at the same stage of construction, as it is a phased process. Hence, the noise impact to be expected at the nearest noise sensitive receptor would be significantly less than the worst case scenario described in **Table 9.4**. This construction phase will therefore result in a moderate temporary, transient noise impact.

62 There is a possibility that a small amount of localised rock breaking may be required if rock is encountered close to the surface during tower construction. In the unlikely event, that the need for rock breaking arises the process will be carried out so as to achieve adherence to the guideline noise limits as presented in **Table 9.5**. If required, temporary noise barriers as outlined in **Section 9.6** will be used to achieve these guideline noise level values.

Table 9.5: Typical Maximum Permissible Noise Levels at the Façade of Dwellings during Construction Activities

Day & Times	$L_{Aeq\ (1hr)}$ dB	L_{Amax}dB
Monday – Friday (07:00 to 19:00 hrs)	70	80
Monday – Friday (19:00 to 22:00 hrs)	60[1]	65[1]
Saturday (08:00 to 16:30 hrs)	65	75
Sundays and Bank Holidays (08:00 to 16:30 hrs)	60[1]	65[1]

[1] Construction activities at these times, other than that required in respect of emergency works, will normally require the explicit permission of the relevant local authority. Source: NRA *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* 2004.

9.5.2.1 Construction Phase Traffic Noise Impact

63 The likely Heavy Goods Vehicles (HGV) noise impact due to the expected traffic flows has been calculated using the Haul Road Method detailed in BS5228 *Noise and Control on Construction and Open Sites*, (1997). Considering a standard tower construction site, as detailed in Chapter 7, **Volume 3B** of the EIS, a maximum frequency of 9 vehicle trips per hour (Q) and a minimum distance of at least 5m (v) from the haul road to any nearby property, and a speed of 30km/h (V) the calculated noise impact is as follows:

Level = Average SWL - 33 + 10 log Q - 10 log V - 10 log d

+ 98 – 33 + 10 log 9 – 10 log 30 – 10 log 5

= 52.8dB $L_{Aeq, 1h}$

64 This is not predicted to cause any significant noise impact to the nearest sensitive receptor at a distance of 5m.

65 Considering an angle tower construction site, as detailed in Chapter 7, **Volume 3B** of the EIS, a maximum frequency of 12 vehicle trips per hour (Q) and a minimum distance of at least 5m (v) from the haul road to any nearby property, and a speed of 30km/h (V) the calculated noise impact is as follows:

Level = Average SWL - 33 + 10 log Q - 10 log V - 10 log d

+ 98 – 33 + 10 log 12 – 10 log 30 – 10 log 5

= 54.0dB L_{Aeq}, 1h

66 This is not predicted to cause any significant noise impact to the nearest sensitive receptor at a distance of 5m. A distance of 5m has been assumed in these calculations and is presented as a practical assumption for distance from receptor to haul road.

9.5.2.2 Supply Vehicle Movements

67 An increase of 3dB (A) on existing traffic noise is required before it may be noticed by the public (example ref: UK Department for Transport *Guidance on the Methodology for Multi-Modal Studies* (DETR 2000), paragraph 4.3.5). With reference to the UK Department of Transport Welsh Office *Calculation of Road Traffic Noise* (CRTN 1988) and if all other factors remain equal, this would represent an increase in traffic flow of 100%.

68 The UK Highways Agency *Design Manual for Roads and Bridges* document (DMRB 2008) suggests that a 1dB increase in traffic might be perceptible, although it acknowledges that other factors in visual perception and magnitude of traffic levels before increases are relevant. Again

with reference to CRTN, a 1dB increase in noise level is approximately equivalent to a traffic number increase of 25%. It is unlikely that the introduction of a small number of additional vehicles on the local supply roads will be sufficient to present a 25% increase in traffic flows. As such this element of the proposed development is not expected to cause significant noise impact. In instances of tree felling for example where supply traffic would use local roads, this would be very short term and transient and would not be expected to cause any significant noise impact. Any such activity will be carried out in adherence to the requirements of the Construction Environment Management Plan (CEMP).

9.5.2.3 Construction Material Storage Yard Impacts

69 The construction material storage yard element of the proposed development will be a temporary ESB yard located south-east of Carrickmacross, County Monaghan. The site is located immediately adjacent to the southern side of the N2 National Primary Road. This ensures appropriate accessibility to all parts of the proposed transmission line.

70 The construction material storage yard has a history of temporary use for construction activities, being a former construction yard facility associated with the construction of the N2 National Primary Road. It will provide for the secure storage of all materials associated with the construction of the proposed development, as well as staff car parking, temporary site offices and welfare facilities.

71 Noise impacts related to the proposed construction material storage yard are divided into construction phase impacts and operational phase impacts. These have been assessed as per the OHL construction phase impacts using the same guidance documents and methodologies as outlined in **Section 9.5.2**.

72 Baseline noise surveys were carried out at the two closest residential dwellings to the proposed compound location as per the guideline requirements. NSL1 is located approximately 215m north-west of the proposed site entrance on the L4700 local road. NSL2 is located approximately 210m south-east of the proposed site entrance on the L4700 local road. These locations are depicted on **Figure 9.1**. The results of the noise monitoring at these locations are shown in **Table 9.6**.

Table 9.6: Baseline Noise Monitoring Results at Construction Compound

Location	Date/Time	Duration	L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
NSL1	20/01/14 13:56	15:00	64.6	84.1	33.9	65.8	42.8
	20/01/14 14:12	15:00	64.5	84.6	28.9	64.2	40.7
NSL2	20/01/14 14:30	15:00	63.9	87.5	34.7	62.6	43.1
	20/01/14 14:46	15:00	66.3	85.4	42.3	67.7	46.3

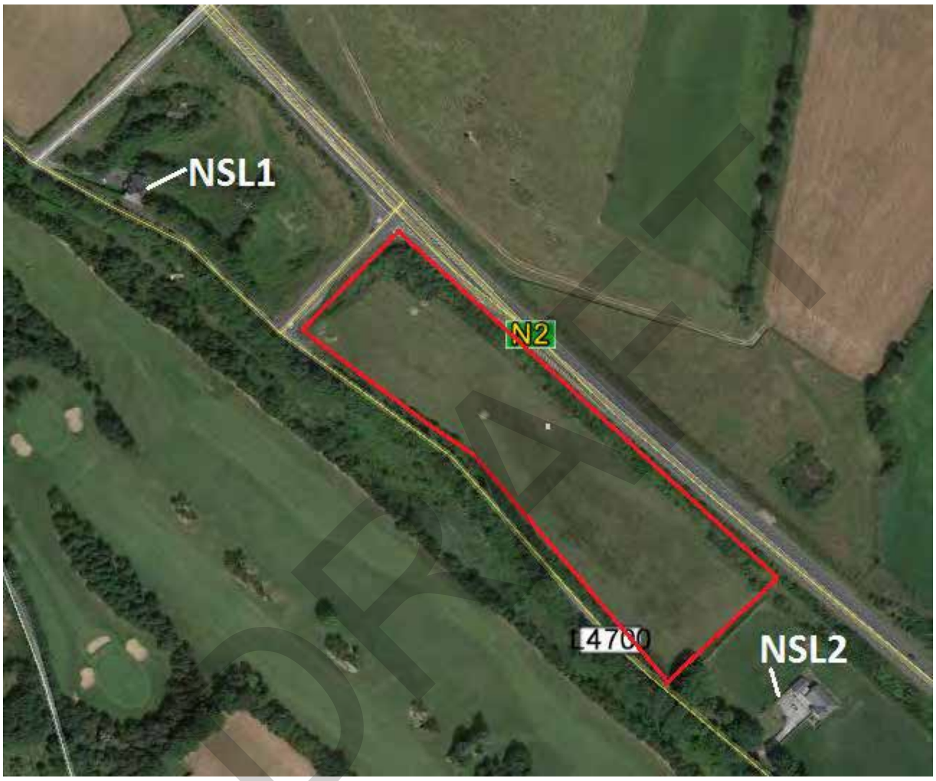


Figure 9.1: Construction Compound Noise Monitoring Locations

73 The noise climate at NSL1 and NSL2 was dominated by passing road traffic on the L4700 local road and by traffic on the N2 National Primary road. Birdsong and aircraft overhead were also audible.

74 With regard to impact from the construction of the construction material storage yard noise, predicted noise levels have been calculated using the methodology described in the British Standard (BS) *BS: 5228: Noise and control on construction and open sites*, (1997). Predictions are based on typical equipment used during various construction stages of the proposed development. Predictions are based on a $L_{Aeq\ 1hour}$ value with all machinery listed in **Table 9.7** operating for a continuous period of 1 hour.

Table 9.7: Predicted Noise Levels from Construction of the Construction Material Storage Yard

BS5228 Calculations	Construction Noise Levels at Varying Distances LAeq 1 hour			
	44m	52m	117m	329m
Plant	Golf Course	NSL2	NSL1	Nuremore Hotel
Dump Truck (2)	63	48	39	41
Roller/ Grader(2)	60	45	36	38
Tracked Excavator (2)	61	46	37	39
Combined Level L_{Aeq} 1hour	**66**	**51**	**43**	**44**

75 The construction phase noise impacts related to the construction material storage yard will be short lived over a number of weeks and are not expected to cause significant impact when assessed against the existing noise levels in the area, as shown in **Table 9.5**.

76 The predicted noise impacts for the use of the construction material storage yard during OHL construction are evaluated by the same methodology and presented in **Table 9.8**. It is assumed in this evaluation that a 2m high solid wooden fence with no gaps will be constructed on three sides of the construction material storage yard. This solid 2m barrier will be affixed to the inside of the proposed 2.6m palisade fence and does not need to be a standalone structure. This fence does not need to run alongside the N2. This fence serves to mitigate the noise from the use of the compound, to NSL1 and NSL2, as well as to the golf course across the L4700 Local Road.

Table 9.8: Predicted Noise Levels from Use of the Construction Material Storage Yard

BS5228 Calculations	Construction Noise Levels at Varying Distances $_{LAeq\ 1\ hour}$			
	44m	52m	117m	329m
Plant	Golf Course	NSL2	NSL1	Nuremore Hotel
Telescopic handler	43	42	33	22
Road Lorry	42	41	32	21
Combined Level LAeq 1hour	**45**	**45**	**36**	**25**

77 The predicted noise levels from the operation of the proposed construction material storage yard are within the guidance noise limits and are not expected to cause a significant noise impact to the nearest sensitive receptors.

78 The predicted road traffic increases associated with the proposed construction material storage yard have been evaluated using the UK Department of Transport Welsh Office Calculation of Road Traffic Noise - (CRTN 1988) guidance document. The predicted noise impact arising

from road traffic associated with the construction material storage yard is predicted to elevate noise levels at NSL1 by 1.3dB and at NSL2 by 2.4dB respectively for the duration of the OHL construction. This will not cause any significant noise impact.

9.5.2.4 Construction Phase Vibration Impacts

79 There is potential for ground vibration due to the construction phase works, this will mainly be derived from excavation and from piling works (in the unlikely event this is required) at some tower locations. Vibration may be defined as regularly repeated movement of a physical object about a fixed point. The magnitude of vibration is expressed in terms of Peak Particle Velocity (PPV) expressed in millimetres per second (mm/s).

80 Common practice in Ireland has been to use guidance from internationally recognised standards. Vibration standards come in two varieties, those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, the magnitude of vibration is expressed in terms of PPV in mm/s.

81 In order to ensure that there is no potential for vibration damage during construction, the NRA recommends that vibration from road construction activities be limited to the values set out in **Table 9.9**. These values have been derived through consideration of the various international standards, compliance with this guidance should ensure that there is little to no risk of even cosmetic damage to buildings.

82 These limits will be adhered to at all times during the construction phase of the proposed development. There is no vibration impact predicted for the operational phase of the proposed development.

Table 9.9: Allowable Vibration during Road Construction in Order to Minimise the Risk of Building Damage

Allowable vibration velocity (Peak Particle Velocity) at the closest part of any sensitive property to the source of vibration, at a frequency of:		
Less than 10Hz	10 to 50Hz	50 to 100Hz and above
8mm/s	12.5mm/s	20mm/s

9.5.3 Operational Phase

83 There will be no significant operational phase vibration impacts associated with the proposed development. There will be occasional requirement in the operational phase for tree cutting / lopping to protect the OHL. This will be carried out during day time hours only. This will be localised, short term and temporary and is unlikely to cause any significant noise impact. Following construction the transmission line will be subject to an annual survey by helicopter

patrol. Helicopter inspections will be announced in advance in local newspaper and the Famers Journal. This is not expected to cause any significant noise impact due to the short term and transient nature of the annual survey.

84 Operational phase noise from the proposed development is characterised by the following types of noise:

- Corona Discharge Noise;
- Continuous Operational Noise;
- Aeolian Noise; and
- Gap Sparking.

85 These aspects are each evaluated in detail in the sections below.

9.5.3.1 Corona Discharge Noise

86 Corona noise is the predominant noise audible from OHLs and can occur on transmission lines carrying higher voltages. Most modern transmission lines and substations are designed to reduce the magnitude of the electric field surrounding the line conductors below the air breakdown value. Corona discharge typically occurs where a sharp point or edge is present, either on the conductor or the tower coupling. Occasionally a small sharp point can be found on a line or on nearby hardware that will result in a corona discharge.

87 Such discharges are often more active during the increased humidity conditions provided by fog or light rain. Water drops impinging or collecting on the conductors produce a large number of corona discharges, each of them creating a burst of noise. In dry conditions, the conductors usually operate below the corona inception level, and much less corona sources are present.

88 Corona noise comprises two sound components; one is irregular (random noise) sound and the other is the pure sound (corona hum noise) of buzzing. The random sound has a wide frequency band because the impulsive sounds caused by corona discharge overlap randomly.

89 The corona hum noise results from the excitation of ion groups, which are generated from corona discharge, caused by the electric field surrounding the conductors. The predominant frequency of the corona hum noise is double the commercial frequency (100Hz is the frequency of the corona hum noise in this instance).

90 The level of operational noise from OHLs will vary depending upon the environmental conditions, the locality and a number of other factors including the distance to ground and voltage. The noise derived from this discharge is typically a short burst of random ‗crackling'.

91 Due to these factors, an exact level of noise impact cannot be definitively predicted, however **Figure 9.2** depicts the noise in wet conditions at distances from 0m to 100m from the line. It may be the case, that under certain circumstances, the background level may be exceeded by more than +10 dB. However due to the unpredictability of corona noise derived from OHLs and very short limited duration of such discharges (typically peak levels of a duration of less than 1 second), the overall impact when considered over an hour (reference BS4142 daytime reference time period) can be deemed minimal.

92 The Electric Power Research Institute's (EPRI) *AC Transmission Line Reference Book – 200 kV and Above* (Third Edition, 2005) provides a method for predicting the noise level at varying distances from the line under varying climatic conditions. The document provides the noise level during rainfall in terms of dB L_{A50} which represents the A-weighted sound pressure level (in decibels, dB) obtained using ‗Fast' time-weighting that is exceeded for 50% of the given time interval.

93 A noise prediction calculation has been carried out with reference to the proposed line for inclusion within this evaluation. The results of this calculation are presented in **Figure 9.2** which illustrate the noise level at varying distances from the existing 400 kV OHL. The noise levels presented have been calculated using the Bonneville Power Administration Method (BPA) and represent the noise level during normal rainfall.

94 **Figure 9.2** and **Table 9.10** show the predicted L_{50} dB (A) level (A-weighted sound level that is exceeded for 50% of the measurement period) and L_{10} dB A level (A-weighted sound level that is exceeded for 10% of the measurement period). These levels are predicted using the Electric Power Research Institute (EPRI) calculation methodology. These noise indicators represent the predicted corona noise levels as a function of lateral distance from the centre of the proposed line route during wet weather conditions.

95 Corona is rarely a problem at distances beyond 50m from a transmission line. The level of audible corona at any time is dependent on the prevailing weather conditions. The dielectric strength of air is lower in wet weather than in dry weather. Thus the voltage stress at a conductor surface does not have to reach such high levels in wet weather for corona noise to become audible.

96 Corona noise attains higher levels and may become audible in wet weather, when large numbers of corona sources form as water droplets on the conductors. However, on such

occasions the background noise level of rainfall and wind tend to mask the noise from the line. People tend to find noise from a high voltage line to be more noticeable during periods of light rain, snow or fog, when they are more likely to be outdoors or to have windows open, and when the background noise is generally lower. In fair weather, corona sources are sufficiently few in number that this noise is unlikely to cause complaint due to the very short term nature of the source (less than 1 second).

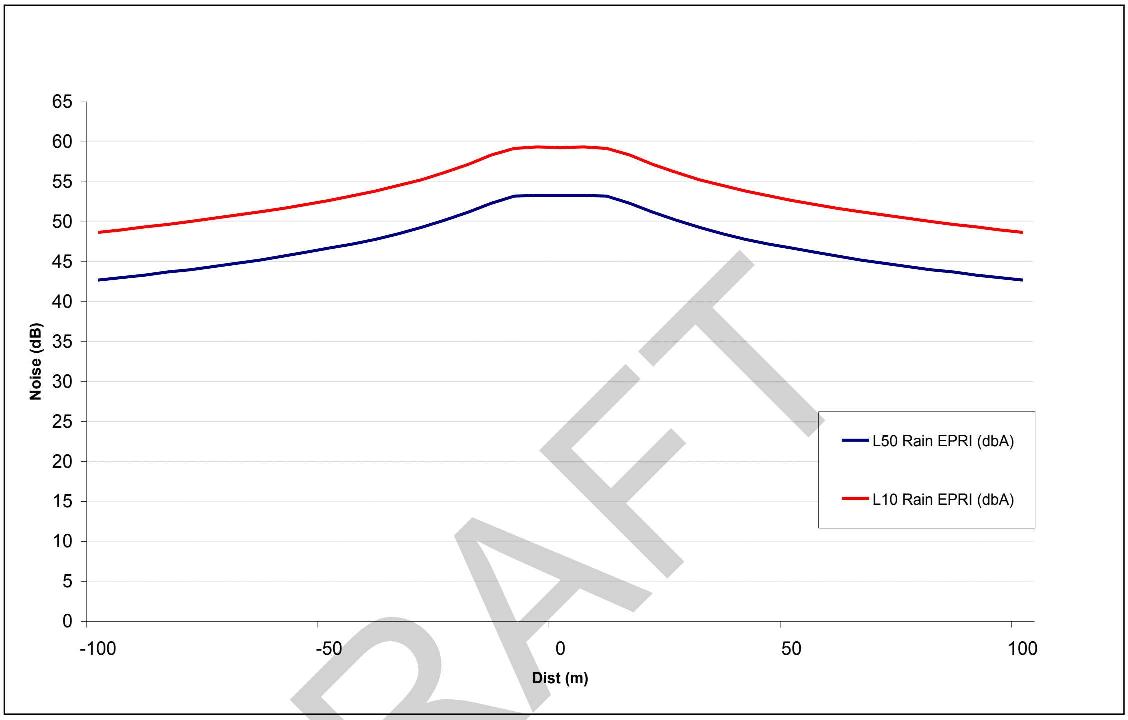


Figure 9.2: 400 kV Single Circuit Line Noise Levels in Wet Conditions

97 A useful guideline referring specifically to power lines is from the New York Public Service Commission (NYPSC) following a public enquiry in 1978. This specified an L_{50} rain level limit of 52dB (A) at the edge of a right of way. This L_{50} noise level was based on an indoor maximum permitted noise level of 35dB (A). This was in the bedroom of a house at the edge of a right of way. It was assumed that the noise attenuation of a partly closed window was 17dB (A). An examination of the background noise measurements and the predicted corona noise levels are unlikely to cause annoyance. The predicted corona noise emitted from the proposed 400 kV transmission line (measured at 50m from the line) is given in **Table 9.10.**

Table 9.10: Summary of Noise Values

Circuit Type	L_{50} Rain EPRI (dBA)	L_{10} Rain EPRI (dBA)	Fair Weather Range (dBA)	
400 kV Double Circuit	48.0	55.4	21.9	41.4
400 kV Single Circuit	46.7	52.7	20.9	40.2
Transposition Towers	46.7	52.7	20.9	40.2

98 As illustrated in **Table 9.10**, the L_{50} value during rain for both the double and single circuit line, reaches a maximum of 48dB (A) L_{50} at 50m from the centre of the proposed line route. This is 4dB (A) below the 52dB (A) L_{50} NYPSC guideline limit for OHL noise in rainy conditions. The maximum fair weather value of 41.4dB (A) is significantly lower than the 52dB (A) guideline limit value. Based on this comparison the proposed 400 kV transmission line will not cause noise annoyance to nearby residents as it is understood that there are no residential receptors located within 50m of any proposed tower locations.

9.5.3.2 Continuous Operational Noise

99 Due to the voltages associated with 400 kV OHLs, continuous operational noise may be audible but not dominant over the ambient noise levels. A noise survey at an existing 400 kV OHL has been conducted at Bogganstown, County Meath near the existing Woodland Substation. This line runs to the west of Woodland Substation on a route south of the village of Summerhill, County Meath. A noise survey was also undertaken at the existing 400 kV substation at Woodland, County Meath. In these surveys, the substation / tower noise was audible but not dominant over the ambient noise levels.

100 The measurement results are presented in terms of ‗dB LAeq,‘ which is representative of an average of the energy associated with the noise at a location over a given time interval. The levels in terms of ‗dB LA_{90}‘ are also presented and represent the level exceeded for 90% of the given time interval. The results are presented in **Tables 9.11** and **9.12**.

Table 9.11: Baseline Assessment directly under Existing 400 kV Line at Bogganstown

Locations	Date	Time	Duration	L_{Aeq}	L_{AMin}	L_{AMax}	L_{A10}	L_{A50}	L_{A90}
Under 400 kV Line at Bogganstown	07-Nov-13	14:46:46	5:00.0	47.6	38.1	99.4	50.6	44.3	39.8
Under 400 kV Line at Bogganstown	07-Nov-13	15:05:44	5:00.0	45.0	37.9	96.1	47.1	43.6	40.6
Under 400 kV Line at Bogganstown	07-Nov-13	15:21:50	5:00.0	42.9	36.4	89.5	45.7	41.2	38.5
Average				45.1	37.5	95.0	47.8	43.0	39.6

Table 9.12: Baseline Assessment under Existing 400 kV Line at Woodland Substation

Locations	Date	Time	Duration	L_{Aeq}	L_{AMin}	L_{AMax}	L_{A10}	L_{A90}
Woodland Substation	07-Nov-13	14:18	15:00.0	43.1	35.1	104.5	44.6	38.3

101 The dB LA90 noise level represents the level exceeded for 90% of the given time interval. This is often considered as representative of the ‗background‘ noise level at a location. This noise level of 39.6dB LA90 directly under the line is not considered significant and would not be expected to cause any significant noise impact to sensitive receptors. It is of note that this noise level is inclusive of all ambient noise sources in the area, such as foliage noise, distant road traffic etc. in addition to the OHL noise.

9.5.3.3 Aeolian Noise

102 Aeolian noise, also known as turbulent wind noise, may be created due to high wind speeds affecting the towers and conductors. It refers to the audible sound of wind interaction with the towers and conductors. The amount of aeolian noise is directly linked to wind speed and direction. This type of noise impact is normally not considered as significant with regard to noise impacts to sensitive receptors, as the ambient noise levels are also higher due to wind noise, therefore masking any specific aeolian noise impact from the proposed development.

103 Aeolian noise is present in the environment as a natural noise source and occurs when wind blows through tree branches, fences and other such structures. Aeolian noise from the interconnector is not expected to cause significant noise impact to sensitive receptors.

9.5.3.4 Gap Sparking

104 Gap sparking can develop at any time on transmission lines at any voltage. It occurs at tiny electrical separations (gaps) that develop between mechanically connected metal parts. Combinations of factors like corrosion, vibration, wind and weather forces, mis-fabrication, poor design or insufficient maintenance contribute to gap formation. Gap sparking can give rise to electrical noise, i.e. it occurs at frequencies higher than those that are audible to humans and therefore can be omitted as a source of noise nuisance.

9.5.4 Decommissioning

105 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration.

9.6 MITIGATION MEASURES

9.6.1 Construction Phase Mitigation

106 With regard to construction activities, the contractor appointed will have to ensure that all plant items used during the construction phase will comply with standards outlined in *European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations* (1990). The mitigation measures are outlined in *BS5228: Noise Control on Construction and Open Sites* (2009), which offers detailed guidance on the control of noise from construction activities. All such controls will be governed by the Construction Environmental Management Plan (CEMP) (an outline of which is available in Appendix 7.1, **Volume 3B Appendices** of the EIS).

107 It is proposed that various practices be adopted during construction, in conjunction with those presented in Chapter 7, **Volume 3B** of the EIS including:

- Night time working will typically not occur, but there is the unlikely possibility that there may be a necessity to continue to operate generator, pumps or other equivalent machinery at a number of locations, where the digging of foundations and erection of towers may cause activity to remain in one location for a longer period of time.

- On these infrequent occasions, screening and enclosures can be utilised. For maximum effectiveness, a screen should be positioned as close as possible to either the noise source or receiver. The screen should be constructed of material with a mass of > 7kg/m^2 and should have no gaps or joints in the barrier material. This can be used to limit noise impact to 45dB (A) $_{Leq}$ (BS 5228 acceptable night time level) at any noise sensitive receptors, if required by agreement with the local authority.

- Appoint a site representative responsible for matters relating to noise and establish channels of communication between the contractor / developer, local authority and resident i.e. for notification of requirement of night works, should this be required.

- A 2m tall continuous fence without gaps will be affixed to three sides of the boundary fence to the proposed construction material storage yard. The fence will be constructed of material with a mass of > 7kg/m^2 and have no gaps or joints in the barrier material. This fence is not required on the boundary between the construction material storage yard and the N2 National Primary Road.

108 Furthermore, it is envisaged that a variety of practicable noise control measures will be employed, these may include:

- Selection of plant with low inherent potential for generation of noise and / or vibration.

- Erection of temporary barriers around items such as generators or high duty compressors. For maximum effectiveness, a barrier should be positioned as close as possible to either the noise source or receiver. The barrier should be constructed of material with a mass of > 7kg/m^2 and should have no gaps or joints in the barrier material. An example is shown in **Figure 9.3.**

Figure 9.3: Example of a Section of Temporary Noise Barrier

- As a rough guide, the length of a barrier should be five times greater than its height. A shorter barrier should be bent around the noise source, to ensure no part of the noise source is visible from the receiving location.

- Positioning of noisy plant as far away from sensitive receptors, as permitted by site constraints.

9.6.1.1 Construction Phase Vibration Mitigation

109 Any construction works that have the potential to cause vibration at sensitive receptors will be carried out in accordance with the limit values as set out in **Table 9.5.**

9.6.2 Operational Phase Noise Mitigation

110 As outlined in the previous sections, it is not expected that noise arising from the proposed development will cause significant noise impact. Corona noise will only be audible under certain weather conditions and in close proximity to the line. Corona noise is caused predominantly by items of transmission line hardware, other than conductors, e.g. clamps and can be effectively mitigated by replacement of individual items of hardware. Aeolian noise very rarely occurs on 400 kV lines and is not expected to arise on the proposed development.

Recommended mitigation measures for aeolian noise include the fitting of air flow spoilers on conductors and the fitting of composite insulators.

111 The OHL will be subject to an annual survey by helicopter patrol. The steady rise in noise level as the helicopter is approaching any given point (while following the line route) should minimise any surprise element to the onset of the helicopter noise. This is not expected to cause any significant noise impact, due to the short term and transient nature of the annual survey and the advance notice given to landowners.

9.7 RESIDUAL IMPACTS

112 Adherence to the mitigation measures will ensure there are no residual noise and vibration impacts associated with the proposed development.

9.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS

113 During both the operational and the construction phase, the noise and vibration impacts will be predominantly associated with the road traffic impacts. This chapter should be read in conjunction with **Chapters 2** and **13** of this volume of the EIS, for a full understanding of the main interrelationships between these environmental topics.

114 The main impacts arise from the following interrelationships:

- **Chapter 2** - Human Beings – Population and Economic - There is the potential for noise impact to population in the form of impact to sensitive receptors such as private dwellings etc. in the construction phase and the operational phase. In the operational phase corona noise has the potential to cause noise impact during inclement weather conditions. These impacts are addressed in the EIS and are not deemed to be significant.

- **Chapter 13** - Material Assets – Traffic - In terms of traffic, during both the operational and the construction phase, the noise and vibration impacts will be predominantly associated with the road traffic impacts. No significant noise and vibration impacts are predicted.

9.9 CONCLUSIONS

115 An evaluation of the potential for noise and vibration impact to sensitive receptors from the proposed development has been carried out. It is predicted that the proposed development as designed, inclusive of the mitigation measures described in this evaluation, will not have a significant noise and vibration impact on sensitive receptors.

10 AIR – QUALITY AND CLIMATE

10.1 INTRODUCTION

1 The Inter Governmental Panel on Climate Change (IPCC) report *Climate Change 2013: The Physical Science Basis,* referred to as the *„Fifth Assessment Report (AR5)"*, presents clear and robust conclusions in a global assessment of climate change science[29]. The report clearly indicates with 95 percent certainty that human activity is the dominant cause of observed warming since the mid-20th century. The *Working Group 1 Report Approved for Policy Makers* has also been published in 2013 and summarises the main findings of the AR5[30]. The *AR5 Report* confirms that warming in the climate system is unequivocal, with many of the observed changes unprecedented over decades to millennia: warming of the climate system is occurring with increased atmospheric and sea temperatures, reduction in snow and ice cover, sea level rise and increasing greenhouse gas concentration in the atmosphere. Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850.

2 Met Éireann's Research Division recently led a major study on the future of Ireland's climate as part of the AR5. The study was a collaborative effort between Met Éireann, University College Dublin (UCD), University College Cork (UCC), National University of Ireland (NUI) Galway, Dublin Institute of Technology (DIT), Trinity College Dublin (TCD), NUI Maynooth, National Biodiversity Centre, *Irish Centre for High-End Computing* (ICHEC) and universities in Germany, UK, Holland and the USA and is published in the Met Éireann led study report *Ireland"s Climate: the road ahead* (2013). [33].

3 Climate change impacts may have subsequent effects on wildlife, public health, air pollution, waves, coastal flooding and renewable energy through to the middle of the century. Regard has also been made to the European Commission's *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessme*nt (2013) in the preparation of this

[29] Stocker, T.F., D. Qin, G.-K. Plattner, L.V. Alexander, S.K. Allen, N.L. Bindoff, F.-M. Bréon, J.A. Church, U. Cubasch, S. Emori, P. Forster, P. Friedlingstein, N. Gillett, J.M. Gregory, D.L. Hartmann, E. Jansen, B. Kirtman, R. Knutti, K. Krishna Kumar, P. Lemke, J. Marotzke, V. Masson-Delmotte, G.A. Meehl, I.I. Mokhov, S. Piao, V. Ramaswamy, D.
Randall, M. Rhein, M. Rojas, C. Sabine, D. Shindell, L.D. Talley, D.G. Vaughan and S.-P. Xie, 2013: Technical Summary. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[30] IPCC, 2013: Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[33] *www.met.ie/UserMediaUpl/file/Irelands_Climate_25092013_LR.pdf*

chapter. Air quality is essential for human health and well being and to ensure the maintenance of natural ecosystems. This chapter assesses the potential impacts on air and climate arising from the proposed development.

4 The proposed development will have a net positive impact on reducing greenhouse gas emissions through facilitation of further development of renewable energy sources in a cost effective and efficient manner. This will in turn displace energy production from fossil fuels with a consequent reduction in the emission of greenhouse gases, mainly carbon dioxide (CO_2), sulphur dioxide (SO_2) and nitrous oxides (NOx). It will also help towards reducing Ireland's dependence on fossil fuels for energy production and underpin the achievement of Ireland's agreed European Union (EU) targets with respect to greenhouse gas emissions and renewable energy. As with the majority of large civil engineering projects potential emissions to air are inevitable during the construction phase, arising from construction activities, transport of materials and the use of plant and equipment. However, given the linear nature of the proposed development, as set out in Chapter 6, **Volume 3B** of the EIS**,** and its construction methodology as set out in Chapter 7, **Volume 3B** of the EIS**,** the construction impacts will be localised and relatively short term and should be considered in the context of the long term impact of the development.

5 This chapter should be read in conjunction with Chapter 7, **Volume 3B** of the EIS and **Chapter 13,** of this volume of the EIS.

10.2 METHODOLOGY

6 The proposed project is a linear construction located in the air quality management area Zone D as defined by the Environmental Protection Agency (EPA) in accordance with EU air quality legislation. Background air quality data for Zone D was obtained from the EPA report on *Air Quality in Ireland 2012 – Key Indicators of Ambient Air Quality (2013) a*nd air quality bulletins as published periodically by the EPA and assessed against the *Air Quality Standards Regulations 2011* (S.I. No. 180/2011) which transpose the requirements of the Clean Air for Europe (CAFE) Directive (2008/50/EC).

7 Global Climate information was obtained from the IPCCs AR5. Predicted local climate change information with respect to Ireland was obtained from the Met Éireann led study report *Ireland"s Climate: The Road Ahead* (2013).

8 Potential localised air pollution impacts arising from construction of the project have been assessed based on the experience of similar construction projects of this nature and with reference to the Environmental Protection UK (EPUK) guidance document *Development Control: Planning For Air Quality* (2010 Update).

9 Reference is also made to the 2013 EU Guidance on *Integrating Climate Change and Biodiversity into Environmental Impact Assessment*. This guidance recognises the need for action on climate change and biodiversity loss across Europe and around the world. It identifies the need to fully integrate the combating of and adaptation to climate change, to halt the loss of biodiversity and the degradation of ecosystems. Potential national impacts of climate change on Ireland's biodiversity have been identified in the Met Éireann led study report and are outlined in **Section 10.4.1.** The overall beneficial impact of the project in providing infrastructure to facilitate displacement of greenhouse gas emissions thereby combating climate change is discussed in **Section 10.5.3**.

10.2.1 Policy and Legislative Context and Air Quality Standards

10.2.1.1 European Union Climate Change Policy

10 In acknowledgement of the clear message of the *AR5 Report* in January 2014 the European Commission (EC) presented a framework to drive continued progress towards a low carbon economy in the European Union (EU). Key to the framework is a 40% reduction in greenhouse gas emission by 2030 compared to 1990 levels. To achieve this target it is estimated that:

- The sectors covered by the EU Emission Trading Scheme (ETS), including energy, would have to reduce emissions by 43% compared to 2005; and

- Emissions from the non-ETS sectors would have to reduce by 30% compared to 2005 levels. The effort needed to meet these targets will be shared equitably between Member States.

11 In addition, an EU-level 2030 target for renewable energy is proposed with, at least, 27% of EU energy consumption to come from renewable sources. This renewable energy target does not, however, place binding targets on Member States and is to be reached by the EU as a whole.

12 Further improvements in energy efficiency are also foreseen. However, the role of energy efficiency in the 2030 framework is not as yet known until a review of Directive 2012/27/EU on energy efficiency is undertaken in 2014.

10.2.1.2 National Policy Position on Climate Action & Low Carbon Development

13 In April 2014 the Government published its *National Policy Position on Climate Action & Low Carbon Development for Ireland*[35] which::

[35] *www.environ.ie/en/Environment/Atmosphere/ClimateChange/NationalClimatePolicy.*

- Recognises the threat of climate change for humanity;
- Anticipates and supports mobilisation of a comprehensive international response to climate change, and global transition to a low-carbon future;
- Recognises the challenges and opportunities of the broad transition agenda for society; and
- Aims, as a fundamental national objective, to achieve transition to a competitive, low-carbon, climate-resilient and environmentally sustainable economy by 2050.

14 The wider context for national climate policy includes:

- Existing and future obligations of the State under international agreements;
- The commitment by Ireland to the United Nations Framework Convention on Climate Change (herein after referred to as the Convention), and its ultimate objective of achieving stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system – to be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner;
- The European Union objective which details the necessary reductions, according to the Intergovernmental Panel on Climate Change, by developed countries as a group, to greenhouse gas emissions by 80-95% by 2050 compared to 1990;
- Existing and future obligations of the State under the law of the European Union; and
- The evolution of climate policy within the European Union and at a wider international level under the Convention.

15 The Government also published the final Heads of the *Climate Action and Low-Carbon Development Bill* in April 2014[35]. The objectives of the Bill are to enable Ireland to meet its legally binding non-ETS emissions reduction 2020 target (and any other new EU and international obligations) and to achieve transition to a low-carbon, climate resilient and environmentally sustainable economy in the period up to and including the year 2050.

10.2.1.3 Air Quality Standards

16 To protect human health, vegetation and ecosystems, EU Directives have been adopted which set down air quality standards for a wide variety of pollutants. The current standards are contained in the CAFE Directive (2008/50/EC) (European Parliament (EP) and Council of Europe (CEU), 2008) and the Fourth Daughter Directive (EP & CEU, 2004). These Directives also include rules on how Member States should monitor, assess and manage ambient air quality.

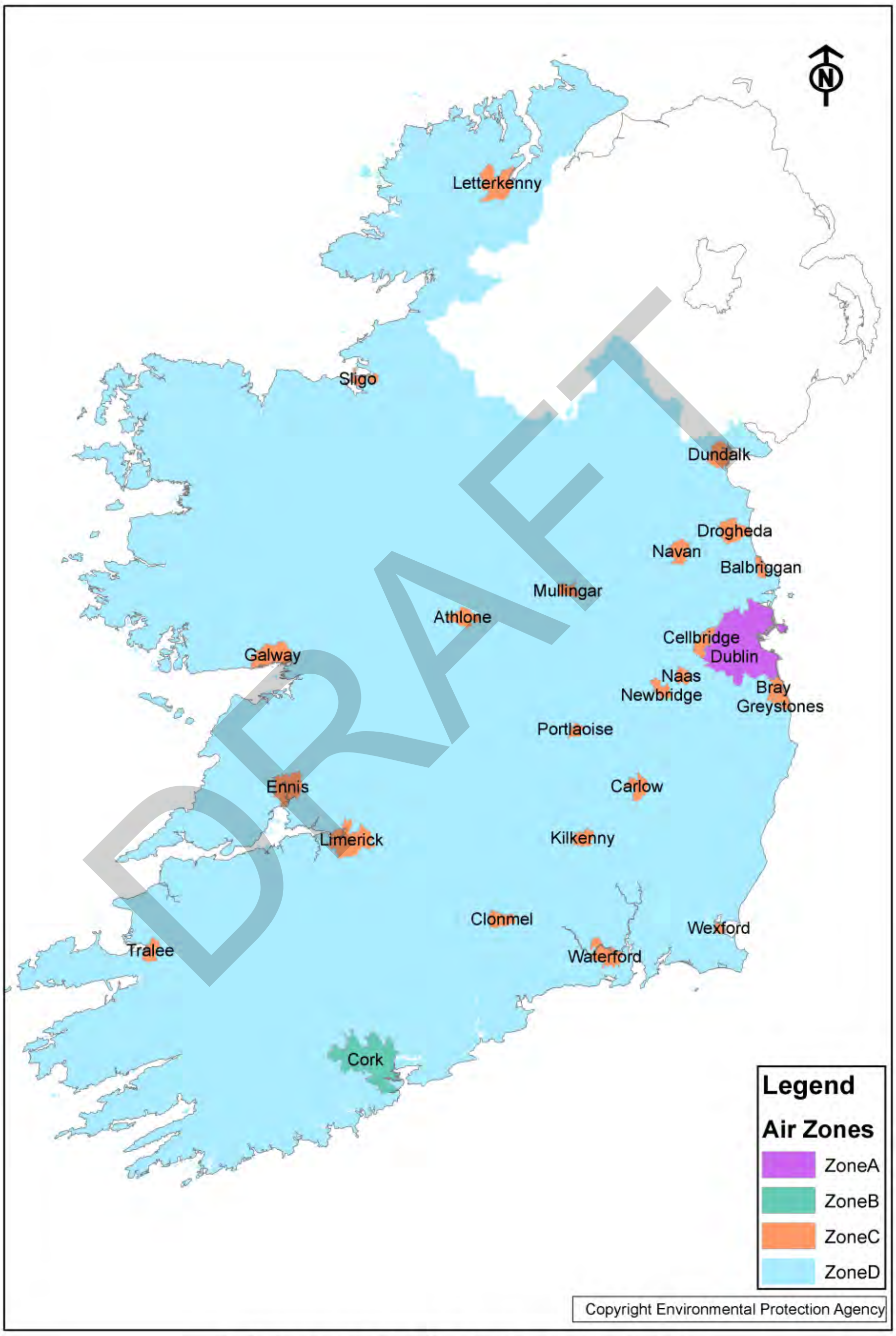
17 The CAFE Directive is an amalgamation of the Air Quality Framework Directive and its subsequent first, second and third daughter Directives.

18 The CAFE Directive was transposed into Irish legislation by the *Air Quality Standards Regulations 2011* (S.I. No. 180/2011). It replaces the *Air Quality Standards Regulations 2002* (S.I. No. 271/2002), the *Ozone in Ambient Air Regulations 2004* (S.I. No. 53/2004) and S.I. No. 33/1999 *Environmental Protection Agency Act, 1992 (Ambient Air Quality Assessment and Management) Regulations*. The Fourth Daughter Directive was transposed by the *Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009* (S.I. No. 58/2009).

19 EU legislation on air quality (CAFE) requires that Member States divide their territory into zones for assessment and management purposes. Ireland is divided into four such zones (refer to **Figure 10.1**) in the Air Quality Standards Regulations (2011). The zones were amended on 1st January 2013 to take account of population counts from the 2011 CSO Census and to align with the coal restricted areas in the 2012 Regulations (S.I. No. 326 of 2012). Zone A is the Dublin conurbation, Zone B is the Cork conurbation, Zone C other cities and large towns comprising Limerick, Galway, Waterford, Drogheda, Dundalk, Bray, Navan, Ennis, Tralee, Kilkenny, Carlow, Naas, Sligo, Newbridge, Mullingar, Wexford, Letterkenny, Athlone, Celbridge, Clonmel, Balbriggan, Greystones, Leixlip and Portlaoise and Zone D, principally rural, is the remaining area of Ireland. The proposed development which includes counties Cavan and Monaghan is located within Zone D.

20 In conjunction with individual local authorities, the EPA undertakes ambient air quality monitoring at specific locations throughout the country in the urban and rural environment. It prepares an Air Quality Report based on data from 30 monitoring stations and a number of mobile air quality monitoring units. The EPA as the National Reference Laboratory for Air, coordinates and manages the monitoring network. Monitoring stations are located across the country. The EPA published air quality summary bulletins for PM10, Ozone and Nitrogen Dioxide to the end of September 2014 and also provides real time air quality data on its website (www.epa.ie/air/quality/).

21 Air quality standards have been developed and incorporated into Irish statute in order to protect both human health and the ambient environment. These standards are based on International agreements, which identify performance standards and limit the generation of air quality pollutants at a regional, national and global level.



Air Quality in Ireland 2012, Key Indicators of Ambient Air Quality

Figure 10.1: Air Quality Zones in Ireland

(Source: Air Quality in Ireland 2012, EPA)

10.2.1.4 Dust Deposition Standards and Guidelines

22 Currently in Ireland there are no statutory limits for dust deposition. Dust particles in the ambient environment is pervasive, however localised increases in dust particles is usually associated with exposure of soil surfaces, usually through human activities associated with agricultural practices or construction. Whether dust deposition becomes an issue for the general public is a subjective issue and depends on a variety of factors including the sensitivity of nearby locations, the repetitive nature of any dust deposition occurring and the nature of the dust particulate itself. It is because of these variances and the subjectivity of the issue that there are no statutory limits. The focus for dust control and emissions is on minimising the potential for a nuisance occurring in the first instance and implementing good site practices where practicable.

23 In recent years the TA Luft/VDI 2119/Bergerhoff Method of dust emission monitoring has become the most commonly used method. This method is advocated by both the EPA and the Department of Environment, Community and Local Government (DoECLG). This method involves determining a mass dust deposition rate per unit area over a given time period, using a direct collection pot to standardise dimensions of either glass or plastic. The system benefits from being a direct collection method i.e. less transferring of material and consequent reduction in sampling errors. This method is defined as an internationally recognised standard and has been adopted by the EPA as the method of choice for licensed facilities.

24 The TA Luft/VDI 2119 recommended threshold guideline value is 350mg/m²/day. Below this threshold guideline value dust deposition problems are considered less likely. This is the recommended threshold value normally stipulated by local authorities and the EPA in conditions attached to development consent and Waste Licences.

10.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

25 The types of issues which OHL developments of this nature typically raise in relation to this topic include the potential for impacts on air quality, primarily due to the generation and dispersion of dust but also due to additional emissions from construction vehicles and plant. The positive climatic effects will also be detailed in this chapter. In this regard, this chapter considers the construction, operational and decommissioning phases of the proposed development.

10.4 EXISTING ENVIRONMENT

10.4.1 Climate Change

26 Global warming, and the management of emissions with the potential to contribute to global warming, is increasingly important on a national and international basis. Global warming has numerous potential implications for Ireland's environment, including:

- Greater risk of intense storms and rainfall events leading to greater potential for flooding in rivers and on the coast, where almost all cities and large towns are situated;
- Changes to habitats and eco-systems with changes in the distribution of species; and the possible extinction of vulnerable species;
- Effects on sea levels and river levels;
- Increased stress on water resources, with water shortages in summer in the east and potential for over exploitation; and
- Increased summer temperatures can also impact human health among the susceptible sector of the Irish community, particularly the elderly.

27 Increased atmospheric levels of greenhouse gases are now widely recognised as the leading cause of climate change. This is borne out by the most recent findings of the IPCCs AR5. Some of the key points of the approved summary of the report include:

> *"Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased."*

> In terms of atmosphere:

> *"Each of the last three decades has been successively warmer at the Earth‟s surface than any preceding decade since 1850 (see Figure SPM.1). In the Northern Hemisphere, 1983–2012 was likely the warmest 30-year period of the last 1400 years (medium confidence)".*

> In terms of ocean:

> *–Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010 (high confidence). It is virtually certain that the upper ocean (0−700 m) warmed from 1971 to 2010… and it likely warmed between the 1870s and 1971".*

―…. the rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia (high confidence). Over the period 1901 to 2010, global mean sea level rose by 0.19 [0.17 to 0.21] m"

In terms of croysphere:

"Over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and Arctic sea ice and Northern Hemisphere spring snow cover have continued to decrease in extent (high confidence)".

In terms of carbon and other biogeochemical cycles:

"The atmospheric concentrations of carbon dioxide (CO2), methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. CO2 concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. The ocean has absorbed about 30% of the emitted anthropogenic carbon dioxide, causing ocean acidification."

"Natural and anthropogenic substances and processes that alter the Earth's energy budget are drivers of climate change".

28 The Met Éireann led study *Ireland‷s Climate: the road ahead* (2013) carried out global climate model simulations as part of Ireland‘s contribution to the science underpinning the IPCCs AR5. The Irish study modelled projections for climate change in Ireland indicated the following:

- The observed warming over the period 1981-2010 is expected to continue with an increase of ~1.5 degrees in mean temperatures by mid-century; the strongest signals are in winter and summer. Highest daytime temperatures are projected to rise by up to 2 degrees in summer and lowest night time temperatures to rise by up to 2-3 degrees in winter.

- Milder winters will, on average, reduce the cold related mortality rates among the elderly and frail but this may be offset by increases due to heat stress during summer.

- Winters are expected to become wetter with increases of up to 14% in precipitation by mid-century with summers becoming drier (up to 20% reduction in precipitation). The frequency of heavy rainfall events during winter may increase by up to 20%.

- Changes in precipitation are likely to have significant impacts on river catchment hydrology, such as increased flow and level during higher rainfall events and prolonged periods of low water level in drier summers.

- An overall increase (0-8%) in the energy content of the wind for the future winter months and a decrease (4-14%) during the summer months.

- A small decrease in mean wave heights is expected around Ireland by the end of the century, while in winter and spring, storm wave heights are likely to increase.

- Expected increases in temperature will further affect the ecology such as that of Irish butterflies, in particular.

- Chapter 7 of the Met Éireann led study considers some additional potential impacts of a warmer climate on Irish Wildlife stating that:

> *"Spring warming in recent years has had a significant impact on Irish wildlife by advancing the timing of key phenological phases of a wide range of organisms, including trees, birds and insects."*

29 The most important long lived greenhouse gases are CO_2, N_2O, and Methane (CH_4). CO_2 arises from a range of sources including the combustion of fossil fuels. According to the EPA, agriculture remains the single largest contributor to overall greenhouse gas emissions in Ireland, at 32.1% of the total, followed by energy (power generation and oil refining) at 20.8% and transport at 19.7%. The remainder is made up by industry and commercial at 14.0%, the residential sector at 11.5%, and waste at 1.8%.

30 The International Kyoto Protocol was devised in 1997 in response to rising emissions of the principal compounds contributing to global warming. The Kyoto Protocol was subsequently ratified by the EU in 2005.

31 Under the burden sharing agreement within the EU, devised to implement the Kyoto Protocol, Ireland agreed to limit emissions between 2008 and 2012 to 13% above 1990 emission levels.

32 Ireland's target, according to the EU Climate Change and Energy Package[36], is to reduce CO_2 emissions by 20% and to increase renewable energy production by 16%. The main policies to be implemented by Ireland are to source 15% of national electricity requirements from renewable energy by 2010 and by 40% by 2020. Other policies include improving the quality and participation in public transport, use of bio-fuels, higher energy conservation in building standards, schemes to improve recovery / recycling of waste streams and better agricultural and forestry management.

[36] The climate and energy package is a set of binding legislation which aims to ensure the European Union meets its ambitious climate and energy targets for 2020.

33 Key objectives for reductions in greenhouse gases across the agriculture, energy, transport, industrial, forestry and built environment sectors, which will ensure that Ireland can meet its international commitments, are set out in the *National Climate Change Strategy 2007–2012*. This Strategy includes the Government's target of achieving 40% of electricity consumption on a national basis from renewable energy sources by 2020. Achieving this target will potentially contribute significantly to limiting the increase of greenhouse gases in Ireland.

34 Under the EU National Emissions Ceiling Directive (2001/81/EC), Member States were required to limit their annual national emissions of SO_2, NOx, volatile organic compounds (VOC) and NH_3 to amounts not greater than the emissions ceilings laid down in Annex 1 of the Directive, by the year 2010 at the latest. Ireland's limits are as follows:

- SO_2 42 kilotonnes;
- NOx 65 kilotonnes;
- VOC 55 kilotonnes; and
- NH_3 116 kilotonnes.

35 Ireland is subject to several conventions and protocols that place limits on, and force reductions in, these emissions.

36 Some key emission reductions have occurred in the energy sector reflecting an increase in the share of renewables in gross electricity consumption. The SEAI publication *Renewable Energy in Ireland 2012*[37] reports that the share of electricity generated from renewable energy sources has increased between 1990 and 2012 from 4.9% to 19.6%. The principal contribution to this transition has come from wind generation. .

37 Ireland's combined emissions in 2008, 2009, 2010 and 2011 were 1.77 million tonnes above its Kyoto limit when the EU Emissions Trading Scheme (ETS) and approved Forest Sinks are taken into account.

38 The EPA is also designated under the *National Climate Change Strategy 2007–2012* to prepare annual national emission projections for greenhouse gases relating to key sectors of the national economy. In the latest EPA projection report *Ireland"s Greenhouse Gas Emission Projections 2012 – 2030*, (April 2014) the following was stated with respect to the energy sector:

[37] http://www.seai.ie/Publications/Statistics_Publications/EPSSU_Publications/Renewable-Energy-in-Ireland-2012.pdf.

"Energy sector emissions comprise emissions from power generation, oil refining, peat briquetting and fugitive emissions. Emissions from power generation accounted for 97% of energy sector emissions in 2012 and are responsible for a similar share of emissions over the projection period.

Under the With Measures scenario, total energy sector emissions are projected to decrease by 11% over the period 2013 – 2020 to 11.5 Mt CO2eq. The decrease in emissions is caused by a projected decrease in the use of peat and increase in the use of natural gas and renewable fuels for electricity generation. Renewables penetration in 2020 is projected to be 26% under this scenario. The emissions savings associated with increased natural gas and renewable fuels in electricity generation is, however, partially offset by the continued combustion of coal which is projected to be 19% higher in 2020 compared with 2012 in this scenario.

Under the With Additional Measures scenario, total energy sector emissions are projected to decrease by 16% over the period 2012 – 2020 to 11 Mt CO2eq. In this scenario, it is assumed that renewable energy reaches 40% penetration by 2020. The largest renewable energy contribution comes from wind which is estimated to be 62% above that in the With Measures scenario in terms of generation input. This scenario also includes additional expansion of renewable electricity generation from co-firing biomass, the construction of an additional waste to energy incineration plant and the continued development of landfill gas electricity generation and biomass CHP."

39 Overall the projections set out in the EPA report show that Ireland is not on a pathway to a low-carbon economy. Total national greenhouse gas emissions are projected to, at best, decrease by an average of 0.4% per annum up to 2020 if all national policies are implemented and delivered. Furthermore, emissions are projected to increase between 2020 and 2030 (12% in total) with transport a key contributor to this trend in the absence of additional policies and measures.

"There is a significant risk that Ireland will not meet its 2020 EU targets even under the most ambitious emission reduction scenario. These projections shows a cumulative distance to target of 1 – 17 Mt CO2eq for the period 2013-2020 with Ireland breaching its annual limits in 2016-2017.

"Strong projected growth in emissions from transport and agriculture are the key contributors to non-ETS emissions. In 2020 non-ETS emissions will be 5-12% below 2005 levels compared with a 20% reduction target".

40 It is clear that the country still faces considerable challenges in meeting EU 2020 targets and developing a low-carbon emission pathway to 2050. The lower cumulative distance to target assumes that all the targets set out in the Government‘s *National Energy Efficiency Action Plan* 2009-2020 (NEEAP) and *National Renewable Energy Action Plan* (NREAP) (2010) are achieved.

10.4.2 Ambient Air Quality

41 Clean air is of particular importance to the Irish population‘s general health and well being. The benefits of a clean natural environment play an important role in reducing the burden of chronic disease. Ireland is fortunate in having a good quality of air relative to other EU Member States as evidenced by the most recent EPA report A*ir Quality in Ireland 2012 - Key Indicators of Ambient Air Quality* (2013).

42 The EPA Air Quality report provides an overview of air quality in Ireland for 2012, based on the data obtained from 29 monitoring stations that form the National Ambient Air Quality Monitoring Network. It includes an assessment of the following pollutants: NOx, SO_2, CO, ozone, particulate matter (PM10, PM2.5 and black smoke), benzene and VOC, heavy metals and polycyclic aromatic hydrocarbons. The EPA Air Quality report concludes that:

> “*Overall, relative to other EU Member States, Ireland continues to enjoy good air quality, with no exceedances for the pollutants measured in 2012. This is due largely to the prevailing clean westerly air-flow from the Atlantic, a small number of large cities and an industrial sector which is relatively clean and well regulated*”.

43 To assess air quality the EPA compares the results of air quality monitoring in Ireland to the limit and target values in the latest EU legislation, the CAFE Directive (2008/50/EC) (EP and CEU, 2008) and the Fourth Daughter Directive (EP and CEU, 2004).

44 The air quality in each zone is assessed and classified with respect to upper and lower assessment thresholds based on measurements over the previous five years. As stated above, the proposed development area falls into the area classified as Zone D, a predominately rural area. In this zone ambient air quality is influenced principally by agricultural activity, domestic heating and vehicle emissions.

45 A summary of background air quality for the main pollutants such as NOx, SO_2, CO, PM10 and PM2.5 as assessed by the EPA for Zone D is provided in **Tables 10.1** to **10.6.** The appropriate limit values as derived from the EU CAFE Directive (2008/50/EC) and as transposed into Irish legislation [S.I.No. 180/204] are also provided for comparative purposes.

46 Air quality in Zone D areas is generally very good with low concentrations of pollutants such as NO_2, SO_2, Particulate Matter 10 microns in size (PM10), particulate Matter 2.5 microns in size (PM2.5) and Carbon Monoxide (CO). This is due mainly to the prevailing clean westerly air flow from the Atlantic and the relative absence of large cities and heavy industry. Concentrations of ozone are higher in rural areas than in urban areas due to the absence of the NOx in rural areas as an ozone scavenger. Ozone is also a transboundary pollutant, with locations on the west coast having the highest concentrations in Ireland.

Table 10.1: EPA Air Quality Monitoring Nitrous Oxides (NOx)

Limit Threshold Values for NO_X as set out in the 2008 CAFE Directive & S.I. No. 180 Of 2011				**Summary Statistics For Hourly NO_X Concentrations In Ireland In 2012**	
Objective	***Reference Time Period***	***Limit or Threshold value***	***No. of Allowed Exceedances***		
Human Health	One hour	200 µg/m^3	18 hours per year	**Annual Mean**	4 µg/m^3
Human health Calendar year 40 µg/m3	Calendar year	40 µg/m^3		**Median**	3 µg/m^3
Alert	One hour	400 µg/m^3		**Hourly Max**	77 µg/m^3
Vegetation	Calendar year	30 µg/m^3			
Upper assessment threshold for human health	Calendar year	32 µg/m^3			
Lower assessment threshold for human health	Calendar year	26 µg/m^3			

Table 10.2: EPA Air Quality Monitoring Sulphur Dioxide (SO2)

Limit Threshold Values for SO2 as set out in the 2008 CAFE Directive & S.I. No. 180 Of 2011				**Summary Statistics For Hourly SO2 Concentrations In Ireland In 2012 Zone D**	
Objective	***Reference Time Period***	***Limit or Threshold value***	***No. of Allowed Exceedances***		
Human health	One Hour	350 µg/m^3			
Human health	One day	125 µg/m^3	3 days per year	**Annual Mean**	3 µg/m^3

Limit Threshold Values for SO2 as set out in the 2008 CAFE Directive & S.I. No. 180 Of 2011				Summary Statistics For Hourly SO2 Concentrations In Ireland In 2012 Zone D	
Alert	One Hour	500 µg/m^3		**Median**	2 µg/m^3
Vegetation	Calendar year	20 µg/m^3		**Hourly Max**	12 µg/m^3
Upper assessment threshold for human health	One day	75 µg/m^3	3 days per year	**Daily Max**	7 µg/m^3
Lower assessment threshold for human health	One day	50 µg/m^3	3 days per year		

Table 10.3: EPA Air Quality Monitoring Carbon Monoxide (CO)

Limit Threshold Values for CO as set out in the 2008 CAFE Directive & S.I. No. 180 Of 2011				Summary Statistics For Rolling 8 hour CO Concentrations In Ireland In 2012 Zone D	
Objective	***Reference Time Period***	***Limit or Threshold value***	***No. of Allowed Exceedances***		
Human health	8 Hour Average	10 mg/m^3	-	**Annual Mean**	0.2 mg/m^3
Upper assessment threshold for human health	8 Hour Average	7 mg/m^3	-	**Median**	0.2 mg/m^3
Lower assessment threshold for human health	13 Hour Average	5 mg/m^3	-	**Hourly max**	0.9 mg/m^3

Table 10.4: EPA Air Quality Monitoring Ozone

Air Quality Limit Values for ozone set out in the 2008 CAFE Directive And S.I. No. 180 Of 2011				Summary Statistics For Rolling 8 hour Ozone Concentrations In Ireland In 2012 Zone D	
Objective	***Reference Time Period***	***Limit or Threshold value***	***No. of Allowed Exceedances***		
Human health	Daily maximum 8-hour mean	120 µg/m^3	25 days per year averaged over 3 years	**Annual Mean**	58 µg/m^3
Vegetation	AOT40 accumulated over May-July	18,000 µg/ m^3 averaged over 5 years		**Median**	57 µg/m^3

Air Quality Limit Values for ozone set out in the 2008 CAFE Directive And S.I. No. 180 Of 2011				Summary Statistics For Rolling 8 hour Ozone Concentrations In Ireland In 2012 Zone D	
LTO health	Daily maximum 8-hour mean	120 µg/ m^3		**Max 8 Hour**	136 µg/m^3
LTO vegetation	AOT40 accumulated over May-July	6,000 (µg/m^3).h		**Number of days greater than 120**	3
				Average AOTO40	2240 µg/m^3

Table 10.5: EPA Air Quality Monitoring Particulate Matter (PM10)

Air Quality Limit and Target Values for PM10 as set out by The CAFE Directive And S.I. No. 180 Of 2011				Summary Statistics For Daily PM10 Concentrations In Ireland In 2012	
Objective	***Reference Time Period***	***Limit or Threshold value***	***No. of Allowed Exceedances***		
PM10 limit value	One day	50 µg/m^3	Not to be exceeded on more than 35 days per year	**Annual Mean**	9 µg/m^3
PM10 limit value	Calendar year	40 µg/m^3		**Median**	9 µg/m^3
Upper assessment threshold	One day	35 µg/m^3	Not to be exceeded on more than 35 days per year	**Daily Max**	54 µg/m^3
Lower assessment threshold	One day	25 µg/m^3	Not to be exceeded on more than 35 days per year	**Number of days greater than 50**	1
Upper assessment threshold	Calendar year	28 µg/m3			
Lower assessment threshold	Calendar year	20 µg/m3			

Table 10.6: EPA Air Quality Monitoring Particulate Matter (PM2.5)

Air Quality Limits and Target Values for PM2.5 as set out by The CAFE Directive And S.I. No. 180 Of 2011				**Summary Statistics For Daily PM2.5 Concentrations For Ireland In 2012**	
Objective	***Reference Time Period***	***Limit or Threshold value***	***No. of Allowed Exceedances***		
PM2.5, target value	Calendar year	25 µg/m^3	To be met by 1 January 2010	**Annual mean**	9 µg/m^3
PM2.5, limit value	Calendar year	25 µg/m^3	To be met by 1 January 2015	**Median**	8 µg/m^3
PM2.5, limit value2	Calendar year	20 µg/m^3	To be met by 1 January 2020	**Daily max**	46 µg/m^3
Upper assessment threshold	Calendar year	17 µg/m^3			
Lower assessment threshold	Calendar year	12 µg/m^3			
PM2.5 exposure concentration obligation.		20 µg/m^3	To be met by 1 January 2015		
PM2.5 exposure reduction target	0 - 20 % reduction in exposure (depending on the average exposure indicator in the target reference year) to be met by 2020				

10.4.3 Other Atmospheric Emissions

47 The pollutants SO_2, NOx, VOC and ammonia (NH_3) are responsible for long range transboundary air pollution such as acidification, eutrophication and ground level ozone pollution.

- SO2 is the major precursor to acid deposition, which is associated with the acidification of soils and surface waters and the accelerated corrosion of buildings and monuments. Emissions of SO_2 are derived from the sulphur in fossil fuels such as coal and oil used in combustion activities.

- NOx emissions contribute to acidification of soils and surface waters, tropospheric ozone formation and nitrogen saturation in terrestrial ecosystems. Power generation plants and motor vehicles are the principal sources of NOx emissions, through high-temperature combustion.

- VOCs are emitted as gases by a wide array of products including paints, paint strippers, glues, and adhesives and cleaning agents. They also arise as a product of incomplete combustion of fuels and as such are a component of car exhaust and evaporative emissions.

- NH_3 emissions are associated with acid deposition and the formation of secondary particulate matter. The agriculture sector accounts for virtually all (over 98%) ammonia emissions in Ireland.

48 Under Article 4.1 of the National Emissions Ceiling Directive (2001/81/EC), Member States are required to limit their annual national emissions of SO_2, NOx, VOC and NH3 to amounts not greater than the emissions ceilings laid down in Annex 1 of the Directive, by the year 2010 at the latest.

49 The transport sector is the principal source of NOx emissions, contributing approximately 55% of the total. The industrial and power generation sectors are the other main source of NOx emissions, each accounting for 12% of emissions with the remainder emanating from the residential / commercial and the agriculture sectors.

50 The agricultural sector accounts for virtually all NH_3 emissions.

51 The main sources of VOC emissions in Ireland are solvent use and transport accounting for 85% of the total. Domestic coal burning in the residential sector is another important but declining source. Reductions corresponding to 48% have been achieved from 1990 with improved emission control for VOCs in motor vehicles has been largely been responsible for the decrease in overall emissions.

10.4.4 Heavy Metals and Organic Pollutants

52 Heavy metals, benzene and polycyclic aromatic hydrocarbons (PAH) were all below the annual limit values in Zone D also. The EPA Air Quality in Ireland Report 2012 (published in 2013) noted however, that domestic fuel burning emissions in rural areas was the main source of particulate matter and poly-aromatic hydrocarbons (PAH). Levels of particulate matter in some smaller towns for example are similar or higher than those in cities, where bituminous coal is banned.

10.4.5 Dust Deposition

53 Owing to the linear nature of the project with isolated areas of activity which are limited in size and the fact that it lies largely in a rural setting, dust deposition monitoring is not considered necessary to inform the existing baseline conditions. Apart from seasonal agricultural activity, dust deposition is unlikely to impact on the ambient environment. The PM10 and PM2.5 monitoring undertaken by the EPA indicates that the ambient air quality in Zone D is below the threshold limit values.

10.5 POTENTIAL IMPACTS

10.5.1 Do Nothing

54 Climate change and local changes in air quality will continue to change in line with prevailing trends in future years.

10.5.2 Construction Phase

55 There will be potential for minor temporary short term impacts on air quality arising from construction transport and construction related activity, including those associated with the construction material storage yard. These potential impacts relate to construction and transport vehicle emissions and localised potential for dust generation.

10.5.2.1 Climate Impacts

56 The impacts on climate change during the construction phase will be non-significant.

10.5.2.2 Dust and Particulate Matter

57 Dust generation will give rise to potential impact on localised air quality for brief periods. During the construction of the proposed development, there will be site preparation and construction activities, both of which have the potential to generate dust. There is therefore some potential for local air quality to be impacted by dust during the construction phase. Dust generated by construction activity can give rise to local nuisance. However, the impact of this will depend largely on climatic factors. For example the potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust also depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations.

58 The primary air quality issue related to construction is dust potentially arising from the following activities:

- General construction activities, including tree lopping and cutting;
- Earth moving and excavation equipment including handling and storage of soils and subsoil material;
- Vehicle movement over hard dry surfaces on the site, particularly freshly laid access tracks; and
- Vehicle movement over surfaces off site contaminated by muddy materials brought off the site.

59 Dust deposition is usually highly localised to areas of activity, with dust particles falling to the ground within several hundred metres of the source. Dust emissions do not cause long term or wide spread changes to local air quality but their deposition on nearby properties and cars has the potential to cause soiling and discolouration.

60 The majority of the releases are likely to occur during the normal construction working hours. However, in the instance of exposed soil produced from significant earthwork activities, there is potential for short term dust generation to occur 24 hours per day depending on weather conditions.

61 Particulate matter can remain suspended in the atmosphere for a longer period and can be transported over a wider area than dust, by wind. It is potentially small enough to be drawn into the lung during breathing, which in sensitive members of the public could cause an adverse reaction. However, given the general good air quality along the construction route and relatively short duration of construction activity at any one location no significant impact from particulate matter is expected.

62 Typical sources of particulate matter during the construction phase are similar in nature to those that give rise to dust. Particulate matter is also released from the engines of site plant, such as compressors, generators etc. whilst they are running.

63 Therefore, occasionally, increased and perceptible localised emissions may occur. There may also be occasions when mechanical breakdown of site plant could cause short term releases of excess particulate matter and short term release may also occur during start up. However with good construction and mitigation practices dust will not impact significantly on air quality.

10.5.2.3 Emissions from Construction Traffic

64 Construction traffic will use local roads to access the working areas with potentially large percentage increases of traffic flow on some local roads, although this is predominantly due to the very low existing flow volumes (see **Chapter 13** of this volume of the EIS). This traffic will be temporary in nature and of short duration and will be dispersed along the proposed alignment. In terms of its potential to cause significant effects on air quality the EPUK guidance document *Development Control: Planning For Air Quality* (2010), identifies the requirement for air quality assessment only where the following criteria are met as otherwise significant air quality effects will be unlikely to occur:

- Road alignment will change by 5m or more; or
- Daily traffic flows will change by 1000 Annual Average Daily Traffic (AADT) or more; or
- Heavy Duty Vehicles (HGV) flows will change by 200 AADT or more; or
- Daily average speed will change by 10km/hr or more; or
- Peak hour speed will change by 20km/hr or more.

65 Additionally the assessment is only required for large, long term construction sites that would generate Heavy Goods Vehicle (HGV) flows of more than 200 movements per day over a period of a year of more. As the numbers of construction vehicles associated with the construction of the transmission line (see **Chapter 13** of this volume of the EIS) are well below the thresholds identified and are considered to be low and temporary in nature at any one construction location, it is considered that impacts to air are non-significant.

10.5.3 Operational Phase

66 During the operational phase there will be no emissions from the towers or OHL and any associated maintenance traffic will be very low with a line inspection by helicopter every year and vehicle access associated with vegetation clearance on a five year cycle.

67 The principal impacts on air quality will be largely positive with respect to climate change arising from increased energy transmission efficiency and displacement of fossil fuel generation through facilitation of renewable energy access to the national grid.

10.5.3.1 Transmission Energy Efficiency

68 The proposed development will consist of an efficient, coordinated and economical system of electricity transmission, which has the long-term ability to meet reasonable demands for the

transmission of electricity. Efficient transmission of electricity will reduce transmission losses reducing the overall power generation requirement with a net positive benefit of reducing carbon emissions. The proposed development will comprise a major improvement in electricity transmission system infrastructure on the Island of Ireland allowing renewable sources to be utilised on an all-island basis further providing for displacement of fossil fuel power generation on the island as a whole.

69 The proposed development will comprise a major improvement in electricity transmission system infrastructure on the island of Ireland. The improvement in energy infrastructure will facilitate the expansion and incorporation of renewable energy generation into the national grid, transmitting the energy in an efficient manner and facilitating the displacement of energy generation from fossil fuel combustion. This will have a major positive impact on the reduction in national CO_2 emissions associated with the energy sector where this leads to displacement of fossil fuel electricity generation. For example, in 2011 wind energy avoided 2,144 kt of CO_2 (60%), followed by solid biomass 633 kt of CO_2 and hydro 346 kt of CO_2 based on figures published by the Sustainable Energy Authority of Ireland (SEAI). The proposed development will impact positively on Ireland‘s ability to achieve its EU and National targets with respect to reducing greenhouse gas emissions and expanding energy production from renewable sources.

70 The operation and maintenance of the proposed development will not result in any significant impact on air quality impacts and has been scoped out of this assessment.

10.5.4 Decommissioning Phase

71 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration

10.6 MITIGATION MEASURES

72 The main potential for impact relates to dust emissions during the construction phase of the project. The most effective way to manage and prevent particulate releases is through effective site management and control of the potential source. Mitigation measures designed to ensure that emissions from these sources are minimised will be set out in detail in the Construction and Environmental Management Plan (CEMP), an outline of which is available in in Appendix 7.1, **Volume 3B Appendices** of the EIS.

73 Mitigation measures will be employed on a site specific basis, based on a review of the construction activities involved and their proximity to nearby receptors in each location. The site specific mitigation measures will be employed to ensure that properties within 50m of construction locations will not be subject to significant dust nuisance. This process will focus on the mitigation of dust from key activities including temporary access route construction and earthworks.

74 The measures described in the outline CEMP are ‗good practice' measures and are designed to ensure that the construction activities do not generate excessive dust or particulate material release. Employment of such measures will ensure that no significant dust effects occur during project construction.

10.7 RESIDUAL IMPACTS

75 The development will have positive long term residual impacts on greenhouse gas emissions as it will facilitate further development and connection of renewable energy sources thereby reducing the dependence on fossil fuels with consequent reduction in greenhouse emissions.

76 In terms of dust no significant impacts are predicted following the implementation of good construction practice and implementing the mitigation measures set out in Section 10.6 above. During adverse weather condition some residual impacts will occur, dependent on wind speed and turbulence during construction, however, it is likely that the impact will be localised in the area immediately surrounding the source and will be of short duration and temporary in nature.

77 Traffic emissions themselves will not give rise to significant air quality effects from vehicular emissions. Construction traffic will contribute to existing traffic levels on the surrounding road network and will have the potential to generate dust. The greatest potential for this to occur will be in the areas immediately adjacent to the principal means of access for construction traffic. In these areas increases in dust generated by vehicle movements and local air pollutant emissions from vehicles may be temporarily elevated during the busiest periods of construction activity, however with the implementation of mitigation measures no significant local air quality effects are predicted.

78 Additional indirect impacts on climate can arise from the production of concrete for tower foundation construction. Emissions associated with the construction traffic for the proposed development have been addressed in this chapter, however there will be additional emissions of CO_2, SO_2 and NOx associated with the use of raw materials for the production of cement for concrete manufacture, its transport, kiln drying of limestone and concrete batching with aggregate materials. These emissions will occur at quarry locations for aggregate and limestone production at the lime kiln location and the concrete batching location. These

activities are controlled under licences issued by the relevant local authority where they take place and will not give rise to local air quality impairment. The overall contribution to climate change gases will be negative, but the impact will be very low and will be offset by the positive impact of the displacement of such gases arising through facilitation of renewable energy developments by the proposed transmission infrastructure.

10.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS IMPACTS

79 During the construction phase, air and climate impacts will be associated with the construction activities of the project and road traffic impacts. Traffic emissions themselves will not give rise to significant air quality effects from vehicular emissions. With the implementation of mitigation measures no significant local air quality effects are predicted. In addition this chapter should be read in conjunction with Chapter 7, **Volume 3B** of the EIS and **Chapter 13** of this volume of the EIS for a full understanding of the main interrelationships between these environmental topics.

10.9 CONCLUSIONS

80 The proposed development will have positive long term residual impacts on greenhouse gas emissions as it will facilitate further development and connection of renewable energy sources thereby reducing the dependence on fossil fuels with consequent reduction in greenhouse emissions.

81 In terms of dust no significant impacts are predicted following the implementation of good construction practice and implementing appropriate mitigation measures.

82 Traffic emissions themselves will not give rise to significant air quality effects from vehicular emissions.

83 With the implementation of mitigation measures no significant local air quality effects are predicted.

11 LANDSCAPE

11.1 INTRODUCTION

1 This chapter describes and analyses the existing landscape character along the route of the proposed development in the Cavan Monaghan Study Area (CMSA) and provides an evaluation of the potential for landscape and visual impacts arising from the proposed development in that study area.

2 Accordingly, this chapter of the Environmental Impact Statement (EIS) identifies and describes the residual landscape impacts which are predicted to occur in the CMSA.

3 A description of the proposed development is set out in Chapter 6, **Volume 3B** of the EIS. That chapter describes the full nature and extent of the proposed development, including elements of the overhead line (OHL) design and the towers. In addition Chapter 6, **Volume 3B** of the EIS provides a factual description, on a section by section basis, of the entire line route. The proposed alignment is described in that chapter using townlands and tower numbers as a guideline. The principal construction works proposed as part of the development are set out in Chapter 7, **Volume 3B** of the EIS.

4 The alignment of the proposed development has been carefully considered so as to avoid and minimise, but it could not remove all, visual and landscape effects. Those effects that remain are the residual unavoidable effects that will occur if planning approval is granted in respect of the proposed development. Accordingly, this chapter does not purport to establish that there are no adverse effects on the appearance or character of the landscape along the alignment of the proposed electricity transmission development in the CMSA.

5 This appraisal does not consider views from individual dwellings, nor does it consider the visual impact of individual towers. Rather, as is appropriate in relation to linear developments, a generalised appraisal has been conducted of the residual unavoidable effects of the overall project on the landscape in the CMSA.

6 In summary, this chapter includes the following information:

- Landscape and Visual Impact Assessment Methodology;
- Description of the Characteristics of the Proposed Development;
- Description of the Existing Environment;
- Description of Potential Landscape and Visual Impact;

- Description of Mitigation Measures;
- Description of Residual Landscape and Visual Impact;
- Description of Interrelationships between Environmental Factors; and
- Conclusions.

7 Given its subject matter, this chapter is supported by mapping contained in **Volume 3C Figures** of the EIS as follows:

- Figure 11.1 CMSA Landscape Character Areas;
- Figure 11.2 CMSA Landscape Character Types;
- Figures 11.3 - 11.6 CMSA Landscape Constraints and Photomontage Locations; and
- Figures 11.7 - 11.10 CMSA Zone of Theoretical Visibility and Photomontage Locations.

8 A set of full-scale photomontages and wireframes are contained in **Volume 3C Figures** of the EIS.

9 Site assessments were carried out by two landscape architects as per best practice.

11.2 METHODOLOGY

11.2.1 Scope of the Evaluation

10 This section of the EIS has been prepared in accordance with relevant EU and Irish Legislation and guidance, including the requirements of Annex IV of the EIA Directive and in accordance with Schedule 6 of the *Planning and Development Regulations 2001* (as amended) and conforms to the relevant requirements as specified therein. The scope of the evaluation is based on a review of legislation, guidance documents, other EISs, feedback from public consultation, consultation with prescribed authorities, including An Bord Pleanála (the Board), and a consideration of the likelihood for significant impacts arising, having regard to the nature of the receiving environment and the nature and extent of the proposed development.

11 The scoping opinion received from the Board (see Appendix 1.3, **Volume 3B** of the EIS) identified the following issues as being relevant to this chapter of the EIS, each of which are dealt with in this chapter or elsewhere in the EIS as noted below:

- Include full-scaled photomontages (these are included in **Volume 3C Figures** of the EIS);

- Provide an overview of landscape character having regard to the Landscape Character Assessments which inform statutory development plans;

- Identify the area of visual influence;

- Appraise impacts on landscape character and visual amenities having particular regard to designated landscapes, views of amenity value, including protected views, and the setting of main tourism assets;

- Identify and appraise potential impacts on historic demesne landscapes;

- Appraise potential for alternative routing or partial undergrounding in sensitive landscape areas (This is included in Chapter , **Volume 3B** of the EIS); and

- Appraise cumulative visual and landscape impact assessment with the 110 kV and 220 kV OHL network and other existing and permitted development. (This is included in Chapter 10, **Volume 3B** of this EIS.)

12 Scoping submissions were also received from Monaghan County Council, Cavan County Council, Fáilte Ireland, An Taisce and the Department of the Environment, (Northern Ireland) and have been taken into account in this appraisal.

13 An outline of the OHL route selection methodology, including mitigation by avoidance, is described in detail in Chapter 5, **Volume 3B,** of the EIS. The *Final Re-Evaluation Report* (April 2013) (see Appendix 1.1, **Volume 3B Appendices** of the EIS), also provides full details of how the preferred route corridor and indicative line route was selected, including reference to the potential for landscape and visual impacts.

14 The *Preferred Project Solution Report* (July 2013) (see Appendix 1.3, **Volume 3B Appendices** of this EIS), outlines the process of moving from an indicative line route, as identified in the *Final Re-evaluation Report* (April 2013), to a more detailed preferred line design.

11.2.2 Guidelines

15 The key guidelines used in this appraisal are the *Advice Notes on Current Practice in the preparation of EIS*, Environmental Protection Agency's (EPA) (2003) and the *Guidelines for Landscape and Visual Impact Assessment*, 3rd edition, Landscape Institute and Institute of Environmental Management and Assessment (2013). A full reference list of guidelines and documents is contained in the **Bibliography** in this volume of the EIS and Table 11.1, **Appendix 11.1, Volume 3C Appendices** of the EIS.

11.2.3 Evaluation Area for the EIS

16 The size of the evaluation area is based on conclusions from the *Final Re-Evaluation Report* (April 2013) and a professional judgement on the nature of visibility over long distances. The approach to identifying the size of the study area for the purposes of this EIS is as follows:

- 5km either side of alignment for general evaluation; and
- Extension to 10km either side of the alignment for designated panoramic scenic views that are at a higher elevation than the alignment.

11.2.4 Desktop Study and Site Survey

17 A desktop study was initially carried out to identify the landscape sensitivities within the CMSA as described in the relevant county development plans and county landscape character assessments.

18 Data available from the Irish Trails Office, Discover Ireland, Fáilte Ireland and the historic garden survey as described in the National Inventory of Architectural Heritage (NIAH) was taken into account, providing information about tourist attractions and various driving, walking and cycling routes.

19 Site visits to public locations were carried out to confirm the nature and extent of the key desktop identified landscape constraints and to ascertain the general characteristics of the landscape through which the proposed line route passes. Site visits also determined the most appropriate locations for photographs on which to base photomontages.

20 As part of the consultation process, Monaghan and Cavan County Councils requested photomontages from specific locations.

11.2.5 Definitions of Terms Used in This Chapter

21 Landscape effects are defined as the result of physical changes to the fabric of the landscape resulting from new development. Such physical changes may include the addition, alteration or removal of structures or vegetation. Landscape effects can be temporary and include those caused by temporary access routes, working areas, storage yard and construction traffic. Landscape effects may be positive (beneficial), negative (adverse) or neutral (no overall change or a balance of positive and negative effects). Landscape effects were evaluated on the basis of:

- The capacity of the existing landscape to absorb the proposed development;

- Effects on landscape character and physical features;
- Proximity of sensitive viewpoints (e.g. scenic routes) and visual receptors; and
- The heights and locations of the typical towers in relation to existing landscape scale.

22 Visual effects are closely related to landscape effects, but concern changes in views. Visual assessment concerns people's perception and response to visual amenity. Effects may result from new elements located in the landscape that cause visual intrusion (i.e. interference with or interruption of the view). Visual effects may be positive (beneficial), negative (adverse) or neutral (no overall change or a balance of positive and negative effects). Visual effects were evaluated taking account of:

- The sensitivity of the receiving environment;
- The visual contrast between the existing environment and the proposed development; and
- The extent of the areas over which these effects will be discernible.

23 A full set of definitions and criteria for assessment (including landscape value, capacity, sensitivity, magnitude of change and significance of effects) is contained in Tables 11.2 - 11.10 **Appendix 11.1, Volume 3C Appendices** of the EIS**.**

24 For the purposes of this evaluation, landscape and visual effects resulting from the introduction of an overhead electricity transmission line will normally be considered to be of an adverse nature. The sensitivity of the landscape, the magnitude of change proposed and resulting significance of effects will be evaluated in this chapter.

11.2.6 Landscape Units

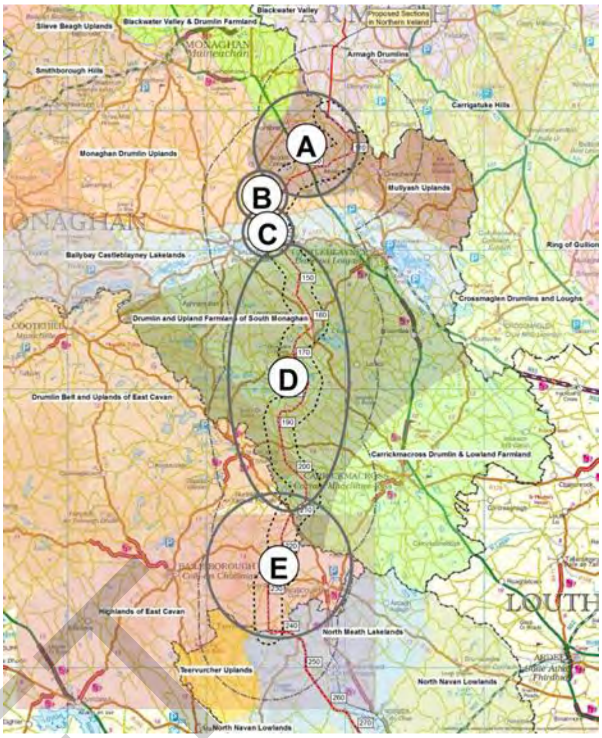


Figure 11.1: Landscape Units

25 For the purposes of this appraisal, and for ease of description, the study area is divided into landscape units as illustrated in **Figure 11.1**.

26 These units are based on landscape character areas described in the *Monaghan County Landscape Character Assessment 2008* and the *Cavan County Development Plan 2014 – 2020.*

27 Landscape character changes gradually over the geography of the study area, and therefore the landscape units are a guide to general landscape character in any particular area.

Table 11.1: Cross-Referencing Between Towers, Landscape Units, Photomontages and Figures

Towers	Landscape Character Area	Landscape Unit	Photomontage	Figure
Tower 103 to128	Mullyash Uplands	A	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	11.3
Tower 129 to 136	Monaghan Drumlin Uplands	B	11, 12	11.3 11.4
Tower 137 to 142	Ballybay Castleblayney Lakelands	C	13, 14, 15, 16, 17	11.3 11.4
Tower 143 to 211	Drumlin and Upland Farmland of South Monaghan	D	18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36	11.4 11.5
Tower 212 to 239	Highlands of East Cavan	E	33, 37, 38, 39, 40, 41, 42	11.6

11.2.7 ZTV (Zone of Theoretical Visibility) Mapping

28 Mapping the extent of the area from which a development is likely to be visible has many names, which is symptomatic of its limitations. Originally known as a Visual Envelope Map (VEM), then as a Zone of Visual Influence (ZVI), and more recently as a Zone of Theoretical Visibility (ZTV), these changes in terminology reflect attempts to address frequent challenges

occasioned by the mapping. Therefore, as a theoretical methodology, ZTV prediction does not take into account the effects of seasons, lighting, weather conditions or visibility over distance. Moreover, a ZTV does not take account of the screening effects of vegetation or buildings and can omit topographical variations of up to 10m. Thus, in reality, ZTV mapping‘s principal use is to identify viewing points for further analysis.

29 ZTV mapping has been prepared for this proposed development (Figures 11.7 - 11.10, **Volume 3C Figures** of the EIS). This was generated using the latest version of Key TERRA-FIRMA and AutoCAD software packages. This mapping indicates areas from where the proposed development is theoretically visible. It is important to note that the mapping does not indicate areas from which the proposed development will be *actually* visible. The ZTV mapping should therefore be used in conjunction with photomontages in order to ascertain the difference between “theoretical and actual visibility”.

11.2.8 Photomontage Locations

30 The Landscape Institute (UK) in its *Advice Note 01/11 Photography and Photomontage in Landscape and Visual Impact Assessment* published in 2011, on the subject states; *“The landscape professional should select a set of photographic viewpoints which are considered representative of the range of likely effects, viewing experiences and viewpoints ensuring that none are under or over represented.”*

31 It is possible to prepare detailed and highly realistic images that illustrate the likely future appearance of a development from a specific viewing point. These are useful for examining the effects from a limited number of critical viewpoint positions. However, they contribute little to an appraisal of the effects on the overall landscape within which an almost infinite number of potential viewpoints exist. There is no meaningful way to illustrate every view within a landscape. Instead, a representative sample of ‗worst case‘ views are provided. These include views from elevated areas, in very open landscape, where the alignment crosses higher ground, or at close distances. Many other locations within the study area will not experience any landscape or visual effects as a result of the proposed development.

32 Other photomontage locations are selected to illustrate the nature of visibility in the wider landscape. As the views are representative of viewing conditions that are encountered, some of them may show vegetation, buildings or topography partially screening the proposed development. Such conditions are normal and representative.

33 A significant limitation of visualisations is that the visual prominence of features in the landscape is significantly affected by lighting conditions and weather. Thus, for example, all views will appear different in various conditions of lighting, haze, weather and seasons. The

views provided in **Volume 3C Figures** of the EIS and shown at a smaller scales in this chapter of the EIS, are representative but not comprehensive because in addition to there being an almost infinite number of viewpoints, there are a very large set of combinations and permutations of lighting conditions that could conceivably occur for every view. The Landscape Institute (UK) Guidelines (2011) in its Advice Note 01/11 *Photography and Photomontage in Landscape and Visual Impact Assessment* published in 2011, on the subject states; *"they (photomontages) are subject to the same inherent limitations as photographs, for example only showing the scene as it would appear under the same conditions that prevailed when the original photograph was captured."*

34 Therefore, at best, visualisations can represent a view from a particular location at a particular time in particular weather conditions. There is no such thing as a fixed or single impact on the appearance or character of the landscape.

35 Photomontages do not show the effects of temporary hedgerow removal at construction stage, as this will be reinstated. The more permanent localised trimming or removal of taller vegetation within falling distance of any part of any OHL support or conductor is also not indicated.

36 The most effective use of photomontages is to view them in the field. The Landscape Institute (UK) in its Advice Note 01/11 *Photography and Photomontage in Landscape and Visual Impact Assessments* published in 2011, states *"It is essential to recognise that two-dimensional photographic images and photomontages alone cannot capture or reflect the complexity underlying the visual experience, and should therefore be considered an approximation of the three-dimensional visual experiences that an observer would receive in the field."*

37 A full-scale set of photomontages, with technical details, are contained in **Volume 3C Figures** of the EIS**.** The detailed location and context of photomontage views are indicated on the mapping in Figures 11.3 – 11.6, **Volume 3C Figures** of the EIS. All photomontage locations are publicly accessible.

Table 11.2: Full Set of Photomontages

Photomontage number	Direction of View
1	View south-east from the junction of local roads L3530 / L33101 & L7510 north-east of the ‗Battle of Clontibret‘ site in the townland of Crossaghy.
2	View south-east from local road L7502 in the townland of Coolartragh.
3	View south-west from Crossbane Road in the townland of Crossbane, Northern Ireland.
4	View south-east from local road L7511 across the townland of Tassan, located approximately 3km south-east of Clontibret.

Photomontage number	Direction of View
5	View west, south-west from local road L7503 in the townland of Lisdrumgormly.
6	View west from local road L7631 (Scenic Road SV12) west of the Mullyash Mountains.
7	View north, north-east from local road (former N2) in the townland of Cashel at junction with L7422.
8	View north-west along the N2 - Castleblayney Bypass in the townland of Annagh (Cremorne By).
9	View south-east along the N2 - Castleblayney Bypass from a layby in the townland of Carrickanure.
10	View east from local road L3420 across the townland of Cornamucklagh North, located approximately 4km south of Clontibret.
11	View north, north-east from local road L7411 at a junction with an access track across the townland of Drumroosk, passing Clarderry and Derryhallagh (Monaghan By), located approximately 3.5km north-west of Doohamlet .
12	View west, south-west from local road L7411 in the townland of Drumroosk approximately 2.5km north-west of Doohamlet.
13	View north-west from N2 Castleblayney Bypass roundabout in the townland of Lislanly.
14	View south-west from local road L3700 (Scenic Road SV15) in the townland of Annyart.
15	View west from local road L3430 in the outskirts of Doohamlet.
16	View north-east from R183 at the junction with local road L7200 in the townland of Ballintra.
17	View south-east across Lough Major from car park along a local access road situated along the northern edge of the lake, south of the R183.
18	View east from local road L3200 across the townland of Clogher, located approximately 4.5km south-east of Ballybay.
19	View west, north-west from local road L4221 (Scenic Road SV21) in the townland of Lattonfasky partially overlooking Lough Egish.
20	View north from R180 north of the townland of Brackly (Cremorne By).
21	View east, south-east from Junction R180 / L4210 across the townland of Greagh (Cremorne By) and Tullynahinnera.
22	View south, south-east from local road L4210 across the townland of Lough Morne, located approximately 7km south-east of Ballybay.
23	View south-east from local hill (Waterworks Reservoir), north in the townland of Kilkit.
24	View south from local road L7113 across Lough Morne.
25	View south-west from R181 at the entrance of a graveyard in the vicinity of Aghmakerr townland.
26	View south, south-east from local road L40431 (Scenic Route SV 22) located in the townland of Tooa, located approximately 7km north-east of Shercock.
27	View south-east from local road L40431 (Scenic Viewpoint 22) in the townland of Tullyglass.
28	View east, south-east from the Ouvry Cross Roads, located approximately 3.5km north-east of Shercock.
29	View north, north-west from local road L4031 at the northern boundary of Corduff, located approximately 5.5km north-east of Shercock.
30	View west, south-west from R178 at road junction with local road L4020 in the

Photomontage number	Direction of View
	townland of Corvally (Farney By).
31	View east from R178 approximately 2.5km east of Shercock, en route to Carrickmacross.
32	View south-west from local road L49051 across the townland of Raferagh, located approximately 4.5km east of Shercock.
33	View south-east from R162 at the cross roads with L7554 and L7553 in the townland of Taghart North or Closnabraddan.
34	View north, north-west from local road L49033 in the vicinity of Lavagilduff townland, located approximately 6km south-east of Shercock and east of the R162.
35	View north-west from R162 at cross roads with local road L8920 between the townland of Drumiller and Lavagilduff.
36	View north-west from R162 at elevated ground between the townland of Tullybrick and Drumbrackan.
37	View north-west from R165 at junction with local road L3526, north-west and just outside of Kingscourt.
38	View north-west from R165 at junction with local road L3532 in the townland of Cornaman, east of Muff Lough.
39	View west from local road L7567 near the site of the Fair of Muff.
40	View south-east from local road L3531 south-east in the townland Moyer.
41	View east from picnic area beside local road L7567 near scenic view point (SV8) Lough an Leagh Gap.
42	View east from local road L3533 in the townland of Drumbar (ED Enniskeen) east of Moyhill Bridge.

11.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

38 It is proposed to introduce large structures into the rural landscape along the length of the line route. These structures are similar in design to other existing high voltage electricity infrastructure in Ireland. The towers and associated infrastructure have the potential to impact on landscape character and visual amenity, particularly where the following factors occur:

- A large number of towers are visible from a single viewing point;
- The OHL crosses or is in close proximity to a scenic route;
- The OHL crosses a national or regional road;
- The OHL is visible along a wide expanse of open countryside of a dominantly natural character;
- The OHL crosses a skyline ridge;
- The OHL is in close proximity to a river or lake at a point where there is visibility from public roads; or

- The OHL crosses a visually conspicuous upland area.

11.4 EXISTING ENVIRONMENT

11.4.1 Landscape Context and Character

39 The study area for this appraisal forms part of the extensive farmed drumlin belt which stretches east-west across the island of Ireland. The long history of human habitation and agriculture is reflected in a complex pattern of hedgerows and fields which form part of the story of human influence in counties Monaghan and Cavan which also includes widespread rural housing development, farm and commercial buildings, a dense road network and existing utilities infrastructure. Main roads including the N2, R162, R180, R178 and R165 and local roads tend to follow the lower parts of the landscape and travel in a north-west–south-east direction following the general orientation of the varying sized bands of drumlins. Other regional roads also form part of the transport network linking the main towns of Castleblayney, Carrickmacross, Kingscourt, Ballybay and Shercock. The area includes some uplands which tend to be more sparsely populated and have in some areas been planted with commercial forestry. Low-lying areas tend to be poorly drained and often contain scrub vegetation and lakes. Buildings tend to be located in the lower parts of drumlins and along roads where views are more enclosed. Expansive views over rolling topography are possible from the higher parts of drumlins. The southern part of Monaghan is more open and exposed with a less hilly and more rolling landform. The part of County Cavan within the study area forms part of this rolling landform and further west is defined by the rising ground of Cornassaus which commands expansive panoramic views. The characteristic landscape features of the study area are the ridgelines and pattern of drumlins, the views from elevated areas and the lakes which occur in the lower lying areas.

11.4.1.1 Monaghan Landscape Character Assessment (MLCA) and Cavan Landscape Categorisation

40 The MLCA was adopted in June 2008 as a variation to the *Monaghan CDP 2013-2019* and subsequently incorporated into the current plan covering 2013-2019. The MLCA provides a description of the landscapes in County Monaghan.

41 A table summarising the general recommendations of the Monaghan County Landscape Character Assessment is contained in Tables 11.11 and 11.12, **Appendix 11.1, Volume 3C Appendices** of the EIS**.**

42 The Cavan CDP 2014 - 2020 has undertaken a categorisation of Cavan‘s landscape, but the identified categories may form part of a future landscape character assessment. The categories have been chosen due to their physical characteristics and geomorphological

features which make them distinctive in the County. The categories subdivide Cavan's landscapes into 5 Character Areas. The line route passes through Area 5 - *East Cavan Highlands*.

43 The county level assessment carried out by Monaghan and Cavan County Councils provides guidance to the more project-specific landscape assessment set out in this chapter. A *Draft National Landscape Strategy for Ireland 2014-2024* was issued by the Department of Arts, Heritage and the Gaeltacht for consultation in July 2014. The implementation of the current draft strategy would include a new National Landscape Character Map and new statutory guidelines on local Landscape Character Assessment.

44 The location of the proposed development in relation to landscape character areas and types as set out in the Cavan and Monaghan CDP's is indicated in Figures 11.1 and 11.2, **Volume 3C Figures** of the EIS.

11.4.2 Landscape Value

45 The criteria for the assessment of landscape value are set out in Table 11.2–11.10, **Appendix 11.1, Volume 3C Appendices** of the EIS**.** The factors that feed into a determination of landscape value are set out below, as well as in **Section 11.4.3** which describes the landscape value of each unit.-

46 The MLCA has recognised particular parts of the landscape as being of significant value – particularly the Mullyash Uplands and Ballybay Castleblayney Lakelands. The Cavan CDPs, past and present, have recognised the uplands of Cornassaus as being of value. Designated scenic views, amenity areas and walking routes are also recognised as being of value. Other recreation routes are promoted by the Irish Trails Office and a series of historic designed landscapes have been recorded in the NIAH.

11.4.2.1 Monaghan County Development Plan 2013-2019

47 It is Monaghan Council Council's policy that any new developments should have regard to the Landscape Character Assessment of 2008 (LCA). Policy LPP 1 of the Monaghan CDP 2013-2019 aims to *"ensure the preservation and uniqueness of the county"s landscape by having regard to the character, value and sensitivity of landscape as identified in the County Monaghan Landscape Character Assessment."*

11.4.2.2 Areas of Primary and Secondary Amenity

48 The Monaghan CDP recognises areas of *Primary and Secondary Amenity Value* and identifies views from scenic routes. The majority of these views are associated with views of lakes or views from upland areas. These are indicated in Figures 11.3 - 11.6, **Volume 3C Figures** of the EIS and listed in Table 11.13 **Appendix 11.1, Volume 3C Appendices** of the EIS**.**

49 The closest *Area of Primary Amenity Value* to the proposed development is Lough Muckno and Environs, which is located approximately 6.6km to the east of the line route.

50 The closest *Area of Secondary Amenity Value* to the proposed development is Lough Major and Environs, which is located approximately 2.3km to the west of the line route.

11.4.2.3 Views from Scenic Routes

51 The closest recognised scenic views to the proposed development are SV22 (at a distance of approximately 0.7km) and SV21 (at a distance of approximately 1.9km). A full list of scenic views in the study area is provided in Table 11.14, **Appendix 11.1, Volume 3C Appendices** of the EIS and their locations are shown on Figures 11.3 - 11.6, **Volume 3C Figures** of the EIS**.**

11.4.2.4 Cavan County Development Plan 2014 - 2020

52 The landscape features recognised by the Cavan CDP are listed in Table 11.15, **Appendix 11.1, Volume 3C Appendices** of the EIS and their locations are shown on Figures 11.3-11.6, **Volume 3C Figures** of the EIS.

53 The closest designated landscape features to the proposed development are Lough an Leagh Mountain located approximately 2.1km and Dun na Rí Forest Park located approximately 3.8km from the proposed development.

11.4.2.5 Key Waymarked Paths

54 The Monaghan Way is a waymarked walking route (of approximately 64km length) that runs from Monaghan Town in the north-east of the county to Inniskeen in the south-east. It passes through many different landscapes and is of local and regional amenity. It runs parallel to the proposed line route for approximately 2km at a distance of between 0 – 400m and crosses the alignment once. The Monaghan Way is considered the main tourism asset in the vicinity of the proposed development.

11.4.2.6 Historic Designed Landscapes

55 A number of Historic Designed Landscapes listed within the NIAH fall within the 5km of the proposed line route. These are set out in Table 11.16, **Appendix 11.1, Volume 3C Appendices** of the EIS along with a description of their condition. Their locations are shown on Figures 11.3 - 11.6, **Volume 3C Figures** of the EIS.

56 The closest historic designed landscapes to the line route with *"main features substantially present"* are Lakelands at a distance of approximately 1.4km and Ballybay House at a distance of approximately 1.8km.

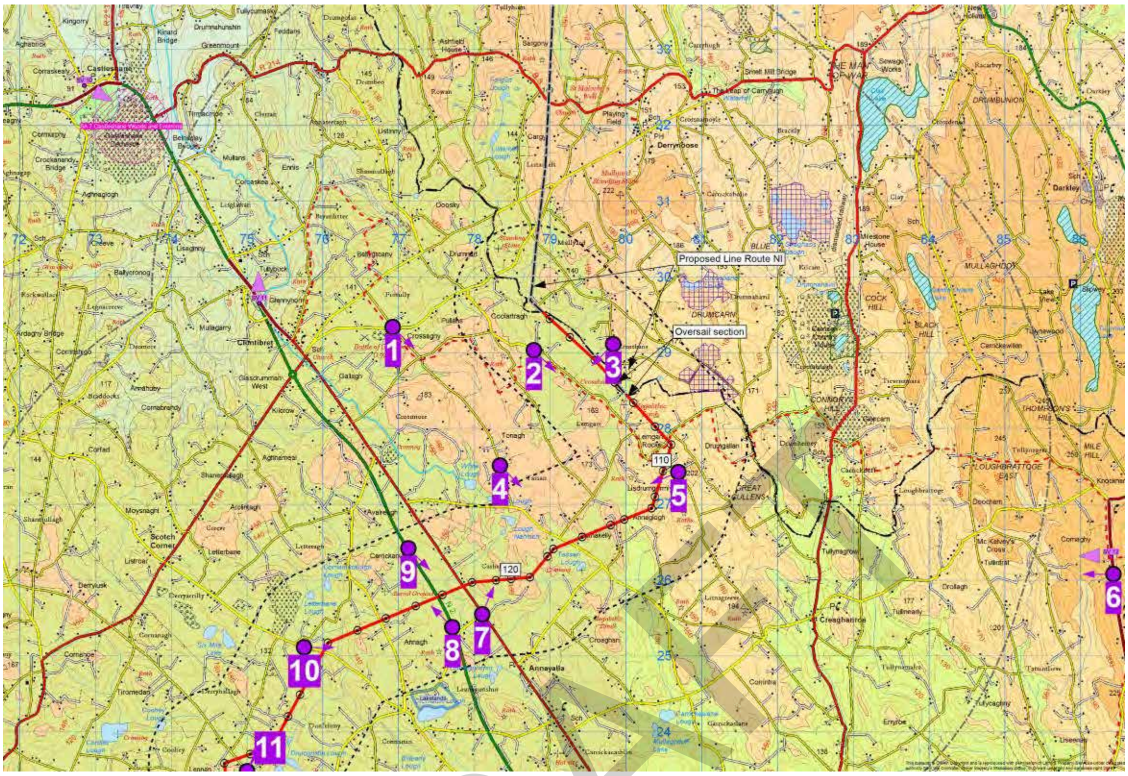
11.4.2.7 Natural Heritage Areas and Areas of Special Scientific Interest

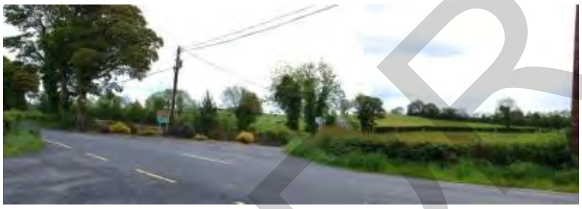
57 While Natural Heritage Areas (NHA) and Area of Special Scientific Interest (ASSI) designations relate to ecological importance, their amenity potential is a factor in warranting evaluation in terms of visual and landscape effects (refer to **Chapter 6** of this volume of the EIS). The ecological designations within 5km of the proposed development are listed in Table 11.17 **Appendix 11.1, Volume 3C Appendices** of the EIS and their locations indicated on Figures 11.3 - 11.6, **Volume 3C Figures** of the EIS**.**

58 The closest are Tassan Lough which is located approximately 0.3km from the line, Lough Egish pNHA located approximately 0.6km, and Cordoo Lough located approximately 1.3km from the line.

11.4.3 Detailed Description of the Landscape Units

11.4.3.1 Detailed Description of Landscape Unit A – Mullyash Uplands (refer to Table 11.1)





View 1 from the L3530 at ‗Battle of Clontibret' site

View 2 from the L7502 at Coolartragh

View 3 from Crossbane Road, Armagh

View 5 from the L7503 at Lisdrumgormly

View 8 along the N2 at Annagh (Cremorne By)

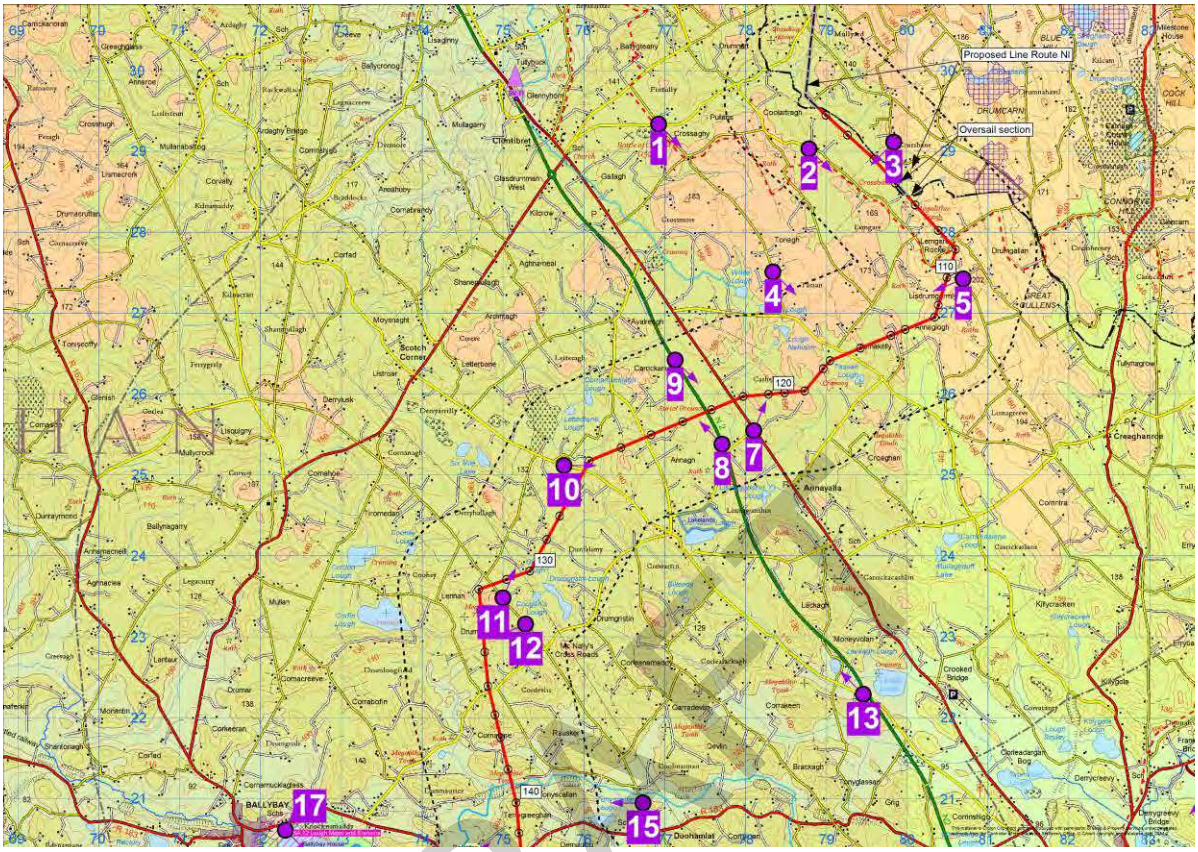
View 10 from L3420 at Cornamucklagh North

Description

This unit falls within the North Monaghan Drumlin Belt. It is a highly varied landscape of small hedge enclosed fields draped over small drumlins. The lands rise to a flatter plateau as one moves north. This is an inhabited, man-altered landscape that contains many small farm holdings and associated roads, sheds, phone and powerlines. There is a pronounced north-west to south-east diagonal pattern to roads, following the orientation of the underlying glacial deposits.

Value – Moderate / High	**Capacity – Low / Moderate**	**Sensitivity – Moderate / high**
Mullyash Mountain, an *Area of Secondary Amenity Value*, lies within this Landscape Unit; approximately 6.4km from the line route. There are a number of scenic viewpoints within this unit; SV12, SV13 and SV14 are located approximately 6 - 7.5km to the east of the line route on the slopes of Mullyash. SV11 is a view northwards at Tullybrack approximately 3.2km from the line route. The Monaghan Way is broadly parallel to the route at between 0 to approximately 400m for approximately 2km and passes under the proposed development at Lemgare Rocks. This unit contains the site of the Battle of Clontibret, a nationally significant historic site that lies approximately 1.2km east of the eponymous village.	While some visual enclosure is provided by the drumlin landscape, any towers on the upper parts of drumlins have the potential to be more visible. The plateau landscape creates opportunities for views out from the edge of the landform over the lower lying landscape to the south. The nature of the plateau topography also limits long range views when the viewer is away from the slopes. The more scenic areas on the eastern side of Mullyash Mountain have been avoided; however, the upland nature of parts of the landscape means that the capacity of the landscape to absorb a development such as a transmission line is low/ moderate. The character of the landscape is more built up as one moves south towards the N2, and there is more capacity in these locations to absorb new development. The alignment crosses the N2 approximately 2km north of the small settlement at Annayalla at an open part of the landscape.	The Mullyash Uplands wider Landscape Character Area is assigned a high sensitivity in the MLCA. This includes the area of Mullyash to the east as well as the drumlin and upland flat areas through which the line route passes. Due to the potential for open visibility, the edges of the plateau like areas would be more sensitive to development. The small valley in the northern most part of this study area is most visible in views from the north-east and part of the Monaghan Way. The scale and enclosure of this landscape feature would render it sensitive to new development. As the line route is located away from the key sensitive area around Mullyash Mountain, the sensitivity of the part of the landscape through which the proposed line route passes is considered moderate / high.

11.4.3.2 Detailed Description of Landscape Unit B – Monaghan Drumlin Uplands (refer to Table 11.1)



View 10, from the L3420 at Cornamucklagh North

View 11, across the townlands of Dunfelimy and Clarderry

View 12, across Drumroosk townland

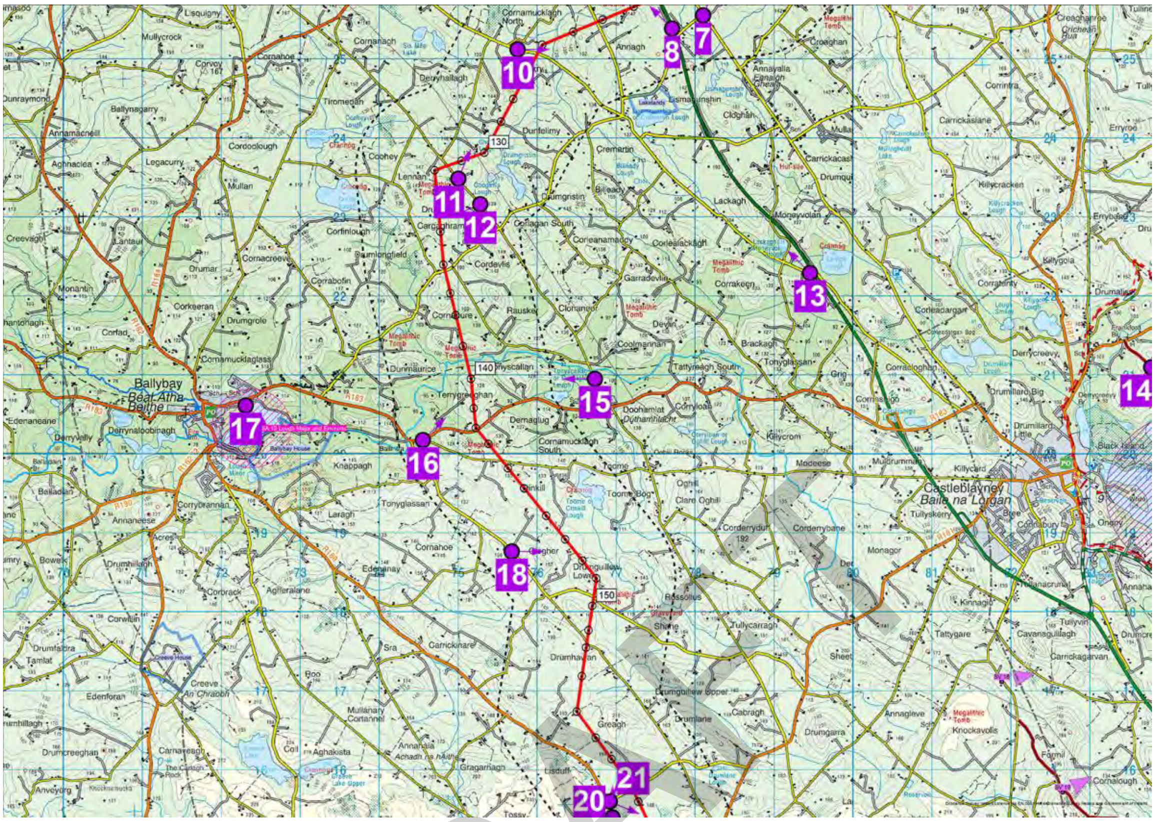
<table>
<tr><td colspan="3">Description
This unit falls within the North Monaghan Drumlin Belt. It is a landscape of small hedgerow enclosed fields draped over small drumlins and a number of small lakes which are located in the vicinity of the line route. This is an inhabited, man-altered landscape that contains small farm holdings and associated roads, sheds and existing 110 kV transmission line.</td></tr>
<tr><th>Value - Moderate</th><th>Capacity – Moderate</th><th>Sensitivity – Moderate</th></tr>
<tr><td>The landscape includes elevated upland drumlin areas and lowland loughs interspersed with marshland and pasture farmland.

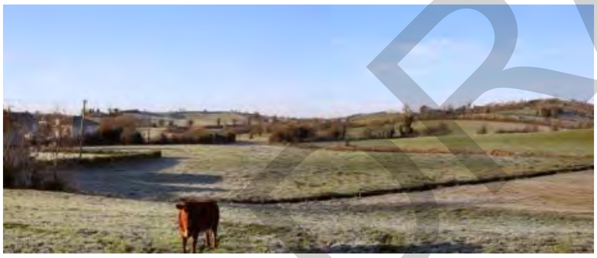
A pNHA is located at Cordoo Lough to the west of the line route.

This Landscape Unit contains a Scenic Viewpoint, SV9, located approximately 9.2km from the line route and looking to the north-east, and away from the proposed development.</td><td>The upper parts of drumlins have less capacity to absorb the visual effects of a transmission line than the lower parts. The undulating nature of the landscape generally restricts the possibility for long distance views, except for where elevated viewpoints are possible.</td><td>There are local variations in sensitivity, primarily dependent on proximity to lakes and elevation.

The open character of the landscape in some areas would result in potential wider visibility of towers, and these areas are more sensitive than areas enclosed by topography.</td></tr>
</table>

11.4.3.3 Detailed Description of Landscape Unit C – Ballybay Castleblayney Lakelands (refer to Table 11.1)





View 15 from the L3430 on the outskirts of Doohamlet

View 16 from the R183 in the townland of Ballintra

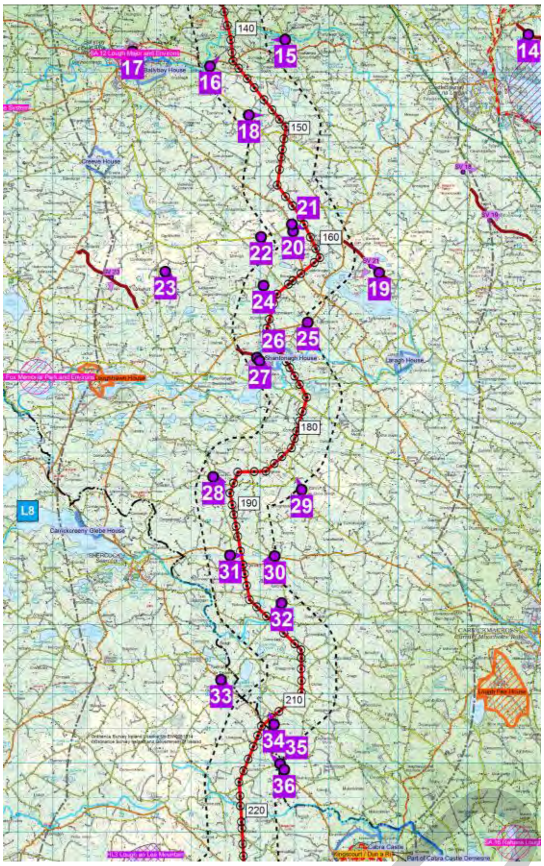
View 17 from Lough Major, Ballybay

<table>
<tr><td colspan="3">Description
This man-altered landscape is defined by undulating drumlin pasture with some relatively low lying areas to the east and west of the proposed development. The village of Doohamlet is located within 2km of the line route. The drumlins in this unit are more pronounced which create highly enclosed landscapes. More open views are possible from elevated parts of the landscape such as at Cornahoe, although roads tend to follow the lower parts.</td></tr>
<tr><th>Value - Moderate</th><th>Capacity – Moderate</th><th>Sensitivity - Moderate</th></tr>
<tr><td>While falling within the Ballybay Castleblayney Lakelands LCA, this part of the line route is relatively far from any of the major lakes such as Lough Muckno, located approximately 6km to the east or Ballybay lake 3km to the west.

There are, however, a number of smaller lakes in the immediate vicinity of the line route, the closest being Tonyscallan or Dernaglug Lough close to Doohamlet, located approximately 1km to the east of the line route. Views from lake environs are important and recognised as such in the MLCA.</td><td>The upper parts of drumlins have less capacity to absorb the visual effects of a transmission line than the lower parts. The undulating nature of the landscape generally restricts the possibility for long distance views, except for where elevated viewpoints are possible.</td><td>Views from the environs of lakes are sensitive as are views from and towards the more elevated parts of drumlins. Views from Doohamlet into the wider landscape are sensitive as well as the context of Tonyscallan or Dernaglug Lough.

The R183 runs perpendicular to the line route.</td></tr>
</table>

11.4.3.4 Detailed Description of Landscape Unit D – Drumlin and Upland Farmland of South Monaghan (refer to Table 11.1)



View 18 from the L3200 at Clogher

View 20 from the R180 at Brackly (Cremorne By)

View 21 from junction R180 / L4210 at Greagh (Cremorne By) and Tullynahinnera

View 24 from L7113 across Lough Morne

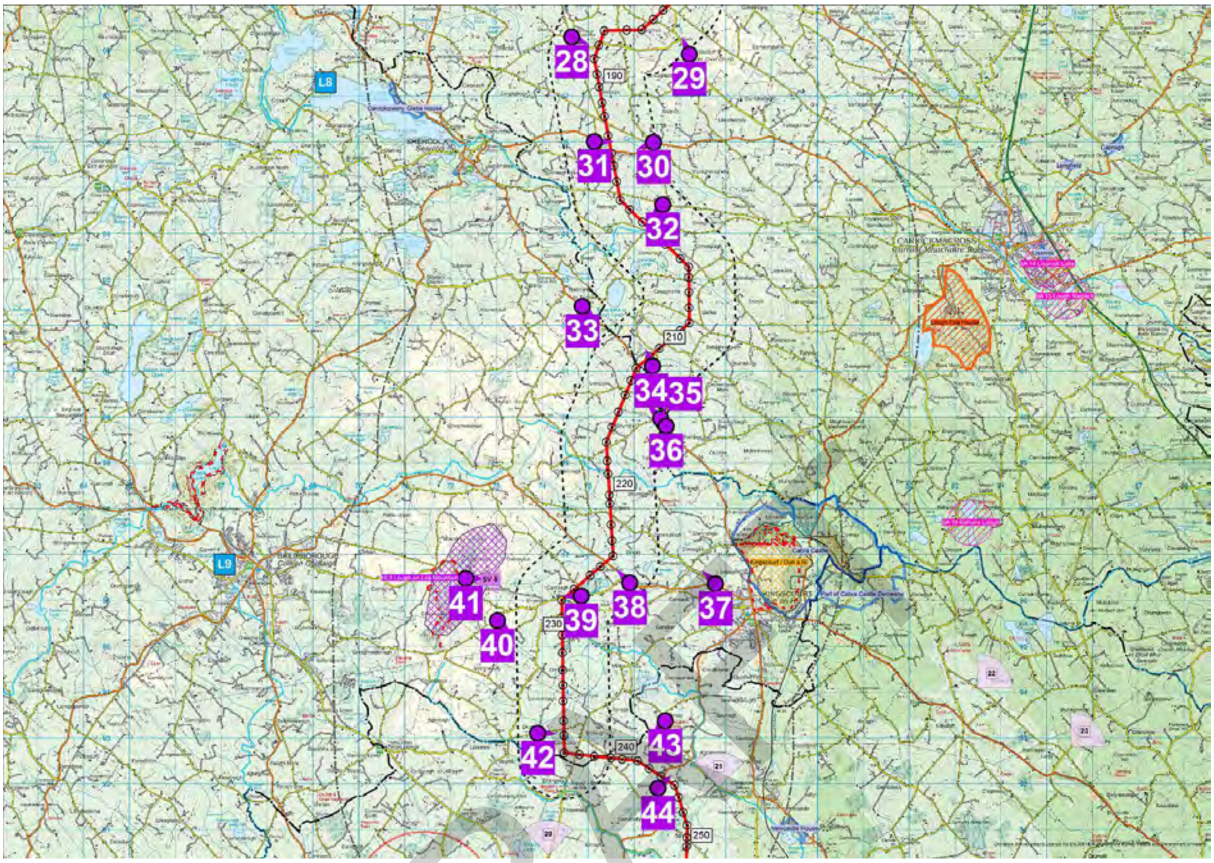
View 26 from the L40431(Scenic Route) at Tooa

View 28 from Ouvry Cross Roads

View 31 from the R178, 2.5km east of Shercock

Description		
This man-altered landscape extends from Castleblayney to the border with Cavan. The northern part of this landscape unit consists of broad shallow valleys which are more open than the more enclosed and complex landscape created by the larger than average drumlins and lakes further south in the unit. Three regional roads are crossed perpendicularly (R178, R180 and R181).		
Value/Value – Moderate	**Capacity – Moderate**	**Sensitivity - Moderate**
The landscape pattern of broad valleys and extensive areas of larger than average drumlins, with a strong hedgerow network includes roads, houses and existing electricity lines. There are a number of scenic viewpoints within this Landscape Unit, SV21 – a distance of 1.9km (view of Lough Egish looking in the direction of the line route) and SV22 at a distance of 0.7km (a view from a scenic drive at Beagh, Shantonagh and Corlat). SV23 is a view towards Lough Bawn and County Cavan in the direction of the proposed development at a distance of approximately 3.8km. Lough Egish which lies to the south of the unit is an important scenic, ecological and historic resource in the county.	The upper parts of drumlins have less capacity to absorb the visual effects of a transmission line than the lower parts. The undulating nature of the landscape generally restricts the possibility for long distance views, except for where elevated viewpoints are possible. The drumlins and vegetation become more dense east of Shercock with curtailed long distance visibility.	The most sensitive areas are the locations on the upper parts of drumlins which afford views over the landscape and the vicinity of lakes. Vegetation in many areas provides screening over distances. There are a number of small lakes within 1km of the line route and the setting of these lakes is sensitive to change.

11.4.3.5 Detailed Description of Landscape Unit E – Highlands of East Cavan (refer to Table 11.1)



View 35 from cross roads R162 / L8920 at Drumiller

View 37 from junction R165 / L3526 outside of Kingscourt

View 39 from L7567 near the site of the Fair of Muff

View 41 from Lough an Leagh Gap

View 42 from the L3533 at Drumbar (Eniskeen By)

Description		
This unit includes two distinct landscape types - the low lying drumlins of the most eastern part of Cavan and the uplands of Lough an Leagh Mountain. Views tend to be enclosed within the drumlin landscape, but any elevated positions provide panoramic views. Both the lowlands and the mountain are man-altered and contain agricultural patterns, a network of roads, houses and telecommunications and electricity infrastructure.		
Value – Moderate / High	**Capacity – Moderate**	**Sensitivity – Moderate/high**
This unit includes the environs of Kingscourt and Lough an Leagh Mountain. The line route passes to the east of an area of designated landscape sensitivity in the current Cavan CDP. This man-made landscape contains an existing 220 kV line and more dense suburban type development closer to outskirts of Kingscourt. A protected viewpoint, SV8, is located 2.1km to the north at Lough and Leagh Gap which is also designated as a *High Landscape Value Area*. A picnic area and information board have been located further down the slopes of the mountain along the local road and a looped walking route leaves from here and passes the existing telecommunications towers on the mountain. The panoramic view from the top of the mountain takes in three windfarms to the west and the man-altered inhabited landscape of the lowlands. Dun na Rí Forest Park is located to the east of Kingscourt approximately 3.8km distance from the line route. The site of the Fair of Muff is located within this Landscape Unit and a commemorative sculpture has been erected near the fair site.	This part of County Cavan has moderate potential capacity to absorb the landscape and visual effects of a transmission line. Topographic variation in this unit is more influenced by underlying bedrock geology – which produces less steep slopes and larger areas of visual enclosure. On the other hand there are more areas of taller vegetation in this unit which produces a corresponding increase in visual screening by mature vegetation.	The parts of the 5km study area within County Cavan are of moderate to high sensitivity. Views from the most elevated parts of the landscape unit at Lough an Leagh Mountain are sensitive, although current views include existing electricity and telecommunications infrastructure. The location of the long-standing annual Fair of Muff is also sensitive as it attracts large numbers of people and has cultural connections with the wider landscape.

11.4.4 Summary Landscape Value

59 Criteria for the determination of landscape value are set out in Table 11.2, **Appendix 11.3 Volume 3D Appendices** of the EIS. Landscape value is determined by landscape quality / condition, scenic quality, rarity, representativeness, conservation interests, recreation value, perceptual aspects and associations. The landscape units of highest landscape value are: A (Mullyash Uplands) and E (Highlands of East Cavan) due to their upland nature, relative rarity and recreation use. The landscape features of most value, as defined in this EIS, within each landscape unit, have been described in **Section 11.4.3**.

11.4.5 Summary – Landscape Capacity

60 Criteria for the determination of landscape capacity are set out in Table 11.3**, Appendix 11.1, Volume 3C Appendices** of the EIS**.**

61 An undulating landscape generally has the capacity to absorb the visual effects of a transmission line where the effects are localised within the small scale landscapes between drumlins. However, in locations where the line crosses higher ground, in order to minimise direction changes, or avoid identified constraints (lakes, recreational sites etc.), the potential for wider visual effects increase.

11.4.6 Summary – Sensitivity of the Landscape

62 The criteria for the determination of landscape and visual sensitivity are contained in Tables 11.4 and 11.5, **Appendix 11.1, Volume 3C Appendices** of the EIS**.**

63 The most sensitive areas are located in Sections A (Mullyash Uplands) and E (Highlands of East Cavan). The other landscape units are generally of moderate sensitivity with pockets of higher sensitivity in the vicinity of lakes, where views are available from higher ground and where the general drumlin landscape opens up to allow for wider views into the landscape. The scale of the proposed development has, however, the potential to cause significant alteration to the landscape character of areas in the near vicinity of the alignment most noticeably at distances of up to 600 - 800m from the alignment.

64 The highest visual sensitivity occurs where the changed landscape is an important element in the view, this generally occurs in views from residential properties, areas of settlement and viewpoints within valued or sensitive landscapes.

65 The *Final Re-evaluation Report* (April 2013) appraised the general capacity of the landscape in a wider context in order to avoid the areas of least capacity to absorb a transmission line. The preferred line route that emerged from this study and which is the subject of this evaluation,

traverses areas that generally have a higher capacity to absorb the transmission line within counties Cavan and Monaghan.

Table 11.3: Summary of Landscape Capacity and Sensitivity

Landscape Unit		Towers	Landscape Value	Landscape Capacity to absorb the proposed development	Landscape Sensitivity to the proposed development
A	Mullyash Uplands	Tower 103 to 128	Moderate / High	Low / Moderate	Moderate / High
B	Monaghan Drumlin Uplands	Towers 129 to 136	Moderate	Moderate	Moderate
C	Ballybay Castleblayney Lakelands	Towers 137 to 142.	Moderate	Moderate	Moderate
D	Drumlin and Upland Farmland of South Monaghan	Towers 143 to 211	Moderate	Moderate	Moderate
E	Highlands of East Cavan	Towers 212 to 239	Moderate / High	Moderate	Moderate / High

11.5 POTENTIAL IMPACTS

11.5.1 Do Nothing

66 In this scenario there will be no changes to the landscape, it will continue to change and evolve as a result of other factors.

11.5.2 Construction Phase

67 Chapter 7 **Volume 3B** of the EIS details the approach to construction and the timescales involved in the various stages.

68 The potential landscape and visual effects arising at construction stage will occur due to the removal of vegetation, visible construction machinery, temporary access routes of approximately 4m width, a construction material storage yard, guarding positions (where the conductor is to be strung over roads and rivers and existing distribution lines) and increases in vehicular movements. The visual effects of the construction of the towers will be temporary and locally significant as most construction occurs as isolated areas of activity which are limited in size. The landscape and visual impact of traffic movements will have a more widespread effect.

69 The nature of temporary access routes is described in detail in Chapter 7, **Volume 3B** of the EIS. This will result in localised and generally temporary landscape changes to the surface of fields and removal of hedgerow and tree vegetation but have little effect on the wider landscape.

70 The highest physical landscape effects will occur at construction stage. The removal of vegetation is described in detail in **Chapter 6** in this EIS. The potential effects on soil are described in detail **Section 11.5.3.6** and in **Chapter 7** of this volume of the EIS. The removal of vegetation and in particular of mature trees where required will have locally significant physical landscape effects. Trees adjacent to the towers or conductors with the potential to fall on the conductors will be cut back to ensure safety clearances. The nature of long term impact will depend on the success of vegetation reinstatement. Potential landscape impacts of soil compaction include failure of vegetation reinstatement and long term ruts.

11.5.3 Operational Phase

11.5.3.1 Introduction

71 This section describes the potential landscape and visual effects of the proposed development in the CMSA. As set out in the previous section of this chapter, the landscape within the study area is generally robust and has proven to be capable of undergoing change without altering its underlying landscape character. The previous section has also identified the more sensitive locations and features within the study area, which would suggest that the highest landscape and visual effects will occur where:

- Towers are viewed in close proximity with no intervening screening;
- Towers are located on top of drumlins;
- Towers are located close to lakes; and
- Towers are located close to scenic or in panoramic view points.

72 This section uses photomontages as a tool to assist in the description of potential effects. In order to provide an overview of the nature of visibility at various distances, **Section 11.5.2.2** contains a selection of representative photomontages. These illustrate the nature of visibility in typical landscapes crossed by the alignment. The nature of visibility is shown at distances of up to 500m, 500m - 1km, 1 - 1.5km, and beyond 1.5km. The effects on scenic viewpoints within 2km of the alignment are also shown.

73 **Section 11.5.3** follows with a detailed description of the landscape and visual effects within each landscape unit supported by a series of reduced scale photomontages for illustrative purposes.

74 A full-scale set of photomontages are contained in **Volume 3C Figures** of the EIS and the detailed location and context of photomontage views are indicated on the mapping in Figures 11.3 – 11.6, **Volume 3C Figures** of the EIS. All photomontage locations are publically accessible.

11.5.3.2 Key Representative Photomontages

75 The area through which the proposed line route passes is widely inhabited, with many houses and farms located along a dense road and hedgerow network. Hedgerows and drumlins provide screening of OHL in many areas. Due to the inhabited character of the landscape, visual receptors are spread throughout the study area. However, it is not possible or warranted to assess or represent visually all potential viewpoints, and therefore this section sets out the nature of visibility at various distances: up to 500m, 500m - 1km, 1 - 1.5km, beyond 1.5km as well as the effects on scenic viewpoints within 2km of the alignment. These represent the most open and ‗worst case' views of the proposed development at these types of distances.

76 Some of these representative views are only possible from extremely localised viewing points, but they are provided to offer an indication of the maximum potential effect. There will generally be less effect on the appearance and character of the landscape when seen from other areas within the study area.

77 The photomontages presented in this section are at a reduced scale for illustrative purposes. Full scale photomontages and wireframes are contained in **Volume 3C Figures** of the EIS. The best way to use the photomontages as a tool is to view them in the field, in the location where the photograph was taken.

11.5.3.3 Viewing Distances of up to 500m

78 The following reduced scale photomontages represent a range of ‗worst case' open viewing experiences within 500m of the proposed development.
Full scale versions of these photomontages and accompanying wireframes and technical details are included in Volume 3C figures of the EIS.

79 Towers are dominant in close views where there is no intervening vegetation or topography, where there are gaps or lower than average roadside vegetation. Even at close distance, vegetation and topography can reduce the visibility or visible extent of towers from specific viewing locations. The nature of visibility changes when the towers are viewed against the sky

or the land. In general terms, the visual impact is greatest when the transmission line is seen silhouetted against the sky and least when seen against a dark, visually complex background – such as trees or vegetated hills.

Photomontage 8 from an open section of the N2, at a distance of 445m. This represents an open view where two towers are visible against the skyline in the context of a national road.

Photomontage 11 from an open section of the L7411 in the townland of Drumroosk approximately 3.5km north-west of Doohamlet, at a distance of approximately 224m. This represents an open view where one tower is visible at close distance against the skyline from a local road.

Photomontage 21 from the junction of the R180 and L4210 at the townland of Greagh (Cremorne By) and Tullynahinnera, at a distance approximately 336m. This represents an open view where three towers are visible against the skyline in the context of a national road in a broad valley.

Photomontage 31 from the R178, 2.5km east of Shercock at a distance of approximately 337m. This represents an open view where five towers are partly visible against the skyline on higher ground in the context of a regional road.

Photomontage 39 from an open section of L7567 at the location of the Fair of Muff, at a distance of approximately 215m. This represents an open view where two towers are visible against the skyline on relatively higher ground.

Photomontage 44 from an open section along the R164 at Corrananagh, at a distance of approximately 271m. This represents an open view where two towers are visible against the skyline, partially screened by vegetation.

11.5.3.4 Viewing Distances of 500m - 1km

80 The following reduced scale photomontages represent a range of ‗worst case' open viewing experiences of between 500m and 1km from the proposed development. For full scale versions of these photomontages and accompanying wireframes and technical details, refer to **Volume 3C Figures** of the EIS**.**

81 Towers are still noticeable in the context of a wider landscape. The screening effects of vegetation, buildings and topography become more apparent. The towers are more conspicuous if sited on higher ground, or if the viewing point is elevated.

Photomontage 12 from local road L7411 at Drumroosk townland at a distance of approximately 535m. This represents an open view from an elevated location over a landscape of dense drumlins. Six towers are partly visible, travelling into the distance, a further four are screened by topography.

Photomontage 16 from the R183 in Ballintra, at a distance of approximately 690m. This represents an open view where four towers are visible against the skyline on higher ground in the context of a regional road, a further two are screened by topography.

Photomontage 18 from L3200 in the townland of Clogher, at a distance of approximately 631m. This represents an open view from an elevated location over a landscape of drumlins. Two towers are partly visible, a further one is screened by topography.

Photomontage 28 from Ouvry Cross Roads, at a distance of approximately 608m. This represents an open view from a location between drumlins. Three towers are partly visible, travelling into the distance, others are screened by topography.

Photomontage 30 from the R178 in the townland of Corvally (Farney By), at a distance of approximately 942m. This represents an open view in a drumlin landscape in the context of a regional road. One tower is distantly partially visible, and a further three are screened by topography or vegetation.

Photomontage 32 from the L49051 in the townland of Raferagh, at a distance of approximately 578m. This represents an open view in a low drumlin landscape. Two towers are visible against the skyline.

Photomontage 35 from the R162 at the cross roads with the L8920 a distance of approximately 924m. This represents an open view in a drumlin landscape in the context of a regional road. One tower is partly visible over the white building in the centre left, while three others are screened by topography or vegetation.

11.5.3.5 Viewing Distances of 1 - 1.5km

82 The following reduced scale photomontages represent a range of ‗worst case' open viewing experiences at 1-1.5km from the proposed development. For full scale versions of the photomontages and accompanying wireframes and techcnical details, refer to **Volume 3C** figures of the EIS.

83 It becomes difficult to discern the towers in the landscape, and in most cases the towers are not visible at this distance. Towers are still distantly visible if seen traversing higher ground or over very flat ground where there is a gap in intervening vegetation.

Photomontage 4 from the L7511 across the townland of Tassan, at a distance of approximately 1.31km. This represents an open view over a relatively flat landscape. Four towers are partly visible in the distance, the remainder are screened by relatively low roadside hedgerow.

Photomontage 22 from the L4210 across the townland of Lough Morne, at a distance of approximately 1.29km. This represents an open view from an elevated location over a landscape of drumlins. Five towers are partly and distantly visible, others are screened by topography.

Photomontage 29 from the L4031 at the northern boundary of Corduff, at a distance of approximately 1.1km. This represents an open view from a slightly elevated location with winter vegetation. One tower is partly visible, others are screened by vegetation and topography.

Photomontage 40 from the L3531 in the townland of Moyer located in the East Cavan Highlands at a distance of approximately 1.42km. This represents an open unscreened view from an elevated location where fifteen towers are theoretically visible across a flat landscape.

11.5.3.6 Viewing Distances of Greater than 1.5km

84 The following reduced scale photomontages represent a range of viewing experiences greater than 1.5km from the proposed development

85 It is not normally possible to distinguish the towers from the surrounding landscape at this distance unless they are seen against the sky in clear weather conditions.

Photomontage 1 from the junction of the L3530, L33101 & L7510 in the townland of Crossaghy, at a distance of approximately 1.85km. No towers are visible due to the screening effects of vegetation.

Photomontage 15 from the L3430 in the outskirts of Doohamlet, at a distance of approximately 1.57km. This represents an open view towards drumlins on the horizon. Three towers are partly visible in the distance. A further two are screened by topography or vegetation.

Photomontage 17 from Lough Major, Ballybay, at a distance of approximately 2.86km. This represents an open view across a lake where three towers are partly visible in the distance. A further thirteen are screened by topography or vegetation.

Photomontage 23 from a local hill (Waterworks Reservoir) in the townland of Kilkit, at a distance of approximately 3.28km. This represents an open view from an elevated location. No towers are discernible at this distance when viewed against the land.

Photomontage 33 from the R162 at Taghart North a distance of approximately 1.78km. This represents an open view in a drumlin landscape in the context of a regional road. Two towers are partly visible, with a further five screened by topography, vegetation or buildings.

11.5.3.7 Recognised Scenic Viewpoints within 2km of the Line Route

Photomontage 19 from Scenic View 21 at Lough Egish, at a distance of approximately 1.77km. Five towers are distantly visible, with a further seven screened by topography or vegetation.

Photomontage 26 from L40431, Scenic Route SV22 in the townland of Tooa, at a distance of approximately 700m. Eleven towers are partially visible and one is screened by topography, however those seen against land are difficult to discern.

Photomontage 41 from Scenic View 8 at Lough an Leagh Gap, at a distance of approximately 2.15km. Eight towers are visible with a further three screened by vegetation.

11.5.4 Description of Potential Landscape and Visual Effects on Landscape Units

86 The following section provides a description of the likely effects on the appearance and character of each of the parts of the landscape that have been identified as ‗Landscape Units' - areas of approximately similar character in the previous sections.

87 The potential landscape and visual effects within each landscape unit are described along with potential effects on identified sensitive landscape features or visual receptors. This information is summarised in a table, to assist readers in obtaining a comprehensive overview of all landscape and visual effects arising from this development. These impacts are then illustrated in the following section by referring to reduced scale photomontages. Full scale photomontages and wireframes are contained in **Volume 3C Figures.** The best way to use the photomontages as a tool is to view them in the field, in the location where the photograph was taken.

11.5.4.1 Landscape Unit A – Description of Potential Landscape and Visual Effects

Landscape Unit A – Mullyash Uplands		
		
General Landscape Character	The area is a man-altered landscape which includes small drumlins, flat upland areas and Mullyash Mountain to the east. The area has potential for high visibility of tall structures in the more elevated locations. The character of the landscape is more built up as one moves south towards the N2.	**POTENTIAL LANDSCAPE EFFECTS** • There will be changes to landscape character in the immediate vicinity of the line (up to 600 - 800m from unscreened towers), but little alteration to the character of the wider landscape. • The line route avoids the higher ground at Mullyash Mountain, and there is no landscape effect on this valued landscape feature. • The introduction of towers into the more remote generally flat upland plateau landscapes close to the border will result in significant localised landscape effects (see photomontage 5). Towers within valleys are more contained, and will not significantly affect the landscape beyond the valley. However, the localised landscape effect on the small scale of the remote valley along the border will be significant. • Landscape effects reduce as one moves south towards the N2, as the landscape character is more defined by existing built infrastructure (see photomontage 8 / 9). **POTENTIAL VISUAL EFFECTS** • Photomontage 6 shows that the transmission line will not be visible from the slopes of Mullyash Mountain. • The transmission line will be partially visible from houses and roads within 1 - 1.5km of the line with no intervening vegetation such as along the roads running parallel to the border in Lemgare (photomontage 2 and 5), at a location crossing the N2 and former N2 (photomontage 8 and 9).

		Visual effects reduce with distance, with the most significant effects occurring up to 600 - 800m from unscreened towers. The towers would be difficult to discern at distances beyond 800m. • Some of the lower lying parts of the landscape contain scrub vegetation which restricts views and many potential viewpoints will be screened by vegetation and topography. • Towers 119 – 121 on the rising ground east of the N2 will be more visible than others due to their relative elevation. These include transposition towers, which are taller and slimmer than the towers along the rest of route. However the difference in tower type will not significantly alter the visual effect, which will be locally significant. (Refer to photomontage 7).
Settlements	Clontibret, Creaghanroe and Annayalla are the main settlements. There are individual houses throughout the countryside and along roads.	There will be no significant visual effects on the villages. However, any houses up to 1-1.5km from the line route, with no or little intervening screening vegetation will have potential visibility of the towers. The most significant effects would be experienced in views up to 600-800m from the line route, where there is no or little intervening vegetation. The nature of visibility over distance is shown in **Section 11.5.2.2.**
Scenic Viewpoints	SV11 View northwards at Tullybrack. SV12, 13, 14 Scenic drive and views of open countryside from Mullyash.	None of these recognised Scenic Viewpoints will be affected by the proposed development.
Key Landscape Features	Mullyash Mountain Site of Battle of Clontibret Tassan Lough Lough Nahinch	Mullyash Mountain will not be affected by the proposed development. A monument commemorating the Site of the Battle of Clontibret (commemorative plaque) is located approximately 1.7km from the line route. Clontibret was a running battle so there is no clear extent to the battle site. There is no significant effect on the setting of Clontibret battle site considering the distance to the line route and the screening effects of intervening vegetation. Tassan Lough is located approximately 300m from the line route. Towers would be visible at close proximity to the lake, in views from the adjacent road. Therefore there would be localised significant visual effects. The current remote character of the small lake would be affected.

		The area around Lough Nahinch (located approximately 600m from the line route) is quite scrubby and therefore views are more enclosed.
Driving, Cycling & Walking Routes	Monaghan Way (Walking route)	The Monaghan Way will parallel the line route for approximately 2km at a distance of between 0 and 400m. Longer distance intermittent views would be possible for distances up to 1.5km from the line. The walking route will cross under the line route between towers 109 and 110. The section that parallels and crosses the line route will experience open views of towers at close proximity where there is no intervening vegetation, resulting in localised significant visual effects. Photomontage 3 and 5 shows the type of visual impact that would occur in close vicinity to the line. Photomontage 2 shows a view from a part of the Monaghan Way that is more screened. This section of the walking route forms only a small part of the long distance way which crosses through a mixture of remote and inhabited landscapes – therefore the development will affect a part of the walking experience, introducing a more industrial landscape character along the route for approximately 2km.
Historic Designed Landscapes	Lakelands	There will be no effects on this Historic Designed Landscape.

88 The following photomontages show the potential landscape and visual effects of the proposed transmission line within Landscape Unit A – Mullyash Uplands. Full scale photomontages and wireframes are contained in **Volume 3C Figures** of the EIS

Photomontage 1 at the site of the Battle of Clontibret in Crossaghy, approximately 1.85km to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage represents a view along the Monaghan Way and close to a monument to the Battle of Clontibret.

Landscape effects – There would be no landscape effects at this location.

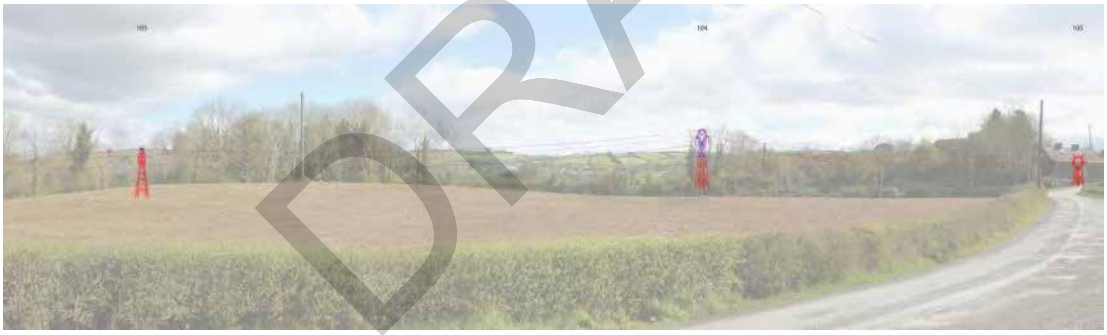
Visual effects - The transmission line would not be visible from this location.

Photomontage 2 from the L7502 in the townland of Coolartragh, approximately 474m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography



Reason for selection: This photomontage shows the nature of views from a stretch of the Monaghan Way.

Landscape effects – The proposed development will be experienced in the context of a local road, houses and existing utilities infrastructure and will therefore intensify an inhabited agricultural landscape character. The open character of the drumlin ridgeline will change to include the towers where open views are possible. The character of the valley will change with the introduction of towers that are of larger scale than anything else within the valley. The more enclosed parts of the valley with hedgerows or stands of trees will experience less landscape impact.

Visual effects - One tower is partially seen against the skyline but three are screened by topography or vegetation. This type of intermittent screening continues along this road southwards, but there are some areas with more open views where open and oblique views of the proposed development are possible. In these cases visibility would be similar to that shown in photomontage 3.

Photomontage 3 looking south from Crossbane Rd. in Armagh, approximately 321m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage represents an open view from Crossbane road, Armagh into the valley that parallels the border in this location.

Landscape effects – There would be significant localised effects on this small scale valley. The character of the valley will change with the introduction of towers that are of larger scale than anything else within the valley. Landscape effects are closely related to visual effects and the more enclosed parts of the valley with hedgerows or stands of trees will experience less landscape impact.

Visual effects – The transmission line will be visible from parts of Crossbane Road where there are gaps in the roadside vegetation. The towers will be mainly seen against the backdrop of hills.

Photomontage 5 at Lisdrumgormly townland, approximately 200m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage shows the transmission line viewed against the skyline in a relatively upland area. The screening effects of topography are shown – the towers in the distance are not visible due to the plateau like nature of this location.

Landscape effects – Scrub vegetation is encroaching as fields are abandoned in this part of the Mullyash uplands. Settlement is sparse and the remote character in this location will change with the introduction of a transmission line. The open character of the skyline will change to include the towers where open views are possible.

Visual effects - The open nature of the landscape means that towers will be visible from parts of the roads in this location. Many areas are, however, more enclosed by hedgerows or scrub vegetation. As scrub grows it will further enclose views in the uplands.

Photomontage 7 from the former N2 in the townland of Cashel at junction with the L7422, approximately 440m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage shows the transposition towers crossing relatively elevated land close to a busy road.

Landscape effects – The towers are seen against the skyline which alters the currently open character of the horizon in this location. The transposition towers are taller than other towers and of a different design, although this is not immediately apparent. The landscape character in this location is influenced by the existing road infrastructure and associated signs as well as residential and farm buildings. The proposed development therefore represents an intensification of this built rural infrastructure and introduces a new scale of tower into the landscape.

Visual effects - The lack of roadside hedgerow and location of the towers on relatively higher ground mean that towers will be visible crossing the former N2 in this location. The highest significant effects will be localised due to the screening effects of topography over longer distances.

Photomontage 8 from the N2, approximately 445m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage shows the crossing of the N2 in a location where open views are possible over the landscape.

Landscape effects – The towers are seen against the skyline which alters the currently open character of the horizon in this location. The transmission line will contribute to an intensification of a landscape character which has been influenced by road infrastructure.

Visual effects - The transmission line crosses the road perpendicularly which minimises the visual effects for drivers. The towers would be discernible because of the very open landscape in this location. They would be seen in the context of a rural landscape which contains existing infrastructure in the form of roads and buildings.

11.5.4.2 Landscape Unit B – Description of potential landscape and visual effects

<table>
<tr><th colspan="3">Landscape Unit B – Monaghan Drumlin Uplands</th></tr>
<tr><td colspan="3"></td></tr>
<tr>
<td>General Landscape Character</td>
<td>The undulating landscape includes elevated upland drumlin areas and lowland loughs with marshland and pasture farmland. There are some open areas with relatively wide visibility.</td>
<td>POTENTIAL LANDSCAPE EFFECTS

There will be changes to landscape character in the immediate vicinity of the line (up to 600 - 800m from unscreened towers), but as the towers generally follow the lower parts of the landscape there will be little alteration to the character of the wider landscape.
The eastern slopes of a drumlin are crossed at Cornanure (Monaghan By) with locally higher landscape effects
The alignment runs approximately 200 - 300m to the north of Coogan's Lough, Drumgristin Lough and Ghost Lough. An existing 110 kV line crosses Coogan's Lough. There will be cumulative localised landscape effects on the setting of these Loughs.
There would be no significant landscape effects on the setting of Cordoo Lough or Corlin Lough

POTENTIAL VISUAL EFFECTS

The most visible towers will be those on the upper parts of drumlins. It will be more difficult to discern towers on lower ground in this complex topographical landscape.
The transmission line will be partially visible from houses and roads up to 1 - 1.5km from the line where there is no intervening vegetation or topography and from elevated areas such as the drumlin immediately to the east of Drumgristin Lough. Visual effects reduce with distance, with the most significant effects occurring up to 600 - 800m from unscreened towers. The towers would be difficult to discern at distances beyond 800m and visual effects would be less in areas with a dense drumlin pattern.

</td>
</tr>
</table>

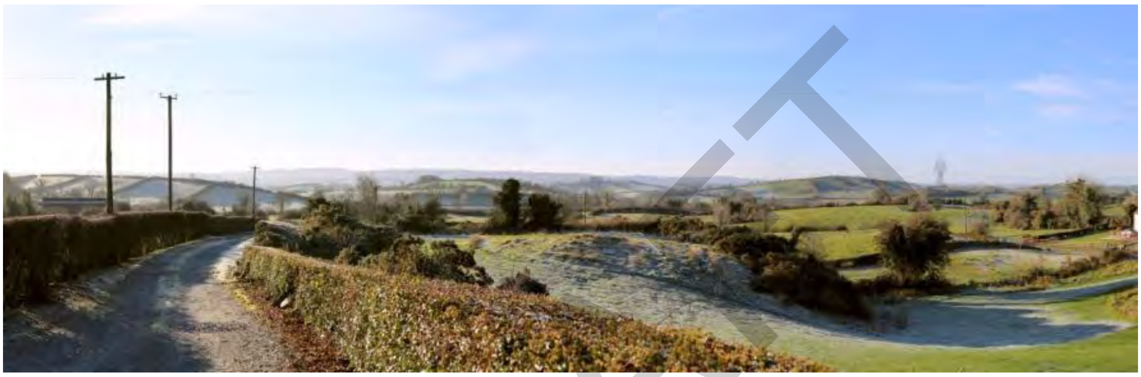
Settlements	There are individual houses throughout the countryside and along roads.	Houses up to 1-1.5km from the line route, with no or little intervening screening vegetation will have potential visibility of the towers. The most significant effects would be experienced in views up to 600-800m from the line route, where there is no or little intervening vegetation. The nature of visibility over distance is shown in **Section 11.5.2.2.**
Scenic Viewpoints	SV9 View of St Macartens Cathedral, Monaghan from Berry Brae	There will be no impact on this scenic viewpoint due to the distance from the proposed development.
Key Landscape Features	Cordoo Lough Natural Heritage Area	There will be no impact on this landscape feature due to the distance from the proposed development.

89 The following photomontages show the potential landscape and visual effects of the proposed transmission line within Landscape Unit B – Monaghan Drumlin Uplands. Full scale photomontages and wireframes are contained in **Volume 3C Figures** of the EIS

Photomontage 12 at Drumroosk townland, approximately 535m to closest tower

Existing view

Proposed view including transmission line



Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage represents the types of panoramic views possible from upper parts of drumlins within 500m of the proposed development.

Landscape effects – The towers that are located on the lower ground are absorbed into the broad landscape, but those on the upper parts on drumlins result in landscape effects arising from their intrusion on the skyline. These effects occur in a landscape context that contains houses, existing electricity lines and a wind farm on the horizon.

Visual effects – The most visible towers are those on the upper parts of drumlins. It is more difficult to discern towers on lower ground in this complex topographical visual scene.

11.5.4.3 Landscape Unit C – Description of Potential landscape and visual effects

<table>
<tr><th colspan="3">Landscape Unit C – Ballybay Castleblayney Lakelands</th></tr>
<tr><td colspan="3"></td></tr>
<tr>
<td>General Landscape Character</td>
<td>This unit includes pronounced drumlin pasture and the village of Doohamlet. Views are generally enclosed by the tight network of drumlins - more open views are possible from more elevated parts of the landscape. There are two lakes within 5km of the line route.

The line route crosses the R183 perpendicularly..</td>
<td>POTENTIAL LANDSCAPE EFFECTS

There will be changes to landscape character in the immediate vicinity of the line (up to 600 - 800m from unscreened towers), but little alteration to the character of the wider landscape.
Towers 137 - 141 cross the higher parts of drumlins and therefore the currently open character of this drumlin ridgeline will change. This effect occurs in the context of a landscape that includes main roads, houses and powerlines.
There would be no significant landscape effects on the setting of Lough Major at Ballybay or Tonyscallon Lough near Doohamlet.

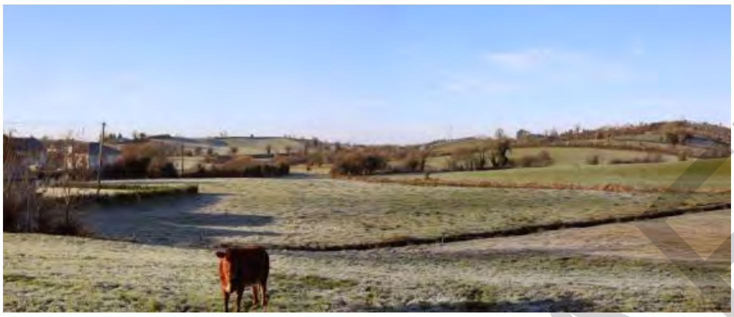
VISUAL EFFECTS

The transmission line will be partially visible from houses and roads up to 1 - 1.5km of the line where there is no intervening vegetation or topography and from elevated areas such as the location north of Doohamlet shown in photomontage 15 and at Cornahoe. Visual effects reduce with distance, with the most significant effects occurring up to 600 - 800m from unscreened structures. The towers would be difficult to discern at distances beyond 800m and visual effects would be less in areas with a very dense drumlin pattern.
The crossing point of the R183 is perpendicular and it occurs in a part of the landscape with existing electricity lines and houses and good screening provided by the surrounding drumlins - the most significant visual effects

</td>
</tr>
</table>

		will be experienced by drivers for a short time. • Parts of the towers may be visible briefly at a distance of 1km along with glimpsed views of Tonyscallon Lake when travelling along the R183. These, if discernible, would be seen in the context of a built up landscape with houses and existing powerlines and would not result in significant visual effects.
Settlements	Doohamlet. There are individual houses throughout the countryside and along roads.	• There would be no significant views of the transmission line from within Doohamlet itself due to the screening effects of drumlins and buildings. • Houses up to 1-1.5km from the line route, with no or little intervening screening vegetation will have potential visibility of the towers. The most significant effects would be experienced in views up to 600-800m from the line route, where there is no or little intervening vegetation. The towers would be difficult to discern at distances beyond 800m. The nature of visibility over distance is shown in **Section 11.5.2.2**.
Scenic Viewpoints	SV15, SV16, SV17 Scenic Drive along Lough Muckno.	• The transmission line will not be visible from these scenic viewpoints due to the effects of distance
Key Landscape Features	Tonyscallan or Dernaglug Lough Lough Major, Ballybay 3km to the west Lough Muckno and Environs Annaghmekerig Lake, Woodlands and environs. Dromore River and lake system including White Lake and Bairds Shore	• There will be no significant landscape effects on any of these key landscape features due to their distance from the proposed development.

90 The following photomontages show the potential landscape and visual effects of the proposed transmission line within Landscape Unit C – Ballybay Castleblayney Lakelands. Full scale photomontages and wireframes are contained in **Volume 3C Figures** of the EIS

Photomontage 15 looking west from L3430 just north of Doohamlet, approximately 1.57km to closest tower
Existing view 
Proposed view including transmission line 
Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography 
Reason for selection: This photomontage represents open views from the surroundings of Doohamlet.
Landscape effects – The towers that are located on the lower ground are absorbed into the broad landscape, but those on the upper parts of drumlins result in landscape effects arising from their intrusion on the skyline. These effects occur in a landscape context that contains houses and existing powerlines, and are in scale with other landscape features.
Visual effects – The most visible towers are those on the upper parts of drumlins and they are openly seen against the skyline from this location. At this distance, visibility would depend on weather conditions.

Photomontage 16 from the R183 in Ballintra, approximately 690m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage represents open views from the R183 where towers cross a drumlin ridge.

Landscape effects – Towers on drumlins result in landscape effects arising from their intrusion on the skyline. These effects occur, however, in a landscape context that contains buildings, a main road and existing powerlines. This location is unusual in that three towers are openly visible on drumlins and the landscape effect would be locally significant.

Visual effects – Three towers are openly visible on tops of drumlins, this would result in locally significant visual effects. The towers are seen in the context of a man-altered landscape and the overall visual effect reduces rapidly with distance.

Photomontage 17 from Lough Major at Ballybay, approximately 2.86km to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage shows the view from recognised amenity site at Lough Major in Ballybay.

Landscape effects - There would be no significant effect on the character of this landscape.

Visual effects – While one tower is very distantly visible, the transmission line would not be normally discernible at this distance.

11.5.4.4 Landscape Unit D – Description of Potential Landscape and Visual Effects

<table>
<tr><th colspan="3">Landscape Unit D – Drumlin and Upland Farmland of South Monaghan</th></tr>
<tr><td colspan="3"></td></tr>
<tr><td>General Landscape Character</td><td>The northern part of this landscape unit consists of broad shallow valleys which are more open than the more enclosed and complex landscape created by the larger than average drumlins and lakes further south in the unit. The drumlins and vegetation become more dense east of Shercock with curtailed long distance visibility.</td><td>POTENTIAL LANDSCAPE EFFECTS
There will be changes to landscape character in the immediate vicinity of the line (within 600 - 800m of unscreened towers), but little alteration to the character of the wider landscape.
Towers 164 - 167 cross the higher parts of drumlins and therefore the currently open character of the local drumlin ridgelines will change (see photomontage 24).
There would be no significant landscape effects on the setting of the largest lake in the environs of the line route, Lough Egish, or on the setting of Lough Troome, Shanontonagh or Greaghlone / Beagh Lough. The transmission line will be experienced from the environs of the following smaller lakes; Lough Boraghy, Lough Morne, Muff Lough and Bock's Lough (although this particular lake is well wooded).
POTENTIAL VISUAL EFFECTS
The transmission line will be partially visible from houses and roads up to 1-1.5km from the line where there is no intervening vegetation or topography and from relatively elevated areas such as Cornmagh. Visual effects reduce with distance, with the most significant effects occurring up to 600-800m from unscreened towers. The towers would be difficult to discern at distances beyond 800m and visual effects would be less in areas with a dense drumlin pattern.
The crossing points of the R178, R180 and R181 are perpendicular which reduces the visual effect – the most</td></tr>
</table>

		significant visual effects will be experienced by drivers for a short time.
Settlements	There are individual houses throughout the countryside and along roads.	• Houses up to 1-1.5km from the line route, with no or little intervening screening vegetation will have potential visibility of the towers. The most significant effects would be experienced in views up to 600-800m from the line route, where there is no or little intervening vegetation. The towers would be difficult to discern at distances beyond 800m. The nature of visibility over distance is shown in **Section 11.5.2.2**.
Scenic Viewpoints	SV18, 19 Distant views of Lough Muckno and Slieve Gullion SV20 Views of Slieve Gullion at Taplagh, Broomfield SV21 Scenic views of Lough Eglish SV22 Scenic drive at Beagh, Shantonagh and Corlat SV23 a view towards Lough Bawn and County Cavan	• The line route will be visible from SV22 – Scenic Drive at Beagh, Shantonagh and Corlat near Shantonagh House. The nature of visibility of the transmission line from this location is shown in photomontages 26 and 27. While the tops of towers are visible, most of the proposed development would be visually absorbed by being seen against a backdrop of the undulating topography. • There are no significant effects on SV21 (scenic views of Lough Eglish) due to the effects of distance and intervening topography.
Key Landscape Features	Loughbawn House and Loughs Lough Eglish. Cornasus *High Landscape Area* Lough an Leagh Mountain Dun na Ri Forest Park Moybologue Church	There will be no effects on any of these identified landscape features due to the distance from the proposed development.
Walking Routes	Lough an Leagh Dun na Rí Forest Park Castle Walk Bailieborough	There will be no significant effects on any of these identified walking routes due to the distance from the proposed development.

Historic Designed Landscapes	Tully House Shantonagh House Lakeview House Dun na Rí Forest Park	There will be no significant effects on any of these identified sites due to the distance from the proposed development.

91 The following photomontages show the potential landscape and visual effects of the proposed transmission line within Landscape Unit D – Drumlin Upland Farmland of South Monaghan. Full scale photomontages and wireframes are contained in **Volume 3C Figures** of the EIS

Photomontage 18 from L3200 across the townland of Clogher, approximately 631m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage shows the proposed development from an elevated location with views over drumlin tops towards higher ground in the distance.

Landscape effects – As the alignment follows the lower parts of the landscape, most of the proposed development has no significant effect on the landscape character. However, the ridgeline of a drumlin is broken by one of the towers. The scale of this is perceived as being generally in keeping with other built features in the landscape from this location.

Visual effects – One tower is partially visible and another is visible against a backdrop of land. A third is screened by topography. There is some intrusion on the views towards the higher ground in the distance. However, good screening is provided by vegetation and topography and by the effects of seeing a tower against land.

Photomontage 20 from the R180 at Brackly (Cremorne By) townland, approximately 392m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage shows the alignment running parallel to and crossing the R180 and the screening effects of topography as towers travel into the distance.

Landscape effects – The landscape effects are not significant in this location as the screening within the landscape results in the proposed development being absorbed into this robust rural landscape character.

Visual effects – Three towers are partially visible and there is some intrusion on the view towards the drumlin in the distance. However, good screening is provided by vegetation, topography and buildings.

Photomontage 21 from the junction of the R180 and the L4210 at the townland of Greagh (Cremorne By) and Tullyhinnera, 336m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage shows the alignment crossing a local road from the junction of the R180 and L4210 in a broad open valley landscape.

Landscape effects – The scale of the proposed development is apparent in this broad valley, with open landscape on both sides of the road. The landscape also contains a block of commercial forestry with provides some absorption of towers (bearing in mind a 74m corridor is required and that trees may need to be removed within this area). However the character of openness is locally adversely affected by the introduction of large scale towers in this location.

Visual effects – Three towers are partially visible against the skyline and the tower closest to the road will be a dominant feature where open views are possible, such as this one.

Photomontage 24 looking over Lough Morne, approximately 454m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage shows the view from a public road adjacent to Lough Morne.

Landscape effects – Line routing has aimed to avoid this combination of towers crossing higher ground in the vicinity of a lake, but it is not possible to avoid all potential impact of a linear development in a landscape with many lakes and drumlins. The setting of this small lake, as viewed from a local road, will be adversely affected by the location of the towers on adjacent drumlins.

Visual effects – Towers 167 and 168 are conspicuously visible on higher ground close to this small lake and adversely affect the visual amenity of this location.

Photomontage 26 from the L40431 (Scenic Road SV22) at Tooa townland, approximately 700m to closest tower
Existing view 
Proposed view including transmission line 
Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography 
Reason for selection: This photomontage shows the transmission line from a scenic route at Shantonagh.
Landscape effects – The towers that are located on the lower ground and seen against a backdrop of land are absorbed into the broad landscape, but those on the upper parts on drumlins result in landscape effects arising from their intrusion on the skyline. These effects occur in a landscape context with little other built towers in view. The visible parts of the alignment are in scale with the landscape at this distance.
Visual effects – The most visible towers are those on the upper parts of drumlins, which break the skyline. It is more difficult to discern towers on lower ground in this complex topographical visual scene.

Photomontage 29 from L4031 at Corduff, approximately 1.1km to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This is an open view from a slightly elevated location with winter vegetation.

Landscape effects – The landscape effects are not significant in this location as the screening within the landscape results in the proposed development being absorbed into this robust rural landscape character.

Visual effects – One tower is partly but distantly visible against the skyline, others are screened by vegetation and topography.

Photomontage 31 from the R178 approximately 2.5km east of Shercock, approximately 337m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage shows the alignment crossing the R178.

Landscape effects – The proposed development is large but not dominant in this landscape which contains a main road with existing utilities infrastructure within an undulating landform.

Visual effects – Six towers are partially visible and there is some visual intrusion due to the fact that a tower is located on the slopes of a drumlin and therefore at a slightly elevated position.

Photomontage 34 from the L49033 in the vicinity of Lavagilduff, approximately 222m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage shows the alignment crossing higher ground in a relatively remote valley.

Landscape effects – The scale of the landscape in this location is adversely affected by the proposed development due to the location of the towers on drumlin tops.

Visual effects – Three towers are partially visible and two are particularly visually dominant in this small scale landscape. The low hedgerows result in open views towards the drumlin ridgeline.

11.5.4.5 Landscape Unit E – Description of Potential Landscape and Visual Effects

<table>
<tr><th colspan="3">Landscape Unit E – Highlands of East Cavan</th></tr>
<tr><td colspan="3"></td></tr>
<tr><td>General Landscape Character</td><td>This unit includes the environs of Kingscourt and Lough an Leagh Mountain. The line route passes to the east of an area of designated landscape sensitivity in the Cavan CDP. The rest of the unit is low lying with high vegetation in many areas and more dense suburban type development on the outskirts of Kingscourt.</td><td>POTENTIAL LANDSCAPE EFFECTS
There will be changes to landscape character in the immediate vicinity of the line (up to 600 - 800m from unscreened towers), but little alteration to the character of the wider landscape.
Cumulative landscape effects will occur where the proposed line crosses the existing 220 kV line (Towers 232 – 235) at Corraneary (ED Enniskeen).
There will be no significant landscape effects on Lough an Leagh Mountain.
There would be some landscape effect on the setting of Muff Lough.
POTENTIAL VISUAL EFFECTS
The transmission line will be partially visible from houses and roads up to 1 - 1.5km of the line where there is no intervening vegetation or topography and from relatively elevated areas such as Cornmagh. Visual effects reduce with distance, with the most significant effects occurring with 600-800m of unscreened towers. The towers would be difficult to discern at distances beyond 800m.
The crossing points of the R162 and R165 are perpendicular which reduces the visual effect – the most significant visual effects will be experienced by drivers for a short time.</td></tr>
</table>

Settlements	There are individual houses throughout the countryside and along roads.	Houses up to 1 - 1.5km from the line route, with no or little intervening screening vegetation will have potential visibility of the towers. The most significant effects would be experienced in views up to 600 - 800m from the line route, where there is no or little intervening vegetation. The towers would be difficult to discern at distances beyond 800m. The nature of visibility over distance is shown in **Section 11.5.2.2**
Scenic Viewpoints	SV8 at Lough an Leagh Mountain.	The transmission line is approximately 2.1km from SV8 which looks down on the landscape from a height. Eight towers are potentially visible with a further three screened by vegetation. However, the transmission line would not be readily discernible at this distance particularly as the towers are seen against the backdrop of land, further reducing their visibility.
Key Landscape Features	Dun na Rí Forest Park. Lough an Leagh Mountain.	There will be no effects on these identified key landscape features due to the distance from the proposed development.
Walking Routes	Lough an Leagh. Dun na Rí Forest Park. Castle Walk, Bailieborough.	There will be no effects on these identified walking routes due to the distance from the proposed development.
Historic Designed Landscapes	Dun na Rí Forest Park.	There will be no effect on this historic designed landscape due to the distance from the proposed development.

92 The following photomontages show the potential landscape and visual effects of the proposed transmission line within Landscape Unit E – Highlands of East Cavan. Full scale photomontages and wireframes are contained in **Volume 3C Figures** of the EIS

Photomontage 36 from the R162 at elevated ground between the townlands of Tullybrick and Drumbrackan, approximately 1.08km to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage shows an open view from an elevated position on the R162.

Landscape effects – There are no landscape effects on this location due to the screening effects of topography.

Visual effects – While three towers are partially visible, there are no significant visual effects on this location due to the screening effects of topography.

Photomontage 38 from the R165 at Cornaman, 694m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage shows an open view from the R165 at a distance approximately 694m.

Landscape effects – There are no landscape effects on this location due to the screening effects of topography.

Visual effects – While one tower is partially visible, against a backdrop of land, there are no significant visual effects on this location due to the screening effects of topography.

Photomontage 39 from the L7567 near the site of the Fair of Muff, approximately 215m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage represents an open view in the vicinity of the Fair of Muff site.

Landscape effects – In landscape terms this site is similar to the wider landscape of east Cavan, however, these fields host the annual Muff Fair, and a commemorative statue and board has been erected. The presence of the transmission line will add an industrial characteristic to an inhabited and robust rural landscape which already contains roads, houses and electricity lines.

Visual effects – Two of the towers are partially visible from this location. One on higher ground is prominently visible due to its relatively elevated position and low roadside hedgerow at this particular viewing position.

Photomontage 41 looking east from Lough an Leagh Gap amenity site, approximately 2.15km to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This view is recognised as significant in the Cavan CDP. It is a picnic area with an information board and the start of a walk to the highpoint of the mountain. It is a rare elevated panoramic view in this area.

Landscape effects - There is no discernible effect on the elevated character of this landscape or on the expansive sense of visibility.

Visual effects - The transmission line would not be discernible at this distance particularly as the towers are seen against the backdrop of land, further reducing their visibility.

Photomontage 42 from the L3533 in the townland of Drumbar (Eniskeen By), approximately 575m to closest tower

Existing view

Proposed view including transmission line

Wireframe – blue shows what is in view, red shows what is screened by intervening vegetation or topography

Reason for selection: This photomontage shows the transmission line at close distance crossing a local road in an area of low drumlins.

Landscape effects – While a tower is visible breaking the skyline, there is no significant effect on drumlin character or the experience of a rural road bordered by continuous hedgerow.

Visual effects - The transmission line would be visible in the context of a network of hedgerows and a landscape containing an existing power line. The vegetation and topography limits significant visual effects to unscreened areas within the immediate vicinity of towers (up to approximately 400m), with visual effects decreasing rapidly with distance.

11.5.4.6 Potential Physical Landscape Effects

93 The main physical landscape effects arise from the need for the removal of vegetation. The degree of tree loping, trimming and removal will depend on a number of factors including tower height, closeness of hedgerow and towers and the lowest point of the conductor sag and topography. Areas where the line route passes through woodland will require the removal of an up to 74m swathe of trees (described in detail in **Chapter 6** of this volume of the EIS).

94 While a maximum working area of 30m x 30m around each tower may require removal of hedgerow vegetation at construction, this will be reinstated, and therefore adverse impacts would be temporary. Other hedgerows along the line route will be permanently lopped or trimmed in order to accommodate required safety clearances. Hedgerows with a height of up to 6m are unlikely to be lopped, although the height will depend on the conductor sag. On reinstatement of vegetation, the continuity of any affected hedgerow or tree lines will be restored, but the linear open corridors through woodland will remain.

11.5.4.7 Potential Impact of the Proposed Construction Materials Storage Yard

95 Figure 11.11, **Volume 3C Figures** of the EIS shows the location of the proposed construction materials storage yard in relation to sensitive landscape features and the location of four views of the site: Viewpoints 1 - 4. The site for the proposed construction materials storage yard is shown below.

Figure 11.2: Viewpoint 3 (panoramic)

96 The proposed construction materials storage yard is located adjacent to the N2 approximately 2.5km south-west of Carrickmacross with access to the site via the L4700. The 1.42ha site is currently a rough grassland field at approximately 40mAOD with a line of semi-mature trees along the north eastern boundary with the N2. There is a continuous band of trees and hedgerows along the south western boundary with the L4700.

97 The surrounding landform is characterised by an undulating topography with a mix of drumlins and low lying pastures with intact hedgerow field boundaries. There are patches of mature trees scattered throughout the local landscape and lakes at lower elevations.

98 Referring to the MLCA, the site is located within the Landscape Character Type *Drumlin Farmland* and within the Landscape Character Area *Carrickmacross Drumlin & Lowland Farmland* LCA.

99 There are two *Areas of Secondary Amenity Value* within the local area. Lough Naglack is located approximately 370m from the site, whilst Lisanisk Lake is located a distance of approximately 1.2km from the site. There will be no views of the site from these lakes due to intervening landform and tree cover.

100 From the local access bridge over the N2, approximately 160m north-west of the site, there are clear open views to the south with the N2 occupying a large part of the view with undulating drumlin fields to the south-east and further west. The majority of the site will be visible next to the N2, on lower lying land and partially screened by a band of deciduous trees along the N2. See **viewpoint 4**.

Figure 11.3: Viewpoint 4

101 The higher parts of the stored materials would be visible from the N2, as well as the traffic leaving and entering the site. The existing vegetation along the road, however, provides good screening, which will increase over the three year time period for the site.

102 There are several properties in close proximity to the construction materials storage yard site. On the L4700 to the south there are several properties which face onto the local road. There will be no views of the site from these properties due to the intervening roadside tree cover.

103 There is a property adjacent to the construction materials storage yard site to the east. From the garden of this property there will be open views of the entire construction materials storage yard site, which lies at a slightly lower elevation.

104 **Viewpoint 1** looks towards the site from the L4700 adjacent to this property.

Figure 11.4: Viewpoint 1

105 The L4700 on the western side of the site is parallel to the N2. This local road cuts through a generally enclosed landscape with roadside vegetation and sloping landform on both sides of the road limiting wide views. Travelling along the L4700 adjacent to the site, there will be clear views of a large portion of the site. The new entrance on this road, parking areas and some construction materials would be visible. As the tower materials are to be laid horizontally; and as the site is at a lower elevation than the road, a large portion of the site (including the tower storage to the northern side) will be visible from this road. See **viewpoint 2.**

106 Travelling along this local road in a southerly direction, there will be clear views of the site, including the prefabricated staff offices at the junction with the local road. The site traffic and site entrance will also be clearly visible. Views of the whole site would not be possible due to the screening effect of the site works at the western side of the site.

Figure 11.5: Viewpoint 2 from the L4700

Figure 11.6: Viewpoint 3 from the L4700

107 In the wider landscape there is a network of local roads and access tracks which do not experience any views of the site due to the undulating drumlin landform and tree cover.

Residual Landscape Effects

108 The grass ground cover will be removed and replaced by compacted hardcore for the duration of use of the site (approximately three years). Boundary hedgerows and tree cover will be retained, (except for those removed to construct the entrance). However, during the construction stage there will be a change in land use and resulting change in landscape character. The site‘s proximity to a main road and previous use as a construction compound result in landscape effects that are short term and low-moderate. On completion of construction, the site will be reinstated to agriculture, the long term landscape and visual effects will be negligible.

Residual Visual Effects

109 The construction materials storage yard will be partly visible from the N2, and the adjacent L4700. It will be openly visible from the bridge crossing over the N2 and from the garden of the property adjacent to the site. Construction traffic entering and leaving the site will also be visible from these locations. The effects on views from the N2 will be short term and low-moderate considering that views from main roads are considered to be of low sensitivity. The effect on views from the L4700 and adjacent property are more sensitive, and effects on these views would be low-moderate and short term.

11.5.4.8 Potential Impact of Swan Flight Diverters

110 **Chapter 6** of this volume of the EIS contains information on the location, extent and type of swan flight diverters required along the route. These have been illustrated on photomontages at varying viewing distances (see Photomontages 16, 24 and 31).

111 Bird flight diverters will be located:

- Between Towers 196 and 203 in the vicinity of Comertagh and Raferagh Loughs;
- Between Towers 160 and 169 where the alignment passes to the west of Lough Egish and east of Lough Morne; and
- Between Towers 139 and 147 where the alignment passes on higher ground to the east of Ballintra.

112 The requirement for swan flight diverters often corresponds with areas of landscape sensitivity, and these three locations are sensitive due to their proximity to lakes and location on higher parts of the landscape. The swan flight diverters will be visible on the earth wires at close proximity to the proposed development. However, the type of bird flight diverter selected for use is visually subtle and is not perceptible at distances greater than approximately 500m. Therefore, considering the relevant scale of the proposed development, the addition of swan flight diverters is not considered to result in significant landscape or visual effects. The slightly higher visual impact resulting from the swan flight diverters is balanced with the benefits to landscape character arising from bird protection.

11.5.5 Decommissioning

113 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration.

11.6 MITIGATION MEASURES

114 In landscape terms, the best mitigation measure is „avoidance' of potential impact by a route selection process that minimises visibility on skylines and proximity to waterbodies and that avoids or minimises excessive proximity or dominance of sensitive visual receptors – such as scenic routes, residences, tourism and leisure amenities and facilities. This has been carried out over the course of constraints evaluation and route selection and is described in The *Final Re-Evaluation Report* (April 2013) (see Appendix 1.2, **Volume 3B Appendices** of this EIS) and The *Preferred Project Solution Report* (July 2013) (see Appendix 1.3, **Volume 3B Appendices** of this EIS).

115 The route selection stage resulted in the avoidance of the parts of the landscape most extensively sensitive to an overhead electricity line. The most sensitive locations along the proposed alignment and the most significant landscape and visual impacts of an OHL have been identified and described.

116 Where it has not been possible to avoid adverse effects on identified specific viewpoints, micro-mitigation is possible through the retention, enhancement or replanting of trees and hedgerows in key locations.

117 The mitigation measures described in detail in **Chapter 6** of this volume of the EIS will serve to minimise physical landscape effects. The key mitigation measures in relation to landscape effects are using existing access tracks and gaps in hedgerows, reinstatement of hedgerows and ground vegetation (with similar or better quality planting), protection of retained vegetation, sensitive vegetation pruning methods and monitoring of vegetation establishment. Hedgerows will be maintained to ensure no vegetation is tall enough to potentially interfere with the conductors. Trees will be pollarded to minimise physical landscape effects. Ongoing monitoring will be carried out during construction and inspection and if necessary replacement of reinstated planting will be carried out after construction, over a 24 month period.

118 The mitigation measures outlined in **Chapter 7** of this volume of the EIS will serve to minimise effects on soil and subsequent vegetation establishment. The key mitigation measures in relation to landscape effects are, correct removal, storage and reinstatement of subsoil and topsoil and removal and disposal of soil where not required for reinstatement.

11.7 RESIDUAL IMPACTS

119 As the key mitigation measures when planning a transmission line occur at route selection and line design stage, the residual unavoidable effects are, , those that have been described in detail in **Section 11.5** of this volume of the EIS.

120 A summary of the significance of residual effects is given in Table 11.18, **Appendix 11.1, Volume 3C Appendices** of the EIS.

121 As visibility of towers is highly influenced by intervening vegetation and buildings, the localised nature of this residual impact may slightly reduce or increase over time as vegetation grows, hedgerows are enhanced or removed and buildings are built.

11.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS

122 Other potential impacts related to landscape are described in **Volume 3D** (MSA) of the EIS). This volume of the EIS concentrates on the CMSA. The following chapters of this volume of the EIS are also relevant to the potential for effects on landscape in the CMSA; **Chapter 4** Human Beings – Tourism and Amenity, **Chapter 6** - Flora and Fauna, **Chapter 7** - Soils, Geology and Hydrogeology, **Chapter 9** - Air – Noise and Vibration and **Chapter 14**- Cultural Heritage.

123 Interrelationships between ecological impacts and landscape occur where the removal or trimming of wooded features (including woodlands, hedgerows and treelines) may have adverse effects on both ecology and landscape. The impact on such wooded features has been minimised by, where possible, locating towers away from hedgerows and other wooded

areas. The use of swan flight diverters will slightly increase the visual impact of the alignment at close distances where these have been installed.

124 Soil compaction caused by construction or maintenance can have an adverse effect on localised landscape character and vegetation establishment.

125 The potential impacts on the setting of recognised individual cultural heritage sites are appraised in **Chapter 14** of this volume of the EIS. This chapter appraises potential impact in the context of the broad cultural heritage contained within the landscape, which includes the patterns of human impact over the millennia. This human impact includes agriculture, drainage, transport, utilities and housing.

126 The OHL will be visible from some short sections of the Monaghan Way. This may be perceived as reducing the attractiveness of this route for tourism and amenity purposes, although the adverse effects are localised.

127 There is a negative population impact which arises from the visual impact, where dwellings are located in close proximity to the proposed development with no intervening vegetation or topography.

128 Noise that may occur in close proximity to the line can have an adverse effect on landscape character.

11.9 CONCLUSIONS

129 The study area for this appraisal forms part of the extensive farmed drumlin belt which stretches east-west across the island of Ireland. The long history of human habitation and agriculture is reflected in a complex pattern of hedgerows and fields which form part of the story of human influence in counties Monaghan and Cavan and which also includes widespread housing development, farm and commercial buildings, a dense road network and existing utilities infrastructure.

130 The most sensitive features of the area subject to this appraisal are the ridgelines of drumlins, the views from elevated areas and the vicinity of lakes which occur in the lower lying areas. The inhabited rural locations in close proximity to the alignment and road crossings are also sensitive to the changes to landscape character that occur with the construction of a 400 kV transmission line.

131 The MLCA and Cavan CDP have recognised areas sensitive to development in particular the Mullyash Uplands and Highlands of East Cavan. This chapter has also identified other sensitive areas and features including settlements, scenic views, heritage sites, recreation and tourist routes and historic designated landscapes.

132 The agricultural landscape of Monaghan and Cavan is generally robust and has undergone continuous change including road and house building, and introduction of utilities infrastructure while sustaining its underlying character and evident time depth. The scale of the proposed development will, however, result in significant alteration to the landscape character of areas in the near vicinity of the alignment – most noticeably at distances of up to 600 - 800m from the transmission line.

133 Towers and associated infrastructure are dominant in close views (up to 500m) where there is no intervening vegetation or topography, where there are gaps or lower than average roadside vegetation, particularly if they are located on the higher parts of drumlins.

134 At distances of 500m to 1km, towers are still noticeable in the context of a wider landscape. The screening capabilities of vegetation, buildings and topography however, become more effective. The towers are more conspicuous at these distances if sited on higher ground or if the viewing point is elevated, or if the proposed development is seen against the sky.

135 Beyond 1km, it becomes difficult to discern the towers in the landscape, and in most cases the towers are not visible at this distance. Towers are still however, distantly visible if seen traversing higher ground or over very flat ground where there is a gap in intervening vegetation.

136 Over the full length of the proposed development, the residual unavoidable impacts will include adverse effects on landscape character and on unscreened views within 600 - 800m of the alignment. Some areas that are particularly elevated in relation to the line will experience significant effects at distances up to 1km. These effects will be particularly noticeable where the transmission line crosses roads, or where hedgerows are low and/or panoramic views are available.

137 Specific identified sensitive locations along the alignment which will experience residual unavoidable landscape and visual impact include; a plateau and valley close to the jurisdictional border with Northern Ireland including a section of the Monaghan Way, the setting the Fair of Muff, a scenic view east of Shantonagh, the vicinity of a number of small lakes, and most commonly, the locations where towers need to cross drumlins to avoid other constraints.

12 MATERIAL ASSETS – GENERAL

12.1 INTRODUCTION

1 This chapter presents an evaluation of the proposed development as set out in Chapter 6, **Volume 3B** of the Environmental Impact Statement (EIS), in relation to Material Assets - General.

2 Chapter 6, **Volume 3B** of the EIS describes the full nature and extent of the proposed development including elements of the overhead line (OHL) design and the towers. It provides a factual description, on a section by section basis, of the entire line route. The principal construction works proposed as part of the development are set out in Chapter 7, **Volume 3B** of the EIS.

3 The information contained within this chapter is concerned with material assets of the Cavan Monaghan Study Area (CMSA) as defined in Chapter 5, **Volume 3B** of the EIS, specifically focusing on:

- Utilities: Gas Pipeline, Electricity Lines and Telecoms;
- Aviation: Airfields and Ballooning; and
- Waste.

4 In this chapter, the existing environment is examined with regards to current utilities, aviation and waste infrastructure, potential impacts on the surrounding environment resulting from the proposed development are evaluated and appropriate mitigation measures are proposed.

5 This chapter should be read in conjunction with Chapters 6 and 7**, Volume 3B** of the EIS, and Chapters 6, 7, 8 and 11 in this volume of the EIS.

12.2 METHODOLOGY

6 This section of the EIS has been prepared in accordance with relevant EU and Irish Legislation and guidance, including the requirements of Annex IV of the Environmental Impact Assessment (EIA) Directive and in accordance with Schedule 6 of the *Planning and Development Regulations 2001* (as amended) and conforms to the relevant requirements as specified therein.

7 The following guidelines were referred to while preparing this appraisal:

- Environmental Protection Agency (EPA) (2002). *Guidelines on the Information to be contained in Environmental Impact Statements;*
- EPA (2003). *Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)*; and
- Department of the Environment Community and Local Government (DoECLG) (2013). *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessments.*

8 The scope of the appraisal is based on a review of legislation, guidance documents, other EISs feedback from public consultation, consultation with prescribed bodies, consultation with An Bord Pleanála (the Board), the Irish Aviation Authority (IAA) and on a consideration of the likelihood for significant impacts arising, having regard to the nature of the receiving environment and the nature and extent of the proposed development.

9 The scoping opinion received from the Board (refer to Appendix 1.3, **Volume 3B Appendices** of the EIS) identified the following issues as being relevant to this chapter of the EIS:

- Identify the enhancements to existing electricity network infrastructure;
- Information on the likely effects on public utilities and services along the route corridor, and in particular any proposed re-routing of overhead electricity lines; and
- Assessment of potential impacts on aviation transport.

10 This section sets out how the appraisal of material assets, specifically utilities, aviation and waste were evaluated for the proposed development. The objective of this chapter is to identify existing utility, aviation and waste infrastructure and determine whether these features place constraints on the proposed development. Impacts during construction, operation and decommissioning that the proposed development may have on utilities, aviation and waste infrastructure are also examined and mitigation measures which may be required to minimise any adverse impacts of the proposed development are identified and considered (refer to **Sections 12.5** and **12.6**).

11 The evaluation is based on the fact that existing best practices in design, construction and operation are employed for the proposed development as set out in this EIS.

12.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

12 This section describes the characteristics of the proposed development and indicates how the material assets are affected by the proposed development.

13 The main potential impacts on waste infrastructure and utilities occur during the construction phase and details of said impacts are included in **Section 12.5**..

14 The main potential impacts on aviation occur during the operation phase, details of said impacts are included in **Section 12.5** and mitigation measures must take account of the long term nature of transmission infrastructure.

12.4 EXISTING ENVIRONMENT

12.4.1 Evaluation of Baseline - Utilities

12.4.1.1 Gas Pipeline

15 Information provided by Bord Gais Networks on the gas pipeline distribution network does not indicate the presence of any gas infrastructure in the CMSA.

16 There is a gas pipeline which lies just outside the defined CMSA, running between Drogheda and Bailieborough, with a pipeline off this serving Kingscourt, Carrickmacross and Lough Egish. It is proposed to extend the Drogheda - Bailieborough gas line to Cootehill. This information is contained the *Final Re-evaluation Report* (April 2013) and a map illustrating the constraints within the CMSA is presented in Appendix C of this *Re-evaluation Report* (refer to Appendix 1.2, **Volume 3B Appendices** of the EIS).

12.4.1.2 Electricity Lines and Telecoms

17 The most significant electricity line in the CMSA is the Flagford - Louth 220 kV OHL which runs in an east-west direction to the south of Kingscourt. There are three 110 kV electricity lines: Louth - Rathrussan, Lisdrum – Louth and Arva – Shankill. There are also a number of medium voltage 38 kV lines crossing the CMSA. Overall in the CMSA there is approximately 217km of existing medium and high voltage lines (91km of 38 kV, 83km of 110 kV and 43km of 220 kV). In addition there are thousands of kilometres of low voltage (20 kV and 10 kV) and telephone OHLs in the CMSA. This information is contained the *Final Re-evaluation Report* (September 2013) and a map illustrating the constraints within the CMSA is presented in Appendix C of the *Re-evaluation Report* (refer to Appendix 1.2, **Volume 3B Appendices** of the EIS).

12.4.2 Evaluation of Baseline – Aviation

12.4.2.1 Airfields

18 There are no licenced airfields in the CMSA. The IAA has indicated that there may be a number of unlicensed airfields and landing strips in the CMSA.

12.4.2.2 Ballooning

19 There are no ballooning companies or clubs operating in the CMSA.

12.4.3 Evaluation of Baseline – Waste

20 In the CMSA the only EPA licensed waste facility located within 500m of the OHL is the Scotch Corner Landfill in Monaghan. A list of the waste management facilities in the CMSA can be found in **Appendix 7.2**, **Volume 3C Appendices** of the EIS.

12.5 POTENTIAL IMPACTS

21 During the preparation of this EIS, an evaluation of the likely significant effects of all aspects of the proposed development has been undertaken.

22 The material asset impacts of the proposed development are divided between the construction and the operational phases of the proposed development.

12.5.1 Do Nothing

23 In the ‗Do Nothing' scenario, the OHL will not proceed and the baseline material asset environment, save for the potential for general development outside of the scope of this project, will remain unchanged. The existing environment remains the same and no material assets are impacted.

12.5.2 Construction Phase

24 The construction programme is anticipated to last approximately three years from commencement of site works (refer to Chapter 7, **Volume 3B** of the EIS for further details on construction). The construction of the OHL will be undertaken in five general stages, according to the following sequence, on a rolling programme of estimated durations:

- Stage 1 – Preparatory Site Work;
- Stage 2 – Tower Foundations;

- Stage 3 – Tower Assembly and Erection;
- Stage 4 – Conductor / Insulator Installation; and
- Stage 5 – Reinstatement of Land.

25 The construction phase will have potential impacts on utilities and waste. It will be a requirement of the contractor appointed to construct the proposed development, to prepare a detailed Construction Environment Management Plan (CEMP) prior to the commencement of construction operations. The objective of this plan will be to minimise the impact caused by the construction stage of the proposed development. Refer to Appendix 7.1 **of Volume 3B Appendices** of the EIS for an outline CEMP.

12.5.2.1 Construction Material Storage Yard

26 The construction material storage yard for the proposed development will be a temporary ESB yard located south-east of Carrickmacross, County Monaghan. The site is located immediately adjacent to the southern side of the N2 National Primary Road. This ensures appropriate accessibility to all parts of the alignment of the proposed transmission line.

27 The site (approximately 1.42ha) is required for the storage of material, adequate vehicular movements and access to material within the site. Therefore, approximately 2" of soil (1,250m^3) that will be removed for the preparation of the site ground will have to be removed to a licensed waste recovery facility and / or landfill, due to restricted site space.

28 Facilities at the construction material storage yard for segregation of waste will be made available to optimise reuse and recycling of construction waste and correct disposal of domestic waste. This is in keeping with the principle of the Construction Waste Management Plan (CWMP) which will form part of the CEMP (see **Section 12.6.1.3.2**).

29 The measures proposed below in the CWMP shall be the minimum measures implemented at the construction material storage yard with regards to waste material.

12.5.2.2 Gas Pipeline

30 There are no crossings of gas pipelines.

12.5.2.3 Electricity Lines and Telecoms

31 There are a number of existing electricity and telecom lines, which will be crossed by the proposed development.

32 The proposed development crosses three existing electricity high voltage OHLs:

- Flagford - Louth 220 kV OHL;
- Louth - Rathrussan 110 kV OHL; and
- Lisdrum – Louth 110 kV OHL.

12.5.2.4 Construction Waste

33 As with any infrastructural project, there will be excavated material during the construction of the proposed development, specifically in relation to the tower foundations. Typically $34m^3$ of excess soil will be excavated at each intermediate tower location with approximately $230m^3$ of excess soil excavated from angle towers. A worst case scenario would be that all excavated material ($10{,}500m^3$ for all the towers in CMSA) would be sent off-site to a licenced /permitted waste recovery facility / landfill.

34 Timber waste will be generated from hedgerows, tree lines and forestry to clear open space for OHL development.

12.5.3 Operational Phase

35 The operational phase will have potential to generate a negligible amount of waste.

12.5.3.1 Operational Waste

36 It is envisaged that little waste will arise from the operational phase of the proposed development. Waste generated in the operational phase will include light cleaning waste arising in maintenance and cleaning operations, the replacement of lighting units as required, oils arising from occasional maintenance activities and packaging materials.

12.5.4 Decommissioning

37 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration

12.6 MITIGATION MEASURES

38 The construction methods carried out by the ESB and its contractors will be in line with international best practice and will fully comply with relevant health and safety requirements.

39 It will be a requirement of the contractor appointed to construct the proposed development to prepare a detailed CEMP prior to the commencement of construction operations. The CEMP will include method statements and work programmes that provide more detailed phasing of work based on the methodologies described in Chapter 7, **Volume 3B** of the EIS and the mitigation measures contained in this EIS. The objective of this CEMP will be to minimise the impact caused by the construction stage of the proposed development.

12.6.1 Construction

12.6.1.1 Electricity Lines and Telecoms

40 A site specific risk assessment must be completed where the crossing of existing electricity and telecom services is necessary. Consultation will take place with service providers, prior to any construction works in the proximity of existing telecoms services likely to be impacted, as required.

41 Refer to **Section 12.5.2.3** for details on where the crossing of existing OHL and telecom services is necessary during construction, maximum efforts will be made to minimise disruption to the service. Extreme caution will be exercised during the construction of towers to ensure that no cables will be disturbed. Care will be taken when stringing conductors. Certain obstacles along a straight have to be guarded such as road / railway crossings and other distribution lines by way of temporary guard poles (refer to Chapter 7, **Volume 3B** of the EIS for further details on construction).

12.6.1.2 Gas Pipeline

42 During the construction phase, the locations of identified underground gas pipelines will be confirmed with the relevant utility. As set out in this chapter, it is not envisaged that any gas pipeline will be encountered. This is a standard requirement for all construction projects.

12.6.1.3 Waste

12.6.1.3.1 Legislation

43 All waste arising during the construction and operational phases will be managed and disposed of in a way that ensures compliance with the provisions of the following legislation:

- *Waste Management Act 1996-2011;*
  - *Waste Management (Amendment) Act 2001* [S.I. No. 36/2001]*;*
  - *Protection of the Environment Act 2003 [S.I. No. 27/2003]; and*
  - *Environment (Miscellaneous Provisions) Act 2011 [S.I. No. 20/2011].*
- *European Communities (Waste Directive) Regulations 2011* [S.I. No. 126 of 2011];
- *Waste Management (Facility Permit and Registration Regulations) 2007* [S.I. No. 821/2007];
- *Waste Management (Facility Permit and Registration Regulations) 2008* [S.I. No. 86/2008];
- *Waste Management (Collection Permit) Regulations 2007* [S.I. No. 820/2007];
- *Waste Management (Collection Permit) (Amendment) Regulations* 2008 [S.I. No 87/2008];
- DoECLG (2006). *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects*; and
- Meath County Council. *Waste Management Plan for the North East Region 2005-2010.*

44 Waste management will be carried out in accordance with *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects* (2006) produced by the Department of Environment, Community and Local Government (DoECLGs.

45 A requirement of the *Waste Management (Facility Permit and Registration) Regulations 2007, as amended,* is to obtain a Certificate of Registration, if excavated material is being disposed or recovered. The extract from the regulations is as follows:

> *–Classes of activity subject to registration with local authority or the agency. Recovery of excavation or dredge spoil, comprising natural materials of clay, silt,*

sand, gravel or stone and which comes within the meaning of inert waste, through deposition for the purposes of the improvement or development of land and the total quantity of waste recovered at the site shall not exceed 25,000 tonnes."

12.6.1.3.2 Construction Waste Management Plan (CWMP)

46 A CWMP (which will form part of the CEMP) will be implemented to minimise waste and ensure correct handling and disposal of construction waste streams in accordance with the Department of the Environment, July 2006, *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects*,. The key principles underlying the plan will be to minimise waste generation and to segregate waste at source.

47 Facilities for segregation of waste will be made available to optimise reuse and recycling of construction waste and correct disposal of domestic waste. On site segregation of waste will be provided by the contractor using skips for timber, steel, general waste, and recyclables.

48 The measures proposed below shall be incorporated into this plan and shall be the minimum level of mitigation to be included in this CWMP :

- Disposal of construction waste will be to licensed / permitted disposal facilities;
- Regulations in relation to waste management will be adhered to;
- Excavated material will be re-used on site where appropriate and where it is possible to do so;
- Other waste generated will be removed off site by licensed contractors for appropriate treatment / disposal or recycling at licensed facilities;
- Soil material will be tested regularly by a qualified company prior to removal to ensure material is inert;
- Where applicable, temporary site sanitary facilities will be connected to a holding tank which will be pumped out as required and disposed of in an appropriate manner to a licensed disposal facility;
- Fuels or chemicals stored on site will be stored in an enclosed, bunded unit and located a safe distance from mobile generators or electrical equipment;
- Hazardous waste oils and oil contained material will be stored in designated bins and disposed of by a licensed hazardous waste contractor;

- Spill kit bags / bins will be made available at construction sites and in relevant vehicles, should a spill occur; and
- Portable bunds will be used when refuelling to avoid fuel spills.

Topsoil

49 All topsoil excavated in the construction of tower foundations will be reinstated where possible. Where practical and appropriate, excavated subsoil will be used for associated construction and landscaping purposes on site. This will allow the material to be beneficially reused and would have no traffic implications or waste disposal to an outside site. Due to the relatively small footprint of each tower, there will not be a large amount of subsoil excavated at each tower location. Typically $34m^3$ of excess soil will be excavated at each intermediate tower location with approximately $230m^3$ of excess soil excavated from angle towers. Where the excavated material will not be used onsite, all surplus soils will be transported to a licensed waste recovery facility and / or landfill, refer to **Appendix 7.2, Volume** 3C**Appendices** of the EIS.

50 In the unlikely event that any soil / subsoil is deemed to be contaminated, it will be stored separately from the inert soil / subsoil and it will be sampled and tested. The material will be appropriately classified as non-hazardous or hazardous in accordance with the criteria for the acceptance of waste at landfills, before being transported to an appropriately licensed facility by permitted contractors. The transport of materials will be carried out by contractors licensed und*er the Waste Management (Collection Permit) Regulations 2007, as amended*.

Waste Steel, Copper and Aluminium

51 Waste steel, copper and aluminium will be stored separately in a metal skip and recycled using a licensed waste company and recycling facility. Other construction waste will include excess material, damaged material, waste timber and packaging waste, and will be stored in designated skips / bins on site for collection by a licensed waste contactor.

Hazardous Waste

52 Waste oils and oil contained material will be stored in designated bins and disposed of by a licensed hazardous waste contractor.

General Waste

53 General domestic type waste consisting of mixed food waste and food packaging, polystyrene, cardboard and plastic etc. will be generated during construction works by construction workers at the tower sites and stringing areas. This waste will brought back to the construction material

storage yard where it will be segregated correctly and placed in designated skips / bins for collection by a licensed waste contractor.

Foul Effluent

54 Temporary facilities will be provided for construction works at tower locations and at the construction material storage yard. The contractor will provide chemical toilets / holding tank and provide for regular collection by a licensed company for discharge to the nearest local authority sewage treatment plant.

Timber

55 Qualified and certified timber contractors will recover / dispose of all timber waste arising from clearing hedgerow, tree lines and forestry (refer to **Chapter 6**, of this volume of the EIS for further details on the flora and fauna impacts).

12.6.2 Operation

12.6.2.1 Waste

56 Light waste generated in the operational phase of the proposed development arising in maintenance and cleaning operations, replacement for lighting units as required, oils arising from occasional maintenance activities and packaging materials will be removed off site by licensed contractors for appropriate recovery / disposal at licensed facilities.

12.7 RESIDUAL IMPACTS

12.7.1 Gas Pipeline

57 Adherence to the mitigation measures will ensure there are no residual impacts associated with the proposed development.

12.7.2 Electricity Lines and Telecoms

58 Adherence to the mitigation measures will ensure there are no residual impacts associated with the proposed development.

12.7.3 Airfields

59 As there are no licensed airfields in the CMSA there are no residual impacts associated with the proposed development.

12.7.4 Ballooning

60 As there are no ballooning enterprises operating in the CMSA there are no residual impacts associated with the proposed development.

12.7.5 Waste

61 To manage construction waste, the main contractor will be required to develop, implement and maintain a CEMP during the construction works. The main contractors will be required to minimise waste and to segregate waste at source.

62 The main waste arising will be inert soil, which will be reused for onsite purposes. Where the excavated material will not be used onsite, all surplus soils will be transported to a licensed waste recovery facility and / or landfill, this ensures the provisions of the *Waste Management Act 1996* and subsequent amendments and regulations and any of the relevant Local Authorities Waste Management Plans.

63 All other waste generated from construction activities will be sent to licensed waste recovery facilities, where possible. It is envisaged that the fraction of waste arising from the proposed development which will be sent to landfill will be minimal consisting only of the residual fraction of the domestic type waste generated by the construction workers which cannot be recovered. All other materials such as paper, plastic, glass etc. will be segregated and recycled.

64 Following good waste management practices it is not expected that waste arising from the proposed development will give rise to any significant impacts.

12.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS

65 This chapter should be read in conjunction with Chapter 6 and Chapter 7, **Volume 3B** of the EIS and **Chapters 6, 7, 8** and **11** of this volume of the EIS, for a full understanding of the main interrelationships between these environmental topics.

12.9 CONCLUSIONS

66 The mitigation measures which will be outlined in the CEMP (refer to Appendix 7.1. **Volume 3B Appendices** for an outline CEMP) will be implemented as part of the construction management. It is considered that the operation phase of the proposed development will have no significant impacts and adherence to the mitigation measures will ensure there are no residual impacts associated with the proposed development.

13 MATERIAL ASSETS – TRAFFIC

13.1 INTRODUCTION

1 This chapter presents an evaluation of the proposed development as set out in Chapter 6, **Volume 3B** of this Environmental Impact Statement (EIS), in relation to traffic.

2 That chapter describes the full nature and extent of the proposed development, including elements of the overhead line (OHL) design and the towers. It provides a factual description, on a section by section basis, of the entire line route. The proposed line route is described in that chapter using townlands and tower numbers as a guideline. The principal construction works proposed as part of the development are set out in Chapter 7, **Volume 3B** of the EIS.

3 This chapter concentrates on the Cavan Monaghan Study Area (CMSA). Chapter 13, **Volume 3D** of the EIS, contains an evaluation of the Meath Study Area (MSA).

4 The primary means of transporting materials and labour to / from site will be by means of vehicles using the existing public road network. This will result in a temporary increase in traffic on public roads in the CMSA and as such necessitates that the impacts of this traffic be considered.

5 The CMSA for this evaluation includes a greater area than the footprint of the infrastructure described above. The CMSA includes the existing road infrastructure in the vicinity of the proposed development and the haul routes within a much wider area, which will be used to bring materials to the work areas. The extent of the CMSA for this evaluation is shown on Figure 13.18, **Volume 3C Figures** of the EIS.

6 This chapter should be read in conjunction with **Chapters 6**, **9**, **Chapter 10**, **11** and **14** of this volume of the EIS as well as **Chapters 6** and **7** of **Volume 3B** of the EIS.

13.2 METHODOLOGY

7 This section of the EIS has been prepared in accordance with relevant EU and Irish Legislation and guidance, including the requirements of Annex IV of the EIA Directive and in accordance with Schedule 6 of the *Planning and Development Regulations 2001* (as amended) and conforms to the relevant requirements as specified therein.

8 The scope of the appraisal is based on a review of legislation, guidance documents, other EISs, feedback from public consultation, consultation with prescribed authorities, pre-application consultation with An Bord Pleanála (the Board), and a consideration of the likelihood for significant impacts arising, having regard to the nature of the receiving environment and the

nature and extent of the proposed development. The following guidance and policy documents were reviewed during the preparation of this chapter:

- National Roads Authority's (NRA) *Traffic and Transport Assessment Guidelines* (May 2014);
- *Monaghan County Development Plan 2013 – 2019*;
- *Cavan County Development Plan 2014 – 2020;*
- National Roads Authority (NRA) *Design Manual for Roads and Bridges TD* 27 (November 2011) *Cross Sections and Headroom*;
- NRA Design Manual for Roads and Bridges TD 41-42 (November 2011) *Geometric Design of Major / Minor Priority junctions and Vehicular Access to National Roads*; and
- NRA *Project Appraisal Guidelines* (January 2011).

9 The scoping opinion received from the Board (see Appendix 1.3, **Volume 3B Appendices** of the EIS) identified the following issues as being relevant to this chapter of the EIS:

- A construction traffic management plan will be required, which should address stringing operations, road closures / detours and impacts on railway infrastructure;
- Identify the means of access for construction and on-going maintenance and the treatment of new widened construction entrances; and
- Identify and assess public road crossings, including the construction methodology. Particular regard should be had to the relationship with the national primary and secondary road network and with the proposed Leinster Orbital Route, to include issues and separation.

10 Following a meeting with the Board in December 2013 to clarify the scope of the construction traffic management plan referred to above, the Board clarified that a fully detailed construction management and construction traffic management plans would not necessarily be required at the time of submitting the planning application. A detailed construction traffic management plan will be carried out post planning however, details of the methods that will be used for construction are outlined within Chapter 7, **Volume 3B** of the EIS and within this chapter describes mitigation measures that will form part of the detailed construction traffic management plan.

11 The operational phase of the transmission line will generate minimal traffic flows as towers are unmanned. Maintenance of the proposed transmission line and towers will generate some traffic but this will be rare and the volumes involved negligible. The operational phase of the transmission line, therefore, has not been considered in great detail.

12 The construction phase of the development, as outlined in Chapter 7**, Volume 3B** of the EIS will generate significantly larger volumes of traffic compared to the operational phase, including long / heavy vehicles, concentrated over a shorter time span. This allied with the largely rural nature of the surrounding road network, means the impact of the construction traffic needs to be considered. However, as discussed further in this chapter, that is not to say that the construction of the proposed development will generate significant volumes of construction traffic.

13 Sources of information used to undertake the evaluation of the construction traffic impacts for the proposed development are as follows:

- Project construction methodology;
- Ordnance survey mapping;
- Aerial photography;
- Consultation with the NRA;
- Consultation with Cavan County Council; and
- Consultation with Monaghan County Council.

14 The above sources of information, combined with feedback received during landowner engagement, as well as other expert and experienced input concerning construction of transmission infrastructure, were used to identify the locations where access to tower locations and stringing areas (areas used to install conductors onto the towers) can be achieved and the likely haul routes that will be used by construction traffic to travel to these access locations. Based on these haul routes, a qualitative evaluation of the ability of these roads to cater for the vehicles, which will be utilised during construction, was undertaken.

15 The development of a construction methodology was used to estimate the number and type of vehicles (both light and heavy vehicles) that will be generated by the construction of each individual tower and associated temporary access tracks for accessing tower locations. This information was then used to further estimate the volumes of traffic that will be generated at the construction material storage yard, and the access between that yard and the construction sites of this linear development.

16 Locations where each tower location and stringing area can be accessed from the public road have been identified. The location identified for these have been chosen to make use of existing entrances and field tracks where possible. The locations of these temporary access tracks are shown in Figure 13.14 – 13.17, **Volume 3C Figures** of the EIS.

17 By considering the proposed construction methodology and phasing, the location of the identified temporary access route locations and the haul routes that will be used to access these locations, an estimate of the volumes of construction traffic that will use individual roads within the CMSA can be generated. These estimates can be used to evaluate the impact on individual roads within the road network in numerical terms (i.e. numbers of vehicles).

18 Data collection, in the form of ‗Automatic Traffic Counts' were carried out to ascertain the typical existing traffic volumes currently using the roads which will be impacted by the construction of the proposed development. (refer to Appendix 13.2, **Volume 3C Appendices** of the EIS). By comparing the projected increase in traffic to the existing background traffic levels, the level of impact has been ascertained.

19 In addition to the impacts on traffic capacity and road condition, other traffic related impacts should be considered. These include:

- Road Safety;
- Air Pollution;
- Noise and Vibration;
- Flora & Fauna;
- Cultural Heritage; and
- Landscape.

20 With the exception of road safety, the above impacts are evaluated in other chapters of this volume of the EIS in respect of the CMSA and **Volume 3D** of the EIS in respect of the MSA. Regarding road safety, in order to get an understanding of the road accident history of the area, road accident data for the roads that will be affected by the development has been obtained from the Road Safety Authority website (www.rsa.ie).

13.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

21 A detailed description of the proposed development is provided in Chapter 6, **Volume 3B** of the EIS and the construction methodology is outlined in Chapter 7, **Volume 3B** of this EIS. As

described in Chapter 7, **Volume 3B** of the EIS, the operational phase of the development will result in negligible volumes of traffic, with the primary traffic impact occurring during the construction phase.

22 The proposed OHL will effectively result in a long linear construction site with multiple isolated areas where construction activities will take place. In order to facilitate construction at the areas where construction activities will be occurring, materials, personnel and equipment will be transported to / from these sites.

23 Transportation of these materials personnel and equipment will primarily be achieved using the existing public road network. Access to the individual sites will generally be achieved via existing field accesses and existing internal tracks where available.

24 Despite the scale of the proposed development, the volumes of vehicles required to attend each individual construction location along the length of the linear development will be relatively low and this traffic will be spread out over several weeks which is the duration it will take to construct individual towers.

25 Due to the length of the proposed line, traffic will be dispersed over a large area during the construction phase, notwithstanding the fact that construction will occur in any one location for a relatively short duration. It is proposed that a construction material storage yard, located in the townland of Moynaltyduff and Moynaltybane, Carrickmacross, County Monaghan will be used to store materials for distribution to the individual sites. Higher volumes of traffic are anticipated at this location prior to their dispersion across the road network leading to individual sites (refer to Chapter 7, **Volume 3B** of the EIS).

13.4 EXISTING ENVIRONMENT

13.4.1 Existing Road Infrastructure

26 Figures 13.1 – 13.4, **Volume 3C Figures** of the EIS, indicate the roads which will potentially be impacted by the proposed development.

27 Traffic surveys were carried out on the surrounding road network in order to determine background traffic flows on the haul routes that will be used by construction traffic. These counts consisted of Automatic Traffic Counters that were in place for a week. The surveys were carried out by Nationwide Data Collection Ltd. in October 2013 at 103 locations. These locations are indicated in Figures 13.5 – 13.8, **Volume 3C Figures** of the EIS. A further three counts were carried out in January 2014 adjacent to the entrance to the construction material storage yard for use in junction analysis at the junctions near to the entrance of this yard.

28 In addition to the counts referred to above, some traffic counter data was taken from publicly available traffic counter data located on the National Roads Authority website (www.nra.ie).

29 Traffic flows fluctuate seasonally, however, based on permanent traffic counter data available from the National Roads Authority website (www.nra.ie) this seasonal fluctuation can be determined. Thus, based on the flows measured at the counter located on the N2 to the south of Ardee (N02 – 15) during 2010, flows in October are higher than those normally experienced throughout the rest of the year. To account for this, baseline flows have been multiplied by a factor of 0.94. While this will result in the measured flows reducing, the lower flows represent a worse case when presenting the percentage increase of traffic flows due to the proposed development. For the three counts carried out in January 2014, the same NRA counter was referenced. Flows were found to be 20% lower in January. As the flows on these three junctions are being used in junction analysis, presenting the worst case involves the factoring up of these flows by this percentage.

30 It is anticipated that, in the event that planning approval is granted, construction of the overall proposed development will commence in 2015 and last for approximately three years. Again, it should be noted that, given the linear nature of the proposed development, no part of the proposed line will experience construction for any extended time period. To account for the predicted growth of background traffic on the road network during the period between the date the surveys were carried out on and the date construction is expected to commence, growth rates have been applied to the background traffic flows. The rates applied have been taken from the NRA Project Appraisal Guidelines and are as follows:

- Meath and Monaghan Counters - 1.040; and
- Cavan Counters – 1.051.

31 The above growth factors have been derived using the high growth rates appropriate to each county and represent two years growth to bring the measured flows to those expected in 2015. While the construction period will continue into 2016 and 2017, it is not certain which towers will be constructed within each year and using 2015 figures will result in higher percentage increases when comparing the predicted flows to existing flows and thus 2015 represents the worst case.

32 Details of the roads, including daily traffic flows where available, that may be impacted upon are provided in **Tables 13.1 – 13.3**.

Table 13.1: Potentially Impacted National Roads

Road Number	AADT[61]	HGV%[62]
N2	8106	10.1%

Table 13.2: Potentially Impacted Regional Roads

Road Number	AADT	HGV%
R162	1593	14.6%
R165	2807	15.7%
R178	2367	14.5%
R179	4050	12.1%
R180	1623	17.5%
R181	1214	19.5%
R183	2841	9.9%
R184	1185	18.2%

Table 13.3: Potentially Impacted Local Roads

Road Number	AADT	HGV%
Old N2	6786	11.0%
L-3532-0	955	8.7%
L-3533-0	86	8.0%
L-3525-0	292	5.7%
L-7557-0	124	8.7%
L-7555-0	122	8.9%
LT49033	N/A	N/A
LT49032	N/A	N/A
LP04903	N/A	N/A
LS08903	N/A	N/A
LT49051	N/A	N/A
L-49041	N/A	N/A
L-8912	80	17.1%
L-4020	210	23.7%
L-8010	99	36.6%
L-8011	179	9.8%
L-40121	47	12.5%
L-40052	71	27.4%
L-40312	22	4.5%

61 Average Annual Daily Traffic (AADT).
62 Heavy Goods Vehicle (HGV) Percentage.

Road Number	AADT	HGV%
L-4004	112	13.0%
L-4011	91	10.8%
L-4042	459	12.4%
L-4010	78	17.5%
L-40103	8	0
Unknown Road(from R181)L-40441	32	6.3%
L-08201	N/A	N/A
L-4210	538	8.0%
L-3201	133	11.8%
L-7211	143	6.2%
L-7200	78	8.8%
L-3403	492	8.7%
L-7430	60	3.3%
L-7411	178	11.0%
L-31031	60	3.3%
L-34211	86	9.1%
L-3420	621	23.5%
L-7421	161	13.9%
L-3510	236	10.8%
L-03520	238	14.0%
L-75031	98	20.0%
L7503	65	9.1%
L-4700	952	0.8%
L-4700 – N2 Link Road	340	2.6%

33 While it is likely that each road referred to in **Tables 13.1 – 13.3**, will be utilised at some stage during the construction phase, the use of the local roads will be minimised with the use of national and regional routes being prioritised due to their standard generally being higher.

34 Materials used in the construction of the proposed development, such as steel and concrete, are likely to be sourced from manufacturers that are not situated within the immediate vicinity of the proposed development. It is proposed that a construction material storage yard will be located at a site situated to the south-east of Carrickmacross and that construction traffic will emanate from this site, towards its destination.

35 Vehicles departing from the construction material storage yard will join the N2 from the L4700, turning north towards Carrickmacross or south towards Ardee, depending on the destination of the materials being delivered. Thereafter construction traffic will migrate onto national and regional roads as necessary. The use of local roads will be minimised as much as possible, particularly to avoid or minimise the encountering of narrow road widths, poorly maintained visibility and unsuitable bearing capacities. Haul routes have been identified, as shown in Figures 13.9 – 13.13, **Volume 3C Figures** of the EIS, which indicate this hierarchical approach.

36 As the national and regional roads will be most used by the proposed development, a brief description of each is included in the following paragraphs.

37 The N2 is a national primary road linking Dublin to the Border with Northern Ireland in Monaghan. The cross section of this road varies between two lane dual carriageway, type 3 dual carriageway and single carriageway, the details of which can be found in the NRA TD27 Cross Section and Headroom.

38 A section of the old N2 which has been re-designated as a regional road is also likely to be used. This road has a carriageway width which varies between approximately 6 and 7m. The road is generally straight with adequate forward visibility.

39 The R162 is a regional road linking Navan to Shercock via Kingscourt. The section which construction traffic related to the proposed line route will use, has a carriageway width of approximately 7m. In general this road is subject to a speed limit of generally 80km/h; however, this is reduced in places. Forward visibility along the road is generally adequate to accommodate these speeds.

40 The R165 is a regional road linking the N2 and the N3, passing through Kingscourt and Baileborough. This road has an approximate carriageway width of between 6 and 7m. This road has several sharp bends which limits forward visibility in places.

41 The R178 is a regional road linking Shercock to Dundalk. This road has an approximate carriageway width of between 6 and 7m. This road has several tight bends along the portion that will be used by construction traffic for the proposed line route and the specified forward visibility for the road‘s speed limit is not available in places.

42 The R179 is a regional road linking Kingscourt to the Border via Carrickmacross. This road has several tight bends along the portion that will be used by construction traffic for the proposed line route and the specified forward visibility for the road‘s speed limit is not available in places.

43 The R180 is a regional road linking Castleblayney to Ballybay. This road has an approximate carriageway width of between 6 and 7m. Within the section of road where the construction phase traffic is likely to use the road, it is generally straight with adequate forward visibility.

44 The R181 is a regional road linking Shercock to the Border via Castleblayney. This road has a cross section of approximately 7m. This road has several sharp bends which limits forward visibility in places.

45 The R183 is a regional road linking Clones to the N2 near Castleblayney. This road has an approximate carriageway width of between 6 and 7m. This road has several tight bends along the portion that will be used by construction traffic for the line route and the specified forward visibility for the road‘s speed limit is not available in places.

46 The R184 is a regional road linking Ballybay to the N2. This road has an approximate carriageway width of 6m. Within the section of road construction phase traffic is likely to use, the road is generally straight with adequate forward visibility.

13.4.2 Road Safety

47 A search of the accident statistics has been carried out using the Road Safety Authority‘s website. **Table 13.4** identifies the number of serious and fatal accidents that have been recorded on the sections of road (in the period between 2005 and 2012) that are likely to be used during the construction phase of the proposed development. This is the most up to date information currently available.

Table 13.4: Road Accidents Along Proposed Haul Routes 2005 – 2012

Road Number	No. of Serious Accidents	No. of Fatal Accidents
R184	0	1
LS07502	0	1
LP03510	1	0
Old N2	3	0
R183	2	1
R181	5	0
R178	3	0
R179	3	1
R162	2	1
R165	1	0
L-3534-0	1	0
N2	6	7
N52	4	1

13.4.3 Site Access

48 The proposed development in the CMSA has a total of 134 towers which will require access for construction. In addition to tower locations, access will be required to associated stringing and general working areas. There are a total of 117 temporary accesses required from the public road network to construct the proposed line. The majority of these will be accessed using existing field gates or laneways. Figures 13.14 – 13.17, **Volume 3C Figures** of the EIS, show the proposed temporary access route locations.

49 It is proposed that a site to the south-east of Carrickmacross will be used as a construction material storage yard. This yard is located to the west of the N2 and is accessed by the L4700. The existing access into the storage yard is located adjacent to a junction on the public road network and has restricted visibility. As such, it is proposed to construct a new entrance onto the L4700 further south of the existing entrance. A speed survey along the L4700 indicated that 85th percentile speeds along the road are 70km/h. A visibility splay of 160m from a 3m set back is achievable to the left and 120m from a 3m setback is achievable to the right.

13.5 POTENTIAL IMPACTS

50 Due to the length and relative remoteness of this transmission line, the principal form of transport used in the construction of the proposed development is by road. This allows flexibility not achievable by other modes of transport, such as rail.

51 The construction of each tower will necessitate the use of several different types of road vehicles. The vehicles directly involved in the works include crane(s), excavators, dump trucks, 4x4s, tractor and trailers and concrete delivery vehicles. For further details of the vehicles being used for the construction of this development, refer to Chapter 7, **Volume 3B** of the EIS. Vehicles not directly involved in construction activities but involved in the construction phase will be vehicles used by site personnel travelling to and from the site.

52 In general the vehicles listed above will be the only road vehicles used during the construction phase. In some locations tree felling / lopping will need to take place in order to construct the transmission line or to provide a corridor with sufficient clearance to avoid conflict between trees and the line route. Tree felling will require the use of specific vehicles for this purpose (refer to **Chapter 6** of this volume of the EIS).

13.5.1 Do Nothing

53 Should this proposed development not be constructed, traffic and road conditions on the public road network would remain similar to the existing situation barring unforeseen circumstances.

13.5.2 Construction Phase

13.5.2.1 Traffic Generation at Tower Sites

54 A detailed breakdown of the volumes of traffic expected to be generated by the construction of the development is presented in **Appendix 13.3, Volume 3C Appendices** of the EIS. This has been prepared based on the construction methodology of towers. The volumes of traffic expected to be generated by each tower is summarised in **Table 13.5** for Light Vehicle (LV) and Heavy Goods Vehicles (HGV). The best case presented below assumes that materials excavated at tower sites will remain on site, being deposited within the same landholding. The worst case assumes that a suitable location was unable to be found on the site and materials excavated are removed from site for disposal at an appropriate facility.

Table 13.5: Tower Traffic Generation

Tower Type	Movements Generated				Peak Daily Movements Generated	
	Best Case		Worst Case		Best Case	Worst Case
	LV	HGV	LV	HGV		
Intermediate Tower	108	46	108	56	17	17
Angle Tower	122	142	122	218	27	46

55 The expected traffic generated by each tower has been prepared based on the estimates described above and these are presented in **Appendix 13.1, Volume 3C Appendices** of the EIS.

13.5.2.2 Traffic Generation at Construction Material Storage Yard

56 As the construction material storage yard is going to be serving the entire development in the CMSA and the MSA, this will be a focal point for traffic. For the purposes of this evaluation, it is assumed that seven construction teams will be employed to work on different sections of the overall proposed linear scheme, which is broken down into three teams working on the Cavan Monaghan section and four teams working on the Meath section.

57 The worst case for traffic generation at the storage yard would be if each of the seven teams were constructing angle towers at the same time and each were in process of constructing the foundations (the peak flows at angle towers occur during pouring of foundations). As excavated materials would be sent straight to disposal and would not go to the construction material storage yard, the best case figures can be used when estimating the generation at the yard. The best case would result in an expected 189 vehicles delivering materials to tower sites and returning empty. A further 189 movements would be expected to maintain the required levels of materials at the yard resulting in a total of 378 daily movements at the storage yard.

58 Using the haul routes identified will result in three of the construction teams travelling north along the N2 towards Carrickmacross and three travelling south towards Ardee. The remaining team would be split between travelling north and travelling south on the N2 depending on the location of the construction site they were destined for. The origin of materials for delivery to the construction material storage yard is not certain at this stage and would likely vary dependent on the material and the availability of supply. For the purposes of this evaluation it is assumed that deliveries will be split evenly between the north and south.

59 Traffic leaving the storage yard will turn right onto the L4700 and then turn right again at the junction between the R4700 and the Link Road. Traffic will then travel to the N2 where it is distributed as described above. This results in an estimated 378 additional vehicles on the L4700 and the Link Road (189 arrivals and 189 departures). Applying a worst case to the N2 would see 108 vehicles turning north from the Link Road onto the N2 and 108 vehicles turning south. Arrivals to the site would result in 108 vehicles turning off the N2 onto the Link Road from the south and 108 vehicles from the north.

13.5.2.3 Guarding

60 Guarding will be required at locations where the line route passes over roads, rivers and other OHL. The volume of traffic generated at each guarding location is expected to be one to two vehicles per day over a five day period. The erection of guarding will result in the requirement for temporary road closures such that the netting can be erected safely. The exact duration of each road closure will be determined at the construction phase however it should generally only be approximately one to two hours for local roads. More extensive closures may be required at larger crossings, however these closures should be a day at worst.

13.5.2.4 Impact on Road Network

61 Based on the estimated traffic generation presented in the above sections the percentage increase in traffic on the roads to be used during the construction phase of the development are presented in **Table 13.6**.

Table 13.6: Impact on Road Network

Road Number	AADT	Peak Daily Increase		Percentage Peak Increase	
		Best Case	Worst Case	Best Case	Worst Case
N2 North of Storage Yard	8106	432	432	5.3%	5.3%
N2 South of Storage Yard	8106	432	432	5.3%	5.3%
R162	1593	54	92	3.4%	5.8%
R165	2807	54	92	1.9%	3.3%
R178	2367	54	92	2.3%	3.9%
R179	4050	54	92	1.3%	2.3%
R180	1623	27	46	1.7%	2.8%
R181	1214	27	46	2.2%	3.8%
R183	2841	27	46	1.0%	1.6%
R184	1185	27	46	2.3%	3.9%
Old N2	6786	27	46	0.4%	0.7%
L-3532-0	955	17	17	1.7%	1.7%
L-3533-0	86	17	17	19.8%	19.8%
L-3525-0	292	17	17	5.8%	5.8%
L-7557-0	124	27	46	21.8%	37.1%
L-7555-0	122	17	17	13.9%	13.9%
LT49033	N/A	27	46	N/A	N/A
LT49032	N/A	17	17	N/A	N/A
LP04903	N/A	27	46	N/A	N/A
LS08903	N/A	27	46	N/A	N/A
LT49051	N/A	27	46	N/A	N/A
L-49041	N/A	17	17	N/A	N/A
L-8912	80	17	17	21.3%	21.3%
L-4020	210	27	46	12.9%	21.9%
L-8010	99	27	46	27.3%	46.5%
L-8011	179	27	46	15.1%	25.7%
L-40121	47	23	23	48.9%	48.9%
L-40052	71	27	46	38%	64.8%
L-40312	22	27	46	122.7%	209.1%
L-4004	112	27	46	24.1%	41.1%
L-4011	91	27	46	29.7%	50.5%
L-4042	459	27	46	5.9%	10%
L-4010	78	17	17	21.8%	21.8%
L-40103	8	27	46	337.5%	575%
L-40441	32	17	17	53.1%	53.1%
L-8201	N/A	27	46	N/A	N/A
L-4210	538	27	46	5%	8.6%

Road Number	AADT	Peak Daily Increase		Percentage Peak Increase	
		Best Case	Worst Case	Best Case	Worst Case
L-3201	133	27	46	20.3%	34.6%
L-7211	143	27	46	18.9%	32.2%
L-7200	78	17	17	21.8%	21.8%
L-3403	492	27	46	5.5%	9.3%
L-7430	60	17	17	28.3%	28.3%
L-7411	178	27	46	15.2%	25.8%
L-31031	60	17	17	28.3%	28.3%
L-34211	86	27	46	31.4%	53.5%
L-3420	621	27	46	4.3%	7.4%
L-7421	161	17	17	10.5%	10.5%
L-3510	236	27	46	11.4%	19.5%
L-3520	238	27	46	11.3%	19.3%
L-75031	98	27	46	27.6%	46.9%
L7503	65	27	46	41.5%	70.8%
L-4700	952	378	378	39.7%	39.7%
L-4700 – N2 Link Road	340	378	378	111.1%	111.1%

62 As can be seen from the table above, traffic on the road network will increase for the duration of the construction phase. While some of the percentage increases are quite high, this is generally reflective of the low number of vehicles generally using these roads. Furthermore, the figures above present the peak additional flow along each road. These peak flows would only be occurring for short durations, typically during the laying of foundations which will take approximately five days. From a capacity perspective, the road network will be able to cater for the flows predicted.

63 The most significant increase in flows will be seen on the L4700, the Link Road and the N2. This is due to the location of the construction material storage yard. The increase in flow on the L4700 is approximately 39.7% and the Link Road 111.1% of the existing flows, however, it should be borne in mind that this represents a worst case scenario and that it would be unlikely that such an increase will actually occur. Furthermore, should this worst case happen, it would only be for a very short duration. For the majority of the three year construction period, flows at the compound will fluctuate around a figure of approximately 50% of the flows presented in the worst case.

64 Due to the significant levels of flows predicted at the proposed construction material storage yard, junction assessments have been carried out at the proposed entrance to the storage yard from the L4700, the priority T junction between the L4700 and the road linking it to the N2 and the priority T Junction between the N2 and the road linking the N2 to the L4700. These junction

assessments have been carried out using the Transport Research Laboratory (TRL) computer program, PICADY, a widely accepted tool used for the analysis of priority junctions.

65 The performance of these junctions have been analysed for the critical AM and PM peak hours (which have been identified as 08:00 - 09:00 in the AM and 17:00 - 18:00 in the PM, on the Link Road, 08:00 - 09:00 in the AM and 16:00 - 17:00 in the PM, on the N2 and 09:00 - 10:00 in the AM and 15:00 - 16:00 in the PM, on the L4700) surveyed traffic and the expected year of construction commencement, 2015.

66 The key parameters examined in the results of the junction analysis are the Ratio of Flow to Capacity Value (RFC value – desirable value should be no greater than 0.85 for PICADY – values over 1.00 indicate the approach arm is over capacity), the maximum queue length on any approach to the junction and the average delay for each vehicle passing through the junction during the modelled period.

67 PICADY requires the following input data:

- Basic modelling parameters (usually peak hour traffic counts synthesised over a 90 minute model period);
- Geometric parameters (including lane numbers & widths, visibility, storage provision etc.); and
- Traffic demand data (usually peak hour origin/destination table with composition of heavy goods vehicles input).

68 The traffic generation estimate presented in **Section 13.5.2.2** is that used for this analysis. Those figures were presented as daily flows however. An eight hour working day has been assumed to convert these flows into hourly figures.

69 The results of this PICADY analysis are presented in **Tables 13.7, 13.8** and **13.9**. The origin / destination traffic demand tables for all the different scenarios tested for the analysed junctions are provided in **Appendix 13.4** and **13.5, Volume 3C Appendices** of the EIS.

Table 13.7: Construction Material Storage Yard Junction Analysis Results

PICADY Results: Construction Material Storage Yard AM & PM Peak Hours							
Year & Time	Arm A – L4700 North		Arm B – Compound		Arm C – L4700 South		Average Delay (min/veh)
	RFC Value	Max Queue Length	RFC Value	Max Queue Length	RFC Value	Max Queue Length	
Existing AM	-	-	0.000	0.0	0.000	0.0	0.00
Existing PM	-	-	0.000	0.0	0.000	0.0	0.00
2015 AM	-	-	0.185	0.22	0.000	0.0	0.07
2015 PM	-	-	0.186	0.23	0.000	0.0	0.06

Table 13.8: L4700 and Link Road Junction Analysis Results

PICADY Results: L4700 and Link Road AM & PM Peak Hours							
Year & Time	Arm A – L4700 North		Arm B – Link Road		Arm C – L4700 South		Average Delay (min/veh)
	RFC Value	Max Queue Length	RFC Value	Max Queue Length	RFC Value	Max Queue Length	
Existing AM	-	-	0.015	0.02	0.018	0.02	0.03
Existing PM	-	-	0.032	0.03	0.012	0.01	0.03
2015 AM	-	-	0.160	0.19	0.173	0.21	0.13
2015 PM	-	-	0.177	0.21	0.167	0.20	0.12

Table 13.9: N2 and Link Road Junction Analysis Results

PICADY Results: N2 and Link Road AM & PM Peak Hours							
Year & Time	Arm A – N2 South		Arm B – Link Road		Arm C – N2 North		Average Delay (min/veh)
	RFC Value	Max Queue Length	RFC Value	Max Queue Length	RFC Value	Max Queue Length	
Existing AM	-	-	0.024	0.02	0.007	0.01	0.01
Existing PM	-	-	0.013	0.01	0.011	0.01	0.00
2015 AM	-	-	0.153	0.18	0.083	0.09	0.03
2015 PM	-	-	0.158	0.19	0.093	0.10	0.03

70 As can be seen from **Table 13.7**, the entrance to the proposed construction material storage yard will operate below capacity during the construction phase.

71 Heavy vehicles will be used to construct the transmission line. Local and minor roads are particularly sensitive to the increase in heavy vehicles as these roads are typically not designed to accommodate large numbers of these types of vehicles. The potential for impacts to the pavement tower, verges, boundary treatments etc. are all increased as is disturbance caused to the local community in relation to noise, vibration, dust and air quality impacts (refer to **Chapters 9** and **10** of this volume of the EIS).

13.5.3 Operational Phase

72 Minimal traffic volumes will be generated by the proposed development during the operational phase of the development as electricity lines are not manned. An annual inspection is carried out of the line however this is typically done by air, thus generating no traffic. A more detailed inspection is carried out every five years whereupon each tower on the line is visited. This will result in one to two vehicles travelling to each landholding along the route to facilitate this inspection. Thereafter, no further traffic would be generated except in exceptional circumstances, such as a fault occurring.

13.5.4 Decommissioning

73 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration.

13.6 MITIGATION MEASURES

13.6.1 Construction Phase

74 It shall be a requirement of the contractor appointed to construct the proposed development to prepare a detailed *Construction Traffic Management Plan* prior to the commencement of construction operations.

13.6.1.1 Construction Programme

75 Prior to the commencement of the construction phase, a construction programme shall be developed that shall seek to maintain traffic levels at an average level throughout the construction phase, avoiding high peaks that would be caused by scheduling multiple teams to be constructing angle towers simultaneously for example.

76 The construction programme shall be developed in consultation with the appropriate local authorities, specifically taking into account potential road repair works that are included in the local authority's road works schedule. One of the key aims of this programme would be to enable any road works being carried out by the local authority to be undertaken following the presence of construction traffic on the road.

13.6.1.2 Road Condition Monitoring

77 The extent of the heavy vehicle traffic movements and the nature of the payload may create problems of:

- Fugitive losses from wheels, trailers or tailgates; and
- Localised areas of subgrade and wearing surface failure.

78 Loads of materials leaving each site will be assessed and covered if considered necessary to minimise potential dust impact during transportation. The transportation contractor shall take all reasonable measures while transporting waste or any other materials likely to cause fugitive loses from a vehicle during transportation to and from site. The roads forming part of the haul routes will be monitored visually throughout the construction period and a truck mounted vacuum mechanical sweeper will be assigned to roads along the haul route as required.

79 In conjunction with the appropriate local authority, additional inspection and review of the roads forming the haul routes will be undertaken one month prior to the construction phase to record the condition of these roads at that particular time. As a minimum this survey shall comprise review of video footage taken at that time, which shall confirm the condition of the road corridor immediately prior to commencement of construction. This shall include video footage of the road wearing course, the appearance and condition of boundary treatments and the condition of any overhead services that will be crossed. Visual inspections and photographic surveys will be undertaken of bridges and culverts that are along the haul roads.

80 Where requested by the local authority, pavement condition surveys will also be carried along roads forming part of the haul route. These will record the baseline structural condition of the roads being surveyed immediately prior to construction.

81 Ongoing visual inspections and monitoring of the haul roads will be undertaken throughout the construction period to ensure any damage caused by construction traffic is recorded and that the relevant local authority is notified. Arrangements will be made to repair any such damage to an appropriate standard in a timely manner such that any disruption is minimised.

82 Upon completion of the construction phase, the surveys carried out at pre-construction phase will be repeated. The pre-construction phase surveys will be used as a baseline to use as a comparison with these post construction surveys. Damage identified as being attributable to construction traffic associated with the proposed development will be repaired to an appropriate standard.

13.6.1.3 Road Closures

83 It is not envisaged that road closures will be required for tower construction. It is acknowledged that some of the roads that will be used for the construction of towers are narrow, however, there are generally opportunities for vehicles to pass. Where required, traffic management measures, such as temporary traffic lights or flagmen, will be deployed on roads. This is consistent with normal good practice traffic management during construction of any project where public road access is required.

84 Temporary road closures will be required during the erection and removal of guarding at road crossings the most notable of which is the M3 Motorway. These road closures will generally be short in duration and the appropriate measures and time for closing each road shall be agreed with the local authorities and any other appropriate stakeholders (refer to Chapter 7, **Volume 3B** of the EIS).

13.6.1.4 Communication

85 Close communication between the relevant local authorities and An Garda Síochána will be maintained throughout the construction phase. This will include the submission of proposed traffic management measures for comment and approval, updates on the condition of the road network and updates on the construction programme. Information on local events that could conflict with traffic management measures and construction traffic will be sought such that alternative measures can be implemented to avoid such conflicts.

86 The local community will be informed of proposed traffic management measures in advance of their implementation. This will be done by posting advertisements in the local newspapers and by delivering leaflets to houses in the affected areas. Contact details will be provided such that residents can seek further information and provide any additional knowledge, such as dates of local events that could impact on traffic management measures that have been put in place.

13.6.1.5 Site Entrances

87 In accordance with Chapter 8 of the Department of the Environment's *Traffic Signs Manual,* road signs will be erected to provide warning of the temporary access locations to construction site's entrance as well as for any operations requiring the provision of warning signs. Signage shall be erected one week prior to the commencement of operations on site.

13.6.1.6 Emergency Response Management

88 It is important that, notwithstanding materials haulage traffic, emergency services can gain ready access to any household along the haul route and gain emergency access to each tower construction site and the construction material storage yard. Priority usage of the haul route and priority access to and from the site will be given to emergency services. Emergency Services in Counties Monaghan and Cavan will be provided with contact details of the contractors personnel responsible for the management of construction traffic. On being notified of an incident, communication will be made to drivers that an incident has occurred and instructions will be provided to them on how to proceed.

13.6.2 Operation Phase

89 Due to the minimal levels of traffic that will be generated by the proposed development during the operational phase, no mitigation measures are proposed for this phase of the development.

13.7 RESIDUAL IMPACTS

90 The temporary nature of the construction phase coupled with the mitigation measures proposed will result in minimal residual impact due to the construction phase of the development in terms of traffic and transport.

91 The residual impact due to the operational phase of the development will be minimal as a result of the minimal volumes of traffic that will be generated during this phase of the development.

13.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS

92 In addition to the impact on the road network, road vehicles also have an associated impact on other environmental factors such as air pollution, dust generation, noise and vibration. During the operational phase this will be minimal due to the low volumes of traffic that will be generated, however, during the construction phase these impacts, although temporary in nature, will prove more significant. These impacts are evaluated in other chapters of this volume of the EIS and this chapter should, therefore, be read in conjunction with **Chapters 9** and **10** of this volume of the EIS.

93 Traffic also has the potential to impact on several other environmental factors depending on circumstances. This likelihood for such impacts would increase when vehicles leave the public road network. These potential impacts traffic may indirectly cause are as follows:

- **Chapter 3** - Human Beings – Land Use and Soils, Geology and Hyrdogeology – Due to the compaction of soil caused by vehicles driving across farmland;
- **Chapter 6** - Flora and Fauna due to the removal of vegetation at access locations to accommodate vehicular access to construction sites;
- **Chapter 8** - Water quality due to potential fuel or fluid leaks reaching groundwater;
- **Chapter 11** - Landscape due to the placing of temporary access tracks; and
- **Chapter 14** - Cultural heritage due to potential damage due to vibrations caused by heavy vehicles operating near cultural heritage sites.

94 This chapter should, therefore, also be read in conjunction with **Chapters 3, 6, 7, 8**, **11** and **14** of this volume of the EIS.

13.9 CONCLUSIONS

95 The operation phase of the proposed development will generate minimal volumes of traffic. The construction phase of the development will generate significant, albeit temporary, volumes of traffic because the primary means of transporting materials and labour to / from site will be via the existing public road network.

96 Due to the nature of the proposed development, during the construction phase the proposed development will consist of multiple discrete construction sites. Access to the individual sites will generally be achieved via existing field accesses and existing internal tracks where available. A total of 117 temporary accesses are required from the public road network to construct the proposed line.

97 Despite the scale of the proposed development, the volumes of vehicles required to attend each individual construction location along the length of the linear development will be relatively low and this traffic will be spread out over several weeks, which is the duration it will take to construct individual towers. Due to the length of the proposed line, traffic will be dispersed over a large area during the construction phase, notwithstanding the fact that construction will occur in any one location for a relatively short duration.

98 It is proposed that a construction material storage yard, located to the south-east of Carrickmacross, County Monaghan will be used to store materials for distribution to the

individual construction sites. Higher volumes of traffic are anticipated at this location as vehicles will be concentrated in this location prior to dispersing to individual sites.

99 Heavy vehicles will be used to construct the transmission line. Local and minor roads are particularly sensitive to the increase in heavy vehicles as these roads are typically not designed to accommodate large numbers of these types of vehicles. The potential for impacts to the pavement structure, verges, boundary treatments etc. are all increased as is disturbance caused to the local community in relation to noise, vibration, dust and air quality impacts.

100 A *Construction Traffic Management Plan* shall be prepared prior to the commencement of construction operations. The objective of this plan will be to minimise the impact caused by the construction phase of the proposed development.

14 CULTURAL HERITAGE

14.1 INTRODUCTION

1 This chapter evaluates impacts on the cultural heritage arising from the proposed development and associated development works within the Cavan Monaghan Study Area (CMSA) as defined in Chapter 5, **Volume 3B** of the EIS. The chapter evaluates both the direct and indirect impacts of the proposed development on the cultural heritage of the CMSA as well as recommending mitigation measures and summarising the residual impacts that will persist once the mitigation has been completed. Impacts are evaluated for the construction, operation and decommissioning phases of the proposed development.

2 The term ‗cultural heritage‘ is a wide ranging concept, covering a vast breadth of knowledge and it is beyond the scope of this document to discuss it in detail. However, in summary, for the purposes of this appraisal, it includes archaeological heritage, architectural heritage, underwater cultural heritage, cultural landscapes and intangible cultural heritage such as folklore. In subsequent sections of this chapter, and in line with the recommendations of the National Monuments Service and the Built Heritage and Architectural Policy Section of the Department of the Arts, Heritage and the Gaeltacht (DAHG), these have been broadly divided under the headings of ‗archaeological heritage‘, ‗architectural heritage‘ and ‗other cultural heritage‘.

3 Efforts have been made from the earliest stages of the project, during both constraints mapping and route selection, to minimise any direct physical impacts and impacts on the setting of cultural heritage sites in the study area.

14.1.1 Legal Framework

14.1.1.1 Conventions and Legislation

4 This appraisal is cognisant that Ireland has ratified several European and international conventions in relation to the protection of its cultural heritage, including:

- The UNESCO World Heritage Convention, *1972;*
- ICOMOS Xi‘an Declaration on the *Conservation of the Setting of Heritage Structures, Sites and Areas, 2005;*
- Codified EIA Directive 2011/92/EU;
- The European Landscape Convention 2000;

- The European Convention on the Protection of the Archaeological Heritage (Valletta Convention), ratified by Ireland in 1997; and

- The European Convention on the Protection of the Architectural Heritage (Granada Convention), ratified by Ireland in 1997.

Relevant legislation includes:

- *Planning and Development Act 2000* as amended;

- *National Monuments Act, 1930,* as amended;

- *The Architectural Heritage and Historic Properties Act*, 1999;

14.1.1.2 County Development Plans

5 The provisions of the Cavan County Development Plan 2014-2020 (the Cavan CDP) and the Monaghan County Development Plan 2013-2019 (the Monaghan CDP) are a material consideration for An Bord Pleanála (the Board) in its determination of the application for planning approval of the proposed development. The CDPs contain lists of cultural heritage sites including national monuments, recorded monuments, architectural conservation areas, protected structures and protected views as well as baseline assessments of the landscape character of the county. The plans also outline the counties' heritage policies and objectives that aim to protect and promote the archaeological, architectural and cultural heritage of the region. This evaluation was carried out with due regard to these policies and other relevant information contained within the plans.

6 The following is a synopsis of how the cultural heritage consultants have addressed the archaeological and architectural policies and objectives outlined in each of the relevant CDPs.

Cavan County Development Plan 2014-2020 - Archaeological Heritage Policies

7 The Cavan County Development Plans relevant Policies and Objectives pertaining to archaeological heritage are featured in Chapter 7 - Built Heritage and & Archaeology. These policies and objectives (BHP-5-8, BH017-25) generally outline the legal status of monuments, the protections afforded to their settings and zones of archaeological potential and detail the role of the planning authority and the Department of Arts, Heritage and Gaeltacht (DAHG). In terms of electrical infrastructure BHO19 states that ―*cognisance will be taken of the ‗Code of Practice between ESB National Grid and the Minister of the ECLG in relation to Archaeological Heritage*."

Cavan County Development Plan 2014 - 2020 - Architectural Heritage Policies

8 The Cavan County Development Plans relevant Policies and Objectives pertaining to architectural heritage are featured in Chapter 7 - Built Heritage and & Archaeology. These policies and objectives (BHP-1-4, BH01-16) generally define the legal status of protected structures, NIAH sites and Architectural Conservation Areas.

Monaghan County Development Plan 2013-2019 - Archaeological Heritage Policies

9 All known archaeological monuments were downloaded from the www.archaeology.ie website and National Monuments, in the ownership or guardianship of the State, in the ownership of a local authority and monuments subject to preservation orders were highlighted in GIS from the earliest phases of the proposed development (Archaeological Heritage Objective - AHO 1). Cognisant of the increased level of legislative protection for National Monuments, all sites with this classification were highlighted to assist the project team in avoiding them during identification of feasible route corridor options. In addition the cultural heritage consultants liaised extensively with the project team to attempt to reduce impacts on the setting of archaeological sites in close proximity to the proposed development (Archaeological Heritage Policy - AHP 1, AHP 2, and AHP 3).

10 The Monaghan County Development Plans relevant Policies and Objectives pertaining to Archaeological heritage are featured in Chapter 4 - Environment and Heritage. These policies and objectives (AOH-1-3, AHP 1-81-16) define the legal status afforded to recorded monuments and define the roles of stakeholders in the planning process. AHP-5 states that in *"considering development in the vicinity of all archaeological monuments, the planning authority will require the preparation and submission of an archaeological assessment, detailing the potential impact of any development on both upstanding and buried structures and deposits. The report shall also include a visual assessment to ensure adequate consideration of any potential visual impact and should define the buffer area or area contiguous with the monument which will preserve the setting and visual amenity of the site."*

Monaghan County Development Plan 2013-2019 – Architectural Heritage Policies

11 All recorded architectural sites, including Protected Structures, sites from the NIAH (both building and garden surveys) and ACAs were mapped in GIS for the constraints mapping phase (Objectives for Architectural and Built Heritage - ABO 1 and ABO 2, Objectives for the Protection of Protected Structures - PSO 1 and PSO 2, Objective for the Protection of Architectural Conservation Areas - CAO 1 and Policy for the Protection of Architectural Conservation Areas - CAP 1). As most protected structures and NIAH sites are upstanding structures, and the character of ACAs are afforded special protection in the *Planning and Development Act 2000* (as amended), the sensitivity of these sites to impacts on setting was

highlighted during initial constraints mapping (PSP 4). Through this early action, it has been possible to avoid physically impacting upon any ACAs or Protected Structures and their immediate curtilages. Ordnance Survey Ireland (OSi) 1st and 2nd edition mapping was consulted during the compilation of this chapter and industrial heritage was highlighted for the evaluation (Objective for the Protection of Built Industrial Heritage - IHO 1). In relation to designed landscapes, historic parks, gardens and demesnes every effort was made to minimise any impacts on the principal components of these features (Objective for Architectural and Built Heritage - ABO 4).

14.1.1.3 County Heritage Plans

12 The *County Monaghan Heritage Plan 2012-2017* and the C*ounty Cavan Heritage Plan 2006-2011*, as well as individual Heritage Project reports, were reviewed in the preparation of this evaluation. This included the *Industrial Heritage Survey of Historic Railways* (2007).

14.1.1.4 Other Guidelines

13 The following guidelines were used in the evaluation of the cultural heritage in the CMSA:

- Cork County Council (2006). *Guidance Notes for the Appraisal of Historic Gardens, Demesnes, Estates and their Settings*;
- Department of the Environment Community and Local Government (DoECLG) (March 2013). *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*;
- Department of Arts, Heritage, Gaeltacht and the Islands (1999). *Framework and Principles for the Protection of the Archaeological Heritage;*
- Department of Arts, Heritage and the Gaeltacht (DAHG) (2011). *Architectural Heritage Protection Guidelines for Planning Authorities;*
- DoECLG (April 2009). *Code of Practice between the Department of the Environment, Heritage and Local Government and ESB Networks;*
- DoECLG (April 2009). *Code of Practice between the Department of the Environment, Heritage and Local Government* and EirGrid; and
- DAHG (July 2014). A Draft *National Landscape Strategy for Ireland (2014-2024)*; and
- Institute of Field Archaeologists (2008). *Setting Standards: A Review.*

14.2 METHODOLOGY

14 The following methodology was prepared to evaluate the impact of the proposed development upon the cultural heritage of the CMSA. A more detailed methodology is outlined in **Appendix 14.1, Volume 3C Appendices** of the EIS, which includes details regarding the methodology for evaluation of impacts on setting.

14.2.1 Summary of Methodology

15 An OHL has a relatively small footprint and careful placement of towers can keep physical impacts on cultural heritage sites to a minimum. However, due to the upstanding linear form of an OHL, preventing impacts on the setting of cultural heritage sites is more difficult. Mitigating such impacts is best achieved by ensuring that known designated and undesignated archaeological and architectural sites are highlighted during the constraints mapping and route selection stages of the proposed development and that sites of particular importance are brought to the attention of the project team to reduce, where possible, any impacts. Prior to undertaking this evaluation the following stages of work had been completed:

- Mapping of designated and undesignated archaeological sites, including:
  - World Heritage Sites;
  - National Monuments, be they in the ownership or guardianship of the State, in the ownership of a local authority or monuments under preservation orders;
  - Archaeological Survey Database, including the Sites and Monuments Record and the Record of Monuments and Places; and
  - Data obtained from the Northern Ireland Environment Agency (NIEA) relating to archaeological sites, including, Sites and Monuments Record, Scheduled Zones, Scheduled Monuments in State Care and Areas of Significant Archaeological Interest.
- Mapping of designated and undesignated architectural sites, including:
  - ACAs;
  - Protected Structures;
  - NIAH)
  - Demesne Landscapes and Historic Gardens as indicated on the Ordnance Survey Ireland (OSI) 6 inch historic mapping, surveyed circa 1830; and
  - Data obtained from the NIEA relating to architectural sites, including Listed Buildings, Industrial Heritage, Defence Heritage and the Register of Historic Parks and Gardens.

- EirGrid (May 2011). *North-South 400 kV Interconnection Development Preliminary Re-Evaluation Report*;
- EirGrid (April 2013). *North-South 400 kV Interconnection Development Final Re-Evaluation Report; and*
- EirGrid (July 2013). *North-South 400 kV Interconnection Development Preferred Project Solution Report.*

16 In addition to the previous work listed above, this chapter has been prepared in two main phases, desk based evaluation and fieldwork. Desk based evaluation involved:

- Review of mapping in GIS compiled over the course of the proposed development;
- Review of literature, including historical sources, guidelines and policy documents, relevant legislation, development plans and heritage plans, and subsequent updating of GIS mapping where appropriate; and
- Review of other sources including historic mapping, orthophotography and LiDAR. During this phase previously unrecorded sites of archaeological and / or architectural potential were highlighted for review during the fieldwork phase of the proposed development.

17 The desk based evaluation gave rise to a greater understanding of the archaeological, architectural and cultural heritage environment through which the proposed development passes, along with detailed mapping in GIS highlighting known features, sites, areas and landscapes in the vicinity which may experience impacts from the proposed development. This chapter has considered in detail an area within approximately 2km either side of the alignment, including tower locations, guarding areas, temporary access routes and stringing areas, as well as having regard to all National Monuments in State Care within 5km either side of the alignment and some notable sites further afield.

18 Upon completion of the desk based evaluation, fieldwork was undertaken to ‗ground truth' the results of the desk study. Detailed GIS mapping was used in the field to identify known archaeological and architectural sites; these included designated and undesignated archaeological and architectural sites as well as sites of archaeological and architectural potential noted from historic mapping and aerial photography. GIS mapping included base mapping of OSI Discovery Series maps as well as first edition OSI historic maps and detailed aerial photography. Where possible, with the permission of landowners, land was accessed and where this was not possible, evaluation was undertaken from the nearest publicly accessible land, roads or adjacent land where access was granted. Consultants in the field were cognisant that the mapping supplied did not contain all sites of archaeological,

architectural or cultural heritage importance and any new archaeological, architectural or cultural heritage sites identified during fieldwork were recorded and added to the GIS. The significance of impacts that may be experienced by archaeological sites, architectural sites and other cultural heritage sites located in the vicinity of the proposed development was then evaluated, for the construction, operation and decommissioning phases of the proposed development.

19 Mitigation measures have been recommended and residual impacts that may be expected following mitigation have been noted.

20 The scoping opinion received from the Board (refer to Appendix 1.3, **Volume 3B Appendices** of the EIS) identified the following issues as being relevant to this chapter of the EIS:

- Identification and assessment of potential impacts on archaeological heritage, including an appraisal of all recorded monuments potentially impacted on during construction activities and an assessment of the visual impact on listed sites. This should include impacts on the character and setting of features of interest as well as the relationship between sites;

- Particular areas of social, cultural and historic interest to be considered include Muff Crossroads;

- Identify any pre-application archaeological excavations or site investigations undertaken. Describe the rationale for the approach adopted with regard to such pre-application investigations, particularly for areas of known archaeological potential;

- Identification and assessment of the effects on architectural heritage;

- The indirect effects of construction activity, including construction access / routes, on structures and building should be considered; and

- The impact on longer views from sites of national importance and significance should be considered and assessed.

14.2.2 Consultation

21 The overall consultation strategy by or on behalf of EirGrid in relation to all stages and elements of the proposed development is described in a separate *Public and Landowner Consultation Report* (refer to **Volume 2B** of the application documentation). That report sets out the objectives of the overall consultation strategy, its structure, details of all consultation activities, feedback received and how such feedback was responded to.

22 Consultations with the DAHG, Monaghan and Cavan County Councils and public consultations were undertaken during the preparation of this chapter of the EIS. All consultation responses received have been logged and considered by the project team.

14.3 CHARACTERISTICS OF PROPOSED DEVELOPMENT

23 The upstanding linear form of the proposed OHL supporting towers has a small physical footprint meaning that in most cases direct physical impacts on archaeological, architectural or cultural heritage sites, structures, monuments or features can be avoided. Such impacts are most likely during the construction phase and can be as a result of:

- Excavations associated with tower construction including site levelling, foundation excavation and any diversion of services or existing drainage that may be required;
- Excavations associated with the erection of temporary guarding areas;
- Facilitating access for equipment and materials for the construction of the towers and guarding; and
- Facilitating access for and the process of stringing the OHLs.

24 Given that its upstanding linear form has an influence over a wide area, the greatest potential for impacts from this type of development are impacts on the setting of archaeological, architectural and cultural heritage sites, structures, monuments or features located in the surrounding region throughout the operational phase of the development.

25 This chapter also evaluates a proposed construction materials storage yard area which is located in a long rectangular field along the edge of the N2 primary road to the south-east of Carrickmacross, County Monaghan. The site straddles the townlands of Monaltyduff and Monaltybane.

14.4 EXISTING ENVIRONMENT

14.4.1 Landscape (Monaghan to Cavan)

26 The following section is based on extracts from the *County Monaghan Landscape Character Assessment* (2008) and the Character Area section from the Cavan CDP (Chapter 8, section 8.19.1).

14.4.1.1 Mullyash Uplands (Landscape Character Area (LCA) 6)

27 **Towers 103 to 128 – Lemgare to Clarderry.** A variable topography comprising a flat plateau area in the western part of this LCA which extends eastward towards the drumlin foothills leading to the summit of Mullyash Mountain. Landscape pattern is strongly defined as small to medium scale pastoral fields bounded by cut hedgerows with occasional mature trees. A network of local roads permeates this landscape. Settlements are very small and often occupy intersecting roads or crossroads. Many of the dwellings are very traditional and feature white render or stone and many are well sited on the lower slopes of rolling hills or drumlins.

28 Whilst not heavily populated today, this landscape character area contains a number of significant historical sites. The earliest is that of Mullyash cairn itself (National Monument 564), located on the summit of Mullyash approximately 6.5km to the east of the proposed development and built around 4000 years ago. This site would have been chosen as it commands extensive views over Monaghan, Armagh and Tyrone. Folklore associated with the cairn (and possible passage tomb) relate to a princess who was buried there. Another megalithic tomb is located at Croaghan, and contains seven separate chambers.

29 Another important site is located at Clontibret, the scene of one of the earliest Battles of the Nine Years‘ War, led by the Earl of Tyrone, Hugh O‘Neill in 1595. At this battle the English, led by Sir Henry Bagenal, were defeated and this battle was significant in that it was one of the first that Hugh O‘Neill himself was directly involved.

14.4.1.2 Monaghan Drumlin Uplands (LCA 5)

30 **Towers 129 to 136 – Derryhallagh (Monaghan By) to Cornanure (Monaghan By).** Elevated landscape featuring drumlin hills and small to medium sized loughs. This is a farmed upland landscape which is relatively remote, being distant and elevated topographically from major and minor towns or settlements. The landscape pattern is relatively strong and takes the form of cut or managed hedgerows mostly with some hedge trees abounding pastoral fields. Occasional clumps of deciduous woodland are located in this landscape. Occasional patches of marshland and areas of localised flooding are located in low lying areas.

31 Dwellings are frequently well located in secluded locations on the lower slopes of the drumlin hills. Many are composed of single storey traditional style dwellings, accessed via narrow lanes off tertiary roads.

14.4.1.3 Ballybay and Castleblayney Uplands (LCA 7)

32 **Towers 137 to 142 - Cornanure (Monaghan By) to Cornamucklagh South.** This is a low lying pastoral landscape which is present as an east west channel located or enclosed between

two upland landscapes located to the north and the south. This character area contains numerous loughs, the majority of which present as highly scenic landscapes. The largest of these is Lough Muckno which is linked to the town of Castleblayney on the east side. Crannogs are a feature of many of these loughs and in the more low lying areas these are fringed with large areas of marsh supporting reeds. Rivers and smaller watercourses extend through this landscape in an east west orientation. Traditional stone bridge crossings feature occasionally on these rivers.

33 A regional road (R183) links the principal towns of Ballybay and Castleblayney and a dismantled railway line, which is not especially visible in this landscape, also follows the same orientation. Between both towns are also a number of megalithic tombs. The area generally would have been attractive for early settlers owing to the availability of water and gently accessible topography. Whilst their ritual sites were constructed on elevated locations, in all probability, their everyday dwellings constructed of wood, were located in the lower lying areas of land. The pastoral landscape pattern comprises, small to medium sized fields bounded by hedgerows which vary in form, some presenting as cut managed hedgerows and some presenting as uncut hedges comprising many maturing trees.

14.4.1.4 Drumlin and Upland Farmland of South Monaghan (LCA 8)

34 **Towers 143 to 211 - Cornamucklagh South to Scalkill.** An elevated landscape containing drumlin hills that are given over to pastoral uses. Hedgerows are, for the most part, uncut and contain many mature deciduous trees. The loughs range in size and the largest of these is Lough Egish. Large areas of marshland feature in the inter drumlin hollows. Occasional traditional farmhouses are located in this landscape, some rendered in white and some built of stone. The most elevated parts of this landscape are highly remote and feature rock outcrops. Although grazed in part by sheep, the farmland is impoverished and there is no strong field pattern. Boundaries to fields are somewhat fragmented and in many places, hedgerows are replaced by stone walls in variable condition. Occasional plantations of coniferous forestry are located in this landscape.

35 There are no major settlements within this LCA, although the area supports an extensive network of tertiary roads and is bisected by two regional roads. Historically this LCA lies within the baronies of Cremone and Farney to the south. Cromwellian soldiers and adventurers were given possession of a number of former Colla MacMahon lands, and a number of significant estates emerged including the Shantonagh Estate.

14.4.1.5 Highlands of East Cavan (Area 5)

36 **Towers 211 to 236 - Scalkill to Clonturkan.** This region consists of drumlins and highlands, with Bailieborough and Kingscourt as the main towns. Much of the area is made up of shale

and sandstone, an indication of a landscape forged by the movement of glaciers in the last Ice Age. This area is dotted with lakes, there are both dry and wet grasslands, some limited forest and scrub. The area around Kingscourt and Bailieborough town is described as ‗areas under urban influence' as they have seen a greater demand for development in recent years.

14.4.2 Archaeological and Historical Background

37 The cultural landscape of counties Cavan and Monaghan are rich and varied and many of the sites scattered across the landscape indicate widespread settlement in the area since the Mesolithic period and continuing throughout the prehistoric and historic periods into the present day. Various published sources, including local and national journals, were consulted to establish a historical background for the alignment of the proposed development. In addition, archaeological and architectural information gathered as part of this chapter was incorporated into the background thus providing a broader understanding of the nature of settlement in the area.

14.4.2.1 Mesolithic Period (8000–4000 BC)

38 In the absence of any evidence of Palaeolithic communities in Ireland our archaeological record begins in the Mesolithic period, when hunter-gatherers navigated the coast and waterways of the country foraging for food and living in temporary camps. Mesolithic sites were usually set on elevated ground overlooking rivers. However, cultural remains from this period have left no lasting legible trace and have no visible dominance in the modern day landscape. Flint tools known as microliths (from Latin ‗small stone') are often the best evidence for these early encampments. These tools are extraordinary in their sophistication and range of use and include scalene triangles, rods, needlepoints, scrapers and micro-awls.

39 Evidence for a Mesolithic presence in this area is relatively scant, but a few sites are known of, such as the lakeside platforms at Moynagh Lough (Bradley (2001), *Excavations as Moynagh Lough*) and the habitation site at Kilcorby, County Cavan (MacManus (2005), *Preliminary Report of Excavations at Kilcorby Townland, County Cavan*). Only one artefact dating to the Mesolithic period was found in the CMSA and this was a Bann flake (NMI Find No. - 1965:138) from Corduff, County Monaghan. Flint implements of this type generally date to the later Mesolithic period (5500-4000BC).

14.4.2.2 Neolithic Period (4000BC-2500BC)

40 The practice of farming spread from the Middle East, through eastern and southern Europe to reach Ireland via Britain around 4000BC. Ireland's Mesolithic hunters were, over a period of time, displaced or assimilated by the new Neolithic settlers. This transition fundamentally changed the local economy from one based on hunting and foraging to one of cereal cultivation

and livestock rearing. The arrival of the first farmers resulted in land clearance by burning or chopping down trees with stone axes. There were no indigenous cereal crops but the settlers brought with them wheat and barley as well as domesticated sheep, goats and cattle. Tending of crops and animals required a more sedentary lifestyle and larger permanent settlements. Farming as a practice required new skills and, more importantly, new tools. This demand resulted in the development of specific crafts. Polished stone axes, ards (ploughs), flint tools for harvesting crops, and stone saddle querns for grinding the grain required the exploitation of specific stone sources. Porcellanite found throughout Ireland and Europe, was quarried at Tievebulliagh Mountain near Cushendall and at Brockley on Rathlin Island, County Antrim. Flint remained an important stone for the production of tools and weapons, objects such as javelin heads, mace heads, polished axes and fine leaf and lozenge shaped arrowheads were used for both hunting and warfare. During this period the first long distance trade networks were established. Stone axes from Britain, a flint axe from Scandinavia, pitchstone from Scotland, and jadeite axes from the Alpine area of northern Europe have all been found throughout the country. Pottery also makes its first appearance in the archaeological record. The pots were handmade, coil built, and fired in bonfires or pits. The earliest pots were mainly undecorated round bottomed bowls, although decoration became more common in the later part of the period. Towards the end of the Neolithic a great diversity in pottery styles existed and flat based pottery was introduced.

41 Other significant changes included the development of a ritual landscape dotted by large megalithic (from the Greek mega – large and lith – stone) monuments built as communal tombs or for ceremonial purposes. These monuments indicate status, knowledge of engineering, and the ability to organise resources, including labour. These tombs are divided into four classes; court tombs, portal tombs, passage tombs and wedge tombs. Five court tombs, two portal tombs, two wedge tombs and three unclassified megalithic tombs have been recorded in this area. Court tombs generally consist of a long cairn with a court at one end providing access into a gallery beneath the cairn (Waddell (2000). *Prehistoric Archaeology of Ireland*). Two examples along the proposed line route include tombs in Lemgare townland (SMR No. - MO014-022) and Cornmucklagh South (SMR No. - MO019-037).

42 Portal tombs are single chambered monuments where the entrance is flanked by two large portal stones supporting a roof stone. There is an *in situ* example recorded in Lennan townland, County Monaghan (SMR No. - MO019-016).

43 Wedge tombs are so named by the distinctive manner in which the roof slopes down towards the back of the tomb and are taller and wider at the entrance. A number of examples are found along the length of the proposed line route including one at Rausker (SMR No. - MO019-025).

44 The lack of major infrastructural development within the CMSA accounts in part for the dearth of known Neolithic settlement sites. However stray finds like the discovery of a stone axehead (NMI Find No. - 1933:236) from Annaglogh, indicates that there was activity during this period. Other finds that could fall into this broad date range include a flint thumb scraper (NMI Find No. - 1956:274) from Cargaghoge, a flint scraper (NMI Find No. - 1965:130) from Cargaghoge, a flint blade (NMI Find No. - 1965:133) from Corduff, a worked flint (NMI Find No. - 1942:68) from Corraneary and a flint slug knife (NMI Find No. - 1956:270) from Sreenty.

14.4.2.3 The Bronze Age (2500BC-500BC)

45 As stone tools were replaced by the use of copper, which was later combined with tin to make bronze, the structure of society also changed. The copper for these tools was probably derived from Ross's Island in Killarney, County Kerry, where excavations have uncovered the earliest copper mines in Ireland and Britain. These somewhat crude copper objects were soon replaced by more durable bronze tools including axes, swords, spears, knives, halberds and cauldrons. Gold jewellery from this period in the form of lunulae, torcs and bracelets are amongst the finest in Europe and hint at the presence of new social elites.

46 In a domestic context, dwellings changed from a general rectangular plan, typical of the Neolithic, to circular arrangements evidenced on excavation by postholes and slot trenches. Middle Bronze Age and Late Bronze Age settlements are usually located on well drained soils suitable for agriculture and near rivers or fording points for ease of transport and communication. Lacustrian areas were also favoured as evidenced by excavations at Moynagh Lough near Nobber (Bradley (1999). *Excavations at Moynagh Lough*).

47 As with the Neolithic houses, Bronze Age houses are not easily identifiable on the ground and none have been found in the vicinity of the proposed development to date. Only one possible domestic site has been recorded in the area and this is a hillfort (SMR No. - MO030-018001) located in Raferagh townland, County Monaghan.

48 Bronze Age ritual and ceremonial activity is represented by a range of monuments including stone circles, standing stone, stone alignments, henges, tumuli, cairns, barrows and flat cemeteries. Several of these site types are represented in the CMSA. There are two standing stones at Boherlea (SMR No. - ME002-040) and Doohat / Crossreagh (SMR No. - ARM019:013) which probably date to the Bronze Age. Excavated standing stones occasionally provided evidence of an associated burial. However, as this is not always the case it is thought that standing stones may have marked a place of significance, or have formed part of an alignment which has since been removed, or perhaps that they marked routeways through the landscape (Waddell (2000). *Prehistoric Archaeology or Ireland*). Several burial sites have also been identified in the CMSA. Barrow sites are located in Beagh (SMR No. - MO030-045), Reduff (SMR No. - MO027-009) and Doohamlet (SMR No. MO10-051). There are several

different classes of barrows but in general they consist of a circular enclosing element of ditches and sometimes banks. The interior, where burials are usually found, may be flat or have a mound of varying height. Burials may also be found in cairns or mounds built of stone, as in the two cairns at Lattonfasky (SMR No. - MO024-025) and Drumnahavil (SMR No. - ARM023:002). Although these sites are difficult to date, most excavated examples have been assigned to the Bronze Age. Bronze Age burials may also be found in flat cemeteries in stone cists or earth cut pits. These cemeteries are generally not evident above ground, but are occasionally discovered during farming and quarrying activities. Three cist burials occurred in a group in Lattonfasky (SMR No. - MO024-025001-3) and a fourth cist burial was found by a farmer ploughing a field in Doon (SMR No. - ME001-009). The topographical files record two food vessels which were found in cists. The first is from Doon (NMI Find No. - 1947:231) and may relate to the site SMR No. ME001:009. The second is from Cabragh (NMI Find No. - 1958:141).

14.4.2.4 Iron Age (c. 500BC-500AD)

49 The end of the Irish Bronze Age merges into the Early Iron Age almost imperceptibly. Not much is known about this period in time and it has been dubbed ‗The Irish Dark Age‘. It would seem from the evidence so far uncovered that iron use was gradually introduced into Ireland, however bronze implements were still very much in use for everyday objects and for ornamentation. Many of the finds dating to the Iron Age include objects decorated in the ‗La Téne‘ style such as the torc found at Broighter, County Derry. Life in Iron Age Ireland seems to have been much as it was in earlier times, with mixed farmers living in or around small defended settlements with late Bronze Age hillforts and hilltop enclosures continuing in use throughout this period. In Meath the primary focus of Iron Age activity is associated with the Royal site of Tara. This complex was both the seat of the kings of Meath and the High King. The site is strongly linked to myth and legend and is associated with the transformation of Ireland from paganism to Christianity. In the literary tradition, recorded by medieval monks this period corresponds with the epic tales of the Táin as told in the Ulster Cycle. One significant Iron Age site is the linear earthwork known as the Black Pig‘s Dyke. This site was believed to have been a single defensive earthwork running from Sligo to Louth and presently is untraceable for most of its length. Parts of the earthwork have been identified in County Cavan just east of Bellananagh (Waddell (2000), *Prehistoric Archaeology of Ireland*) and in County Monaghan. It is possible that the proposed line route may pass over the subsurface remains of this earthwork.

14.4.2.5 Early Medieval Period (c. 500AD-1200AD)

50 With an expansion in population, the Early Medieval Period witnessed the introduction of a new settlement type generally known as the ringfort. Other names for this site type include rath, lios, cashel and dun. These circular enclosures, numbering between 30,000 and 40,000 across the country, represent the homesteads of the upper echelons of Irish Early Medieval society.

Ringforts are generally circular areas surrounded by a bank(s), walls and an external ditch. In some cases there can be up to three sets of defences. The larger more impressive multivallate, raised and platform raths are generally regarded as higher status settlements and are the foci around which the smaller satellite univallate enclosures would be arranged. This relationship is the physical evidence for the Tuath system characterised by petty kingdoms, sovereign in their own right that paid fealty to a larger regional / provincial state. One hundred and eighteen ringforts have been identified in the CMSA indicating that this region was intensively settled during the early medieval period. Hut sites and souterrains are associated with some of these sites. Pre-development testing (Licence No. 05E0375) in the vicinity of a ringfort (SMR No. - MN019-006) in Lismagunshin revealed the possible remains of a cashel. The ringfort was subsequently excavated (Licence No. 05E0785) and a number of pits were found in the vicinity of the site. In addition there is one recorded cashel, which are the stone counterparts of ringforts, located in Cornalara (SMR No. - CV029-001).

51 Sites classified as enclosures and earthworks also occur throughout the CMSA. These monuments were originally identified from 19th Century OS maps and as cropmarks with no visible above ground presence. In the absence of excavation, many of these sites are thought to be early medieval ringforts and the sheer number of them suggests that this area was settled extensively during this period.

52 In addition there are ten crannóg sites in the CMSA. Crannógs were defended settlements constructed on natural or artificial islands in lakes or marshy areas. They were generally located in shallow water close to the shore and there is often evidence for underwater causeways linking them to the dry land. Crannógs are well represented in counties Meath, Cavan and Monaghan due to the natural topography of drumlins and inter-drumlin lakes and rivers. Crannógs may date to both the prehistoric and early medieval period but the excavation of some of these sites and the discovery of early medieval finds from them indicate that the majority of these sites in the CMSA date to this period. A number of finds from the vicinity of the crannóg in Ervey Lough are typical finds from the early medieval period.

53 In the fifth century Christianity was introduced to Ireland and monastic sites began to be founded throughout Ireland. Between the 6th and 8th centuries the influence of the church continued to grow and through the secular and ecclesiastical legislation it is possible to trace the gradual assimilation of the Church into early Irish society (Edwards (1996). *The Archaeology of Early Medieval Ireland*). Despite the abundance of evidence for settlement in the CMSA during the early medieval period, there are no ecclesiastical sites from this period known within the vicinity of the proposed development. In fact there is very little evidence for ecclesiastical activity in this area apart from a few holy wells, cross slabs and bullaun stones. The possible Church at Croaghan (SMR No. - MO014-036) could date from the early medieval period, however the Archaeological Inventory records a tradition of mass been said here, which

indicates that it may be later in date (Brindley (1986). *Archaeological Inventory of County Monaghan*).

54 Historically the 8th century saw the arrival of the Vikings. At this stage the country consisted of a patchwork of petty kingdoms vying with each other to establish local power bases all under the nominally rule of a High King. As with monasteries throughout the country, annals record Viking attacks at Lough Ramor and Tullean in Cavan and at Mucnam near Castleblayney and Clones and Donaghmoye County Monaghan.

55 The end of the Viking Age in Ireland came with the reign of Brian Ború as leader of the Dalcassians and Malachy, the Uí Neill King of Tara. Following a number of battles including Tara in 980 and Clontarf in 1014 the Norsemen's military power was broken. They however continued as traders and intermarried amongst the native Irish. Boru's descendants squandered his victory and regional squabbling over territory led indirectly to an invasion by the Anglo-Normans under Strongbow in 1169.

14.4.2.6 Medieval Period Onwards (c. 1200AD-1600AD)

56 The start of the medieval period is generally defined by the arrival of the Anglo-Normans in 1169. Originally invited by Diarmuid Mac Murchada as mercenaries to assist in the recovery of his Leinster Kingdom, the Anglo-Normans quickly set about making territorial claims for themselves. By 1171 King Henry II mounted a second invasion resulting in his Lordship of Ireland. As the Anglo-Normans began to acquire lands they built earth and timber fortifications known as motte and baileys. By the 12th century these were replaced by more permanent stone castles.

57 During this period the lands of Midhe (meaning ‗middle'), which consisted of the present Meath and Westmeath, with parts of Cavan and Longford, were granted to Hugh de Lacy by Henry II. The lands of eastern Breifne (meaning ‗hilly'), now much of County Cavan, remained in the control of the Uí Raghallaigh rulers until the 16th century. However the Uí Raghallaigh's remained on good terms with the Anglo-Normans and thus several motte and bailey and stone castles are located along the southern part of County Cavan. In Monaghan or Muine Cheain, meaning land of the little hills, the MacMahons dominated the political arena through most of the early medieval and medieval period. They ruled the Kingdom of Airghialla, later known as Oriel, for several centuries and allied themselves with the Anglo-Normans throughout most of the medieval period. However there was limited Anglo-Norman settlement in this area and thus only three motte and baileys are known of in the county.

58 There are some recorded archaeological monuments and finds from this period which are located within the constraints of the CMSA. A castle and bawn site (SMR No. - CV035-016) was situated in the townland of Cordoagh (ED Enniskeen) but is no longer standing. The castle

was erected by Conor O‘Reilly in the 15th century but was apparently abandoned during the 17th century, after the Plantation. Local tradition associates this site with the ‗Fair Green‘ located at Muff (SMR No. - CV035-058 – redundant record). The ‗Fair Green‘ is marked on all editions of the 19th century OS maps and is marked as a sub-rectangular level area.

59 Ecclesiastical centres representing the various orders were also prolific during medieval times. The medieval Franciscan friary and associated graveyard at Lattonfasky (SMR No. - MO024-034001–2) dates to this period.

60 In the late 16th and early 17th centuries an attempt was made to bring the rebellious Irish aristocracy under control, as the English hold in Ireland had begun to deteriorate in the preceding centuries. One of the results of this was the Nine Years‘ War (1594–1603), fought between the forces of Gaelic Irish chieftains Hugh O'Neill of Tír Eoghain, Hugh Roe O'Donnell of Tír Chonaill and their allies, against English rule in Ireland. The war was fought in all parts of the country, but mainly in the northern province of Ulster. The ultimate outcome resulted in the end of the old Gaelic order, leading to their exile in the Flight of the Earls and to the Plantation of Ulster. One of the earliest battles of the Nine Years‘ War was fought just outside the CMSA near Clontibret in 1595. The battle took place over two days and was predicated on English efforts to lift O‘Neill‘s siege of Monaghan Castle. Sir Henry Bagenal, commander of English forces, marched from Dundalk with an army of 1,750 troops to relieve the garrison. En route, in the drumlin hills of Clontribet, O‘Neill‘s men supported by the MacMahon and Maguire clans ambushed and harried Bengals men. Despite heavy losses the English relieved the castle, only to be attacked again on the return journey. Bagenal admitted only 31 men were killed and 109 men wounded on the second day of fighting, but his losses were almost certainly higher. The Irish annals claimed up to 700 English killed. Estimates of the confederate losses vary between 100 to 400 men killed.

61 Following the Nine Years‘ War and the Flight of the Earls, the re-conquest of the country was completed by James I. After this point, the English authorities in Dublin established real control over Ireland for the first time, bringing a centralised government to the entire island, and successfully disarmed the native lordships. From the mid-16th and into the early 17th Century, crown governments carried out a policy of colonisation known as Plantations that led to the introduction of English laws and institutions, such as the establishment of counties and local officials and common law courts. The plantation of Ulster by James VI of Scotland led to the plantation of Cavan. However, Monaghan was not planted and the lands were left in the control of the local chiefs.

62 These new settlers, who had a British and Protestant identity, would form the ruling class of future British administrations in Ireland. However, the English were not successful in converting the Catholic Irish to the Protestant religion and the brutal methods used by crown authority to pacify the country heightened resentment of English rule.

63 This seething resentment was unleashed with a rebellion of the Irish of Ulster in October 1641, during which thousands of Scots and English Protestant settlers were killed. The rebellion spread throughout the country and at Kilkenny in 1642 the association of ‗The Confederate Catholics of Ireland‘ was formed to organise the Irish Catholic war effort. The Irish Confederates professed to side with the English Royalists during the ensuing civil wars, but mostly fought their own war in defence of their own landed interests.

64 From 1641 to 1649, the Confederates fought against Scottish Covenanter and English Parliamentarian armies in Ireland. Politically they allied themselves with the Royalists cause but were divided over whether to send military help to them in the English Civil War. Following the death of Charles I at the hands of the victorious parliamentarians the Confederate revolt was brutally suppressed during the Cromwellian conquest of Ireland. The New Model Army was paid for its campaign in Irish land that effectively ended the old Catholic landed class.

65 Despite the devastation wreaked on the country by the Cromwellian conquest there was still another bloody chapter to be written. The War of the Two Kings, also known as the Williamite War, followed the deposition of catholic King James II in 1688 when he was replaced by his daughter Mary II with her more acceptable protestant husband William of Orange. In order to regain his throne James landed in Ireland in March 1689, with 6,000 French soldiers. After initial successes such as Dromore the Jacobites were able to advance northwards and occupy Belfast. At Crom Castle on 28 July 1689, near Enniskillen, the Jacobites received their first major setback. This was compounded later when William decided to take personal charge of the campaign culminating in his victory on the banks of the Boyne near the village of Oldbridge on 11 July 1690 (Simms (1986), *War and Politics In Ireland 1649-1730*).

66 The Williamite victory in Ireland ensured British and Protestant dominance over Ireland. Until the 19th Century, Ireland would be ruled by what became known as the ‗Protestant Ascendancy‘, the mostly English Protestant ruling class. The majority Irish Catholic community and the Ulster-Scots Presbyterian community were systematically excluded from power, which was based on land ownership. This legacy is evident in the many large country homes of the Anglo-Irish landed gentry in County Meath and, to a lesser extent, Cavan.

67 During the 18th to the early 20th century small scale farming continued to dominate the area. Small farmsteads were dotted over the landscape, which was been increasingly modified with the enclosure of the land into smaller fields. The growth of the linen trade also played a

significant role in the local economy. Several flax mills in the CMSA are recorded on early maps. In addition a number of these mills were used as corn mills and in some case small settlements developed around them.

14.4.3 Desk Based Evaluation Archaeological

68 Unless stated otherwise, in the tables herein, distance refers to the distance from the data point indicated in the Archaeological Survey Database, downloaded from www.archaeology.ie or digital data made available by the NIEA, to the nearest point on the centreline of the proposed line route. The archaeological, architectural and cultural heritage sites in the CMSA are displayed in Figures 14.1 – 14.13, **Volume 3C Figures** of the EIS.

14.4.3.1 World Heritage Sites

69 The closest United Nations Educational Scientific and Cultural Organisation (UNESCO) World Heritage site is the archaeological ensemble of the Bend in the Boyne or Brú na Bóinne (Ref: 659) which is located approximately 30km to the south-east of the CMSA section of the proposed development.

70 Candidate World Heritage Sites, which were submitted to UNESCO in 2010 by the then Minister for Environment, Heritage & Local Government as part of a tentative list of sites that Ireland would be nominating for World Heritage listing were also considered in relation to the proposed development.

71 In addition consideration was given to significant sites within Northern Ireland, these include the royal site of Navan Fort (Eamain Macha) and the Dorsey Rampart and Iron Age linear earthwork. Both sites are approximately 17km to the north north-east and east respectively from where the CMSA meets the border...

14.4.3.2 Landscape Conservation Areas

72 There are no Landscape Conservation Areas designated within either County Monaghan or County Cavan, however each county does have designated landscape areas. The Monaghan CDP designates two areas of Primary Amenity Value the closest of which is associated with Lough Muckno to the east of Castleblayney, approximately 6km to the east of the proposed development.

73 The Cavan CDP designates a number of County Heritage Sites, the closest of which are Dun a Rí Forest Park, located just to the north of Kingscourt and approximately 3.3km to the east of the proposed development, and Moybologue Church located to the south of Bailieborough, approximately 5.5km to the west of the proposed development.

14.4.3.3 National Monuments in the Ownership or Guardianship of the State

74 There are no National Monuments recorded in the National Monuments listing within 5km either side of the proposed development.

14.4.3.4 National Monuments in the Ownership of a Local Authority

75 In accordance with the National Monuments Act archaeological monuments in the ownership of a local authority can be afforded the same level of protection as those in State care. The most common monuments in the ownership of local authorities consist of historic graveyards that were vested to the Burial Boards by the Church Temporalities Commission. Vesting of these sites took place during the disestablishment of the Church of Ireland towards the end of the 19th Century. The modern day successors to the Burial Boards are the local authorities.

76 There are four religious sites listed in the Archaeological Survey Database (ASD) which are located within 2km of the proposed development, they include:

- SMR No. - MO014-036 a church located approximately 1km to the south of Tower 115. The site is not indicated on OSI historic mapping. The Archaeological Inventory for County Monaghan (1986) describes the site as follows, "*Foundations of plain rectangular structure (6.3m x 5m) orientated E-W, with entrance at W. Masses were said here formerly*".

- SMR No. - MO014-033 a burial ground located approximately 340m north of Tower 124. The site is not indicated on OSI historic mapping. The Archaeological Inventory for County Monaghan (1986) describes the site as follows, ‗*Rectangular area (23m x 13m), orientated ESE-WNW, covered with stones. According to local information, a cemetery*'.

- SMR No. – MO024-004 a burial ground approximately 740m to the east of tower 150 which appears as a graveyard on the OSI 1st edition map;

- SMR Nos. MO024-034001 and MO024-034002, the ruins of Templemoyle and its associated Graveyard, a small Franciscan Friary on the banks of Lough Egish, located approximately 1.1km to the south east of Tower 161

14.4.3.5 Monuments Subject to Preservation Orders

77 The list of Monuments covered by preservation orders contains a single entry within 2km of the proposed development which refers to a ringfort (SMR No. – MO027-006 / PO – 7/1984) in the townland of Dooraa (spelled Dooroa in the list of preservation orders). The ringfort is located approximately 1.25km west south-west of Tower 169.

14.4.3.6 Archaeological Monuments

78 There are in total 233 archaeological monuments recorded within 2km of the centreline of proposed development, including 223 archaeological monuments listed in the ASD (Error! Reference source not found.), and a further 10 sites listed in the NISMR (**Table 14.2).** These sites date from the late Mesolithic period to the post-medieval period.

79 The earliest datable monuments recorded within the CMSA are 10 megalithic tombs consisting of four court tombs, two portal tombs, two wedge tombs and two unclassified megalithic sites. All the above typically date to the Neolithic period however wedge tombs can chronologically extend into the Early Bronze Age. Bronze Age monuments are represented by barrow sites at Beagh (SMR No. MO030-045), Reduff (SMR No. MO027-009) and Doohamlet (SMR No. MO10-051), cairns at Lattonfasky (SMR No. MO024-025) and Drumnahavil (SMR No. ARM023:002), standing stones at Boherlea (SMR No. ME002-040) and Doohat (NISMR ARM019:013), a hillfort at Raferagh (SMR No. MO030-018001) and three cist burials found in a group in Lattonfasky (SMR No. MO024-025001-3)..

80 There are several site classifications for which dates could not be determined in the absence of archaeological excavation, these sites could potentially span the prehistoric to early medieval periods. They include 11 crannógs, 23 enclosures and 2 earthworks.

81 The most numerous sites are the ubiquitous ringforts of which 140 examples are recorded. These along with 11 associated hut sites and nine souterrains can all be considered to be early medieval in date. The holy well in Lattonfasky (SMR No. MO024-039) may have been in use during the early medieval period but in many cases holy wells can have their origin in the prehistoric period. The possible Church at Croaghan (SMR No. MO014-036) could date from as early as the early medieval period, however the Archaeological Inventory records a tradition of mass being said here, which indicates that it may be later in date (Brindley (1986), *Archaeological Inventory of County Monaghan*).

82 Medieval activity in the CMSA is represented by the castle and bawn at Cordoagh (ED Enniskeen) (SMR No. CV035-016001–2) which was built in the early 15th century by Conchobair O'Reilly and the possible medieval Franciscan Friary and associated graveyard at Lattonfasky (SMR No. MO024-034001–2). There are also two possible burial grounds at Shane (SMR No. MO024-004) and Carrickanure (SMR No. MO014-033). The dates of these are uncertain but both probably date to the post-medieval period and there is local lore that the graveyard in Shane may been used in Penal and Famine times (Brindley (1986). *Archaeological Inventory of County Monaghan*). Other post medieval sites include the spa well at Collops (SMR No. CV035-015) and the designed landscape feature or tree-ring at Leiter (SMR No. CV035-046).

Table 14.1: Summary of Archaeological Monuments from the ASD Located within 2km of the Proposed Development

Classification	Count		Classification	Count
Anomalous stone group	1		Graveyard	1
Barrow - ring-barrow	1		Hillfort	1
Barrow - unclassified	2		Hut site	11
Bawn	1		Megalithic tomb - court tomb	4
Building	1		Megalithic tomb - portal tomb	2
Burial ground	2		Megalithic tomb - unclassified	2
Cairn - unclassified	1		Megalithic tomb - wedge tomb	2
Castle - unclassified	1		Redundant record	2
Church	2		Ringfort - rath	137
Cist	3		Ringfort - unclassified	1
Crannog	11		Ritual site - holy well	1
Designed landscape feature	1		Souterrain	5
Earthwork	2		Standing stone	1
Enclosure	23		Well	1
Total	**52**		**Total**	**171**
Overall Total 223				

Table 14.2 Summary of Archaeological Monuments from the NISMR Located within 2km of the Proposed Development

Classification	Count
Cairn	1
Enclosure	1
Megalithic Tomb possible	1
Rath	2
Souterrain	3
Souterrain possible	1
Standing Stone	1
Total	**10**

14.4.3.7 Topographical Files

83 The finds listed in the topographical files of the National Museum pertaining to the CMSA comprise a typical cross section of artefacts and tools spanning from the Mesolithic to the early modern period. The files were inspected with regard to all the townlands in the vicinity of the proposed development.

84 The earliest datable find was a Mesolithic Bann flake (NMI Find No. - 1965:138) from Corduff. Only one stray find possibly dates to the Neolithic and this is a stone axehead (NMI Find No. - 1933:236) from Annaglogh. Bronze Age activity in the area is better attested and finds from this period include food vessel pottery from Cabragh (NMI Find No. - 1958:141) and Doon (NMI Find No. - 1947:231), bronze swords from Cargaghoge (NMI Find No. - 1956:287) and Lisduff (NMI Find No. - 1959:173), socketed axeheads from Doohat (ARMCM.163.1935) and Lisdrumturk (NMI Find No. - 1956:289), a palstave axehead (NMI Find No. - 1942:412) from Muff, two spearheads from Cornasassonagh (unregistered) and Mohercrom (NMI Find No. - 1963:33), a javelin head (IA/128/62) from Corvally and a bronze cauldron (NMI Find No. - 1965:181) from Lisdrumturk. The Iron Age is represented by an iron spearhead (IA/53/1974) from Cordoagh, a La Tène toilet box (unregistered) from Cornalaragh and a probable Roman key (NMI Find No. - 1956:349) which was found in a crannóg in Greaghlone Lough. There are also several prehistoric flint lithics from the area which cannot be assigned a more precise date. These included two scrapers (NMI Find Nos. - 1956:274, 1965:130) from Cargaghoge, a blade (NMI Find No. - 1965:133) from Corduff, a worked flint (NMI Find No. - 1942:68) from Corraneary and a flint slug knife (NMI Find No. - 1956:270) from Sreenty.

85 Finds from the early medieval period are well represented. Four quern stones typical of this period have been found in Corlea (NMI Find No. - 1978:160), Tullynahinnera (NMI Find No. - 1968:429), Edengora (NMI Find No. - IA/73/72) and Cornalaragh (NMI Find No. - 1965:315). The stone disc (NMI Find No. - 1955:47) found on a crannóg in Breakey Lough probably dates to the early medieval period. Several finds from the crannóg in Ervey Lough may also date to this period. These include a bronze omega pin (NMI Find No. - 1958:69), a silver pennanular brooch (NMI Find No. - 1958:70), a bronze ring-pin (NMI Find No. - 1958:77), a bronze pin (NMI Find No. - 1958:44), a wooden yoke-like object (NMI Find No. - 1957:80), two vessels (NMI Find No. - 1957:81, 1957:88), several staves (NMI Find No. - 1957:82–5), two cattle goads (NMI Find No. - 1957:86–7) a dish (NMI Find No. - 1957:89), an axehead (NMI Find No. - 1957:90) and a bronze tubular object (NMI Find No. - 1957:91). The clay pipe (NMI Find No. - 1956:320) from Bocks Middle, the iron snaffle ring (NMI Find No. - 1943:361) from Kilcrossduff and the metal Box, coin of George III and protractor (unregistered) from Annaglogh are all post-medieval in date.

86 There are also several finds which are difficult to assign a precise date to, from the CMSA. These finds include a hone stone (NMI Find No. - 1943:365) from Laragh, a wooden keg of bog butter (NMI Find No. - 1965:275) from Corlea, a ball of worsted (NMI Find No. - 1935:435) from Ardragh, unglazed pottery sherds (NMI Find No. - 1965:183–4) and a stone mortar (NMI Find No. - 1965:185) from the floor of a wooden house in Cargaghoge Bog, a loom weight (unregistered) from Beagh, an oak boat / trough (unregistered) from Ardragh, a bronze bell-shaped object (NMI Find No. - 1965:253) from a bog in Cornalaragh, a bronze strap-buckle (NMI Find No. - 1960:618) from Ervey, a polished black stone object (NMI Find No. - 1935:388)

from Greagh lane, a hammerstone (NMI Find No. - 1965:115) from Raferagh and a glass marble and a lump of vitreous substance (NMI Find No. - 1943:77a–b) from a crannóg in the bog at Kilcrossduff.

87 Note: the finds from the topographical index in many instances do not record artefacts recovered from recent excavation work, which may be with conservators or individual archaeological consultancies.

14.4.3.8 Previous Archaeological Fieldwork

88 The Excavation Bulletin is both a published annual directory and an on-line database that provides summary accounts of all the excavations carried out in Ireland and Northern Ireland, from 1970 to 2010. The Excavations Bulletin is compiled by Isabel Bennett and published by Wordwell, with support from the OPW and the DAHG. For the years from 1977 to 1984 the Excavation Bulletin was incorporated in the Irish Journal of Archaeology. The database gives access to almost 15,000 reports and can be browsed or searched using multiple fields, including Year, County, Site Name, Site Type, Grid Reference, Licence No., Sites and Monuments Record No. and Author.

89 Similarly the National Road's Authority (NRA) archaeological database (http://archaelogy.nra.ie) contains a description of the results of excavations carried out in advance of various road schemes. In general, the database contains information on sites for which final excavation reports have been received. In a small number of cases, owing to the significance of particular sites, information from preliminary excavation reports has been included in lieu of the final report. The database can be searched using menus in one or more categories including county, townland, site type and dating period.

90 A search through the databases for the relevant townlands along or in the general vicinity of the proposed line route in counties Monaghan and Cavan produced seven results. Of these five were described as having no archaeological significance. These sites include townlands between Belturbet and Aghalane as part of the N2 realignment and the proposed sites of dwelling houses at Laragh and Tassan County Monaghan and Dunaree, County Cavan.

91 Sites where archaeological material was encountered include a post-medieval farm at Avalreagh and a possible cashel site at Lismagunshin. Both these sites were uncovered as part of the N2 works between Clontibret and Castleblayney. Alveragh townland (Licence No. - 05E0787) is located approximately 1km north of the proposed line route between Towers 122 and 125. Test-trenching in advance of road construction uncovered the remains of a post-medieval farm structure thought to be a shed for animals and the remains of a possible bawn wall. A water trough for animals was also discovered.

92 At Lismagunshin, located approximately 850m from the proposed line route, a site marked 'Fort' on 1835 OS 6-inch map was excavated in advance of road construction. The site was approximately 30m in diameter. No trace of a ditch was present. The only internal features noted were a number of shallow burnt pits, one of which contained a blue glass bead (Sutton B. (2008). *Excavations Bulletin*). A small portion of the intact bank may survive incorporated into the field boundary on the west side of the site. There was quite a lot of stone incorporated into the field boundaries dividing the site at the top of the hill, and it is possible that the enclosing element of this site was constructed out of stone. It would appear that this site may in fact be the remains of a cashel, the stone equivalent of the earthen ringfort.

14.4.3.9 Cartographic and Aerial Anomalies

93 Detailed analysis of first edition and second edition OSI mapping was undertaken as well as a review of several sources of aerial and satellite photography, including LiDAR. Any sites of archaeological, architectural or cultural heritage potential were noted and mapped in GIS. In all, 169 sites were recorded in the vicinity of the proposed development, these are summarised in **Table 14.3**.

Table 14.3: Potential Archaeological, Architectural and Cultural Heritage Sites noted from Cartographic and Aerial Sources

Feature Type	Count
Beetling Mill	1
Bridge	2
Corn Mill	1
Cultivation Ridges	1
Farmstead	56
Gravel Pit	1
House	71
Level Crossing building (GNR)	1
Lime kiln	24
Mill race	1
Pond	1
Quarry	1
Railway line (GNR)	1
Thorn	1
Well	5
Well / Spring	1
Grand Total	**169**

14.4.3.10 Toponym Analysis

94 Townland names are useful in terms of understanding the geology, archaeology, land use, ownership and folklore of an area. The names can provide information on families, topographical features, and historical incidents. In terms of the built environment many names reference churches, fords, castles, raths, graveyards, roads and passes etc. Townlands are the smallest administrative land divisions used in Ireland and are in fact the only surviving administrative structure with a continuous history of development going back to medieval times if not earlier. Irish townlands generally relate not to settlements, but land units and as such they acquired legal title at an early date. They are the basic divisions of the countryside and were carefully recorded in the maps and books that accompanied the great land transfers of the 17th century. The names feature on the Ordnance Survey maps, the first edition of which was completed for the whole country circa 1842. In the compilation of the Ordnance Survey scholars, such as Eugene O'Curry and John O'Donovan, were commissioned to provide the Survey with the anglicised forms of the Irish placenames, and it is these anglicised forms that have been in general use ever since. In compiling the following data a number of resources were consulted including the Placenames Database of Ireland www.logainm.ie and *Irish Names of Places* by P.W. Joyce (1913).

95 The spellings of townland names, which were recorded by the Ordnance Survey from the 1830s onwards, are phonetically-rendered versions of the original Irish. Examples of some of the commonest names contain prefixes such as Drum, Corr, Knock, Mullagh / Mully and Tullagh / Tully which refer to the hills of the region; or Killy, Der / Derry, Cool / Cul, which refer to woodlands. Some common names refer to the human / settlement landscape, as in Lis, or Ra / Rath, Cashel, Gort, Terry, Bally, and Cross.

96 Names relating to aspects of the local topography include Tassan translated as the little cataract, Annagh - the marsh, Clogher - stony place, Drumguillew – ridge of the wood and Tullyglass – the hillock of the stream.

97 Flora and fauna feature in many names like Drumhillard - the ridge of the eagle, Clonturkan - the meadow of the hog / pig, Carrickanure - the rock of the yew tree or Corrinenty – the round hill of nettles.

98 Human settlement is indicated in references to forts, houses and landownership as follows: Latnakelly - Monument or grave mound of the McNally's, Terrygreeghan - O'Greaghan's land, Aghmakerr - McKerr's ford or Raferagh - Fiachcra's fort.

99 One of the more unusual townland names is Cornasassonagh, meaning the round hill of the Englishmen, or hired soldiers. This name may be linked to a historical event and could

reference a local action or the passing of soldiers in many of the campaign's fought throughout the wider vicinity.

100 Refer to **Appendix 14.2, Volume 3C Appendices** of the EIS, for a list of townland names and analysis.

14.4.3.11 Townland Boundaries

101 Ranging from less than a hectare up to several thousand hectares, townland boundaries are the smallest officially recognised land division in Ireland. During the early to mid-19th century, Ordnance Survey Ireland produce the first edition of the Ordnance Survey maps, which documented in detail, for the first time, all the townlands of Ireland; numbering in excess of 60,000. Undertaken for taxation purposes, the process involved defining new townland boundaries where previously there had been none, such as in bog and mountain areas and in some instances amalgamating existing townlands. The earliest references to townland boundaries are found in pre-Norman legal documents, referring to grants of land to monasteries.

102 Monaghan County was not officially formed into a county until 1585. The modern county is divided into five baronies; Truagh, Dartree, Monaghan, Cremorne and Farney. The baronies are further sub divided into parishes and townlands. The modern landholding system in County Monaghan reflects elements of the later medieval Gaelic territorial organisation as recorded in a number of early modern land-settlements from the turn of the 17th century.

103 There are eight historic baronies in Cavan. Throughout the Medieval Period the area of the county was part of the Kingdom of East Breffni, named after its ruling Gaelic family. Originally Cavan marked the western province of Connaught, but was transferred to Ulster by Lord Deputy Sussex in 1562 for strategic reasons because it ‗*bordereth upon the English Pale*" (Report of the Earl of Sussex 1562). For this reason Cavan was part of the Ulster plantation, was shired and became a county.

104 More recent townland boundaries may relate to demesne boundaries. Taking a variety of forms from rivers and streams to fences, banks, field walls and demesne walls they can provide an interesting insight into the past.

105 In a number of instances towers are located adjacent to townland boundaries but there are none located on townland boundaries.

14.4.4 Desk Based Evaluation Architectural

106 There are no listed buildings, registered historic parks or gardens, industrial heritage sites or defence heritage sites located in Northern Ireland within 2km of the proposed development.

14.4.4.1 Architectural Conservation Areas

107 There are currently no ACAs designated within 5km of the proposed development. The closest, located within Carrickmacross, is approximately 6.5km to the east of the proposed development. It is noted however that County Monaghan has indicated its intent to designate a number of new ACAs during the life of its current County Development Plan, Ballybay is one such town and is located approximately 3.4km to the west of the proposed development.

14.4.4.2 Records of Protected Structures and the National Inventory of Architectural Heritage

108 The Records of Protected Structures for counties Cavan and Monaghan are currently under review in light of surveys having been undertaken relating to the NIAH. All Protected Structures and NIAH sites within the two counties were included in this evaluation.

109 There are three structures noted in the NIAH that are rated as being of National importance located within 5km of the proposed development. Saint Peter‘s Church (RPS No. - 41402801) in Laragh, County Monaghan, and Gartlan‘s Public House (RPS No. - 293) and the Church of the Immaculate Conception (RPS No. - 294), both in Kingscourt, County Cavan. All are in excess of 3km from the proposed development.

110 In total there are 14 protected structures located within 2km of the proposed development as it traverses counties Monaghan and Cavan. There are a further 21 sites that have been highlighted by the NIAH surveys of County Monaghan and County Cavan, that are in the process of being reviewed for possible inclusion within their RPSs in the future. The closest such structure, Manse House, recently added to the NIAH survey for County Monaghan, is located approximately 200m to the east of the proposed development in the vicinity of Tower 194. Details of all structures listed in both the RPS and the NIAH located within 2km of the proposed development are provided in **Appendix 14.3, Volume 3C Appendices** of the EIS.

14.4.4.3 Demesne Landscapes and Historic Gardens

111 OSI first edition mapping was used in conjunction with the NIAH Garden Survey to map all demesne landscapes and historic gardens within 2km of the proposed development. Both Garden surveys for Monaghan and Cavan have been completed to a Phase 2 level which makes an initial assessment of the condition and survival of all identified sites using aerial photography and historic mapping. Individual site survey reports record a general appraisal of

the site, the presence and survival of principal buildings, movement within the site eg; drives, walks and avenues and demesne features – walled gardens, orchards, woodland, vistas etc. There are relatively few historic gardens in the vicinity of the proposed development as it passes through counties Cavan and Monaghan and those in the vicinity are relatively small. This is especially apparent when compared with the expansive demesnes of County Meath in the MSA (refer to Chapter 14, **Volume 3D** of the EIS) to the south, some of which cover several hundred hectares.

112 Demesne landscapes and historic gardens are generally shaded on the OSI 1st edition maps, however it was discovered during the appraisal that this is not the case for County Monaghan. Contact was made with the Architectural Section of the then DoEHLG and at the time (May 2011), they were unaware of this anomaly. In light of this, the Garden Survey on the Buildings of Ireland website (http://www.buildingsofireland.ie/Surveys/Gardens/) was used as a baseline for the point locations of historic gardens and then their boundaries were mapped in GIS using professional judgement and experience.

113 Generally the historic gardens listed in **Table 14.4** are located at a distance from the proposed development, however in the vicinity of Towers 170 to 175, the proposed line route passes through an area where three demesne landscapes and historic gardens are found in close proximity. These are associated with Lakeview House, Shantonagh House and Tully House. It appears that the proposed line route passes through the demesne landscape associated with Shantonagh House and Tully House.

Table 14.4: Demesne Landscapes and Historic Gardens within 2km of the Proposed Development

Name	NIAH Garden Survey Description	Townland	County	Area (Ha)
Woodfort	Main features unrecognisable - peripheral features visible	Ervey	Meath	13.5
Rock Field	Main features unrecognisable - peripheral features visible	Avalreagh	Monaghan	4.9
Shantonagh House	Main features substantially present - peripheral features unrecognisable	Tooa	Monaghan	20.1
Lakeview House	Virtually no recognisable features	Shantonagh	Monaghan	17.1
Tully House	Virtually no recognisable features	Tullyglass	Monaghan	21.2
Ballybay House	Main features substantially present - peripheral features unrecognisable	Knocknamaddy	Monaghan	48.2
Lakelands	Main features substantially present - peripheral features unrecognisable	Lismagunshin	Monaghan	12.1
Heath Lodge	Virtually no recognisable features	Leiter	Cavan	26.9
Northlands	Main features unrecognisable - peripheral features visible	Taghart North or Closnabraddan	Cavan	39.9

14.4.5 Route Survey

114 The following route survey is a distillation of the desktop evaluation including use of detailed aerial photography, LiDAR, coupled with the vantage point surveys and field survey work undertaken.

14.4.5.1 Towers: 103 - 121

Townlands: Lemgare, Lisdrumgormly, Annaglogh, Latnakelly, Tassan, Cashel

115 The CMSA section of the proposed development proceeds north to south from the Armagh border crossing into Lemgare townland, County Monaghan. Between Towers 103 and 109 the proposed line route proceeds to the south-east, skirting the border and passing a number of recorded monuments including a ringfort in Coolartagh (SMR No. - MO014-020) and a souterrain (SMR No. - MO014-039) in Lemgare located approximately 750m and 400m to the south-west of the proposed line respectively. Further south-east in the vicinity of Tower 106 the proposed route passes almost directly over a ringfort with the remains of a building within its interior (SMR Nos. - MO014-021001 and 021002). The site is described in the archaeological inventory as an oval area of rock outcrop (approximately 26m ENE-WSW; 39m NNW-SSE) surrounded by artificial scarp and bank with and entrance to the SSW.

116 Between Towers 106 and 107 the proposed line route passes within close proximity to two monuments, an enclosure (SMR No. - ARM023:004) and a court tomb (SMR No. - MO014-022). The enclosure is located in Crossbane townland, County Armagh and is recorded as a polygonal earthwork situated on a slight eminence sloping to a stream. The perimeter of the monument is defined by a stone wall. This site is located approximately 140m from the proposed alignment. On the Monaghan side of the border (110m west of the line route) is (SMR No. - MO14-022), a Court tomb with a cairn. This monument is aligned north-west south-east. The court gives access to the scant remains of chamber. Continuing south-east to Tower 109 the proposed line route passes a number of now derelict structures that feature on the first edition OS maps before diverting to the south-west. Near Tower 110 there is a sub circular copse of gorse that may obscure a site of archaeological potential. This copse is located within approximately 30m of the proposed alignment.

117 Between Towers 109 and 112 the proposed line route heads in a southerly direction, passing a complex of monuments to the east including three ringforts and an enclosure. One of the ringforts in Annaglogh contains a souterrain and a possible hut (SMR No. - MO15-003001-03). All of these sites are in excess of 400m from the proposed line route.

118 At Tower 112 the proposed line route alters course to the south-west, passing over a ridge in Latnakelly. The line route passes 380m to the north of Tassan lough the site of a crannóg (SMR No. - MO14-034), which is situated on its southern shore. The crannóg is tree-lined and is recorded as a roughly circular cairn of loose stones and charcoal 18m in diameter. Within Tassan townland the proposed line route passes a number of structures that appear on historic maps. Near Tower 121 at the junction of the proposed line route and the N2 roadway the proposed line route oversails a well site featured on the early OS maps.

14.4.5.2 Towers: 121-136

Townlands: Cashel, Annagh Carrickanure, Cornamucklagh North, Clarderry, Derryhallagh (Monaghan By), Drumroosk, Caragaghramer, Cornanure (Monaghan By)

119 From the N2 the proposed line route continues to the south-west via Annagh (Cremorne By) and Cornamucklagh North bypassing two monuments - a rath (SMR No. - MO14-032) and a possible burial ground (SMR No. - MO014-033) in Carrickanure (340m and 450m from the line route respectively). The cemetery is defined by a rectangular area (23m x 13m), orientated east south-east and west north-west, and covered with stones. Between Towers 124 and 129 there are no recorded monuments within 500m of the proposed alignment however there a number of 1st edition features including wells, structures and a quarry site. Many of these sites are no longer extant.

120 North of Ghost Lough between Towers 129 and 130, in Derryhallagh (Monaghan By) townland the proposed line route passes within 90m of an anomalous stone group (SMR No. - MO019-048). This site is on slightly raised ground which slopes gently from the south to the north. It is described as having nine irregularly shaped limestone boulders placed closely together (3.5m N-S × 3.2m E-W), forming no definite pattern. According to local tradition this feature is known as a 'giant‘s grave' and there are various legends and superstitions associated with the stones.

121 Between Corofin Lough and Coogans Lough the proposed line turns south through drumlin country passing in close proximity to a number of derelict farmsteads and two lime kilns. Also noted in this area are two monuments, an earthwork and a portal tomb both occupying elevated sites either side of the proposed line route. The ringfort (SMR No. - MO019-017) is indicated as a 'Fort' on 1835 'OS 6-inch' map, however, site investigations confirm that there is now no visible surface remains. The portal tomb (SMR No. – MO019-016), located approximately 210m west of the proposed line route between Towers 133 and 134 is visible on a hillside from a nearby access road. The tomb which opens to the north-west has two side stones and a displaced roof stone.

122 Continuing south via Drumroosk and Caragaghramer the proposed line route passes a derelict farmstead and structure. There is a ringfort (SMR No. - MO019-023) 750m to the east of Tower 136. The fort is well screened by trees and there is no visible trace of the fosse or an entrance.

14.4.5.3 Towers: 136-152

Townlands: Cornanure (Monaghan By), Rausker, Terrygreeghan, Cornamucklagh South, Crinkill, Clogher, Drumguillew Lower, Drumhowan

123 From Caraghramer the proposed line route continues over drumlins into Coranure townland bypassing a number of first edition features, all of which have no above ground trace. Approximately 270m to the east of the line in Rausker townland on the eastern slope of a ridge is a wedge tomb (SMR No. - MO019-025). The wedge tomb, incorporated into a mound, consists of a gallery flanked by two buttresses and a single outer walling stone on the north-west side. The gallery (L 3m; Wth 0.7m) is preceded at the south-west by short portico. Two displaced roof stones lie across the gallery. The structure measures 11m long by 5m wide (de Valera and Ó Nualláin (1982) *Survey of the Megalithic Tombs of Ireland*). The site is not visible from any public roads, but is clearly visible in aerial photography and its elevated position can be seen from Discovery Series mapping. Also in the general vicinity, in excess of 750m from Tower 140, is a tree ringed rath in Tonyscallan (SMR No. - MO019-026).

124 West of the proposed line route between Towers 138 and 142 are five monuments including two ringforts (SMR Nos. - MO019-020 and 022), a megalithic tomb (SMR No. - MO019-021), and two crannógs (SMR Nos. - MO019-043 and 044). Both the megalith and ringfort SMR No. - MO19-022 are in excess of 900m from the line route, the other sites are in excess of 500m. Also of note between Towers 139 and 140 the line route crosses over the old Great Northern Railway, Armagh to Castleblayney line dated 1910.

125 Crossing the R183 road, Tower 142 diverts the proposed line route to the south-east where it passes in close proximity to two monuments including a court tomb (SMR No. - MO019-037) and a ringfort (SMR No. - MO019-038), both found in Cornamucklagh South. The court tomb is within 50m of the proposed line route between Towers 144 and 145 and is described as a roughly trapezoidal cairn incorporating at its north-west border a deep U-shaped court. The gallery structure is represented by a single side stone. The site is not visible from the road. The ringfort (SMR No. - MO019-038) is located approximately 40m to the east of the proposed line route on the summit of a hill and is recorded as an oval area approximately 40m in diameter surrounded by a scrub lined, earthen bank with traces of a fosse. From aerial imagery the bank looks degraded to the south-west.

126 From this point the line route passes east of Crinkill Lough, containing a crannóg on its eastern shore (approximately 710m from the line route). At Tower 149 the line route deviates to the south and passes to the west of a megalithic court tomb (SMR No. - MO024-003) and a burial ground (SMR No. - MO024-004). The court-tomb is located approximately 430m from the line route and has a slightly curved gallery. A number of the stones around it are shattered. Nearby 600m from the line route is a burial ground (SMR No. - MO024-004) which according to local tradition was used in Penal and Famine times. The site is a rectangular, slightly raised area enclosed by foundations and the remains of wall faced with slabs set on edge. Internally are a few grave markers, chiefly lines of small stones and several thin slabs (Irish Folklore Commission (1938), *IFC Survey of Schools*). The site is currently overgrown with scrub.

14.4.5.4 Towers: 152-169

Townlands: Drumhawan, Greagh, Brackly, Tullynahinnera, Cooltrimgish, Boraghy, Aghmakerr, Drumillard

127 South from Drumhawan through Greagh (Cremorne By) between Towers 155 and 161 the proposed development passes a number of first edition structures and two ringforts, both in excess of 700m from the proposed development. North-west of Lough Egish the line route diverts to the south-west at Tower 161 and crosses the R180 near Boraghy. On the shore of Lough Egish is one of the few religious archaeological sites in the vicinity of the proposed development, the ruins of Templemoyle Church and graveyard (SMR Nos. – MO024-034001 and 002) which is located approximately 1km to the south-east of Tower 161. From this point it proceeds to the east of Lough Morne passing within approximately 60m of a ringfort (SMR No. - MO024-032) at Aghmakker. This fort is surrounded by scrub and measures 30m in diameter. It is enclosed by an earthen bank with modern stone facing and has traces of external fosse, visible mainly at the north-east and the east. The site is not visible from the road.

128 The proposed line route crosses the R181 road at Drumhillard, along the roadside at this juncture are a number of buildings that appear on historic maps.

14.4.5.5 Towers: 169-176

Townlands: Drumillard (Cremorne By), Tooa, Tullyglass.

129 Proceeding south-east through a small valley the proposed line route between Towers 169 and 171 passes three elevated monuments including a ringfort and enclosure in Tooa (SMR No. - MO027-007001 and MO027-008) and a barrow in Reduff (SMR No. – MO027-009). All the sites are in excess of 400m from the proposed development and are not visible from any public vantage points. The ringfort is tree lined and contains the foundations of two conjoined hut sites. The enclosure is marked 'Fort' on 1835 OS 6-inch map. The barrow is described as a circular, slightly raised mound surrounded by fosse with external bank. The entrance at the

west north-west has traces of stone lining through the bank and causeway. To the east as the line route crosses the R181 between Towers 169 and 170 are two three bay houses that have recently been surveyed as part of the NIAH for County Monaghan (NIAH Reg. Nos. - 41402419 and 41402421).

130 Between Towers 171 and 175 the proposed line route passes to the east of two demesnes - Shantonagh House (RPS Ref. 41402715) and Tully House (RPS Ref. 41002060). Shantonagh House is described as a three bay, two storey over basement house with its main demesne features substantially present. Tully House is described in the garden survey as having virtually no recognisable features. Some small ruined walls are all that remain of a Corn Mill near Tully House; the house itself and associated outbuildings have vanished entirely. There is also no trace of Beetling Mill that was once located to the south. Other significant buildings in the area include Farm Hill (NIAH Reg. No. – 41402707) and the adjoining Farm Hill Flax Mill (RPS No. – 41402706); neither of the demesnes will be impacted. Archaeological sites in the area include a rath and an enclosure in Tullyglass townland (SMR No. - MO027-031 and 32); both sites are located approximately 110m and 520m to the west of the proposed line route respectively. The enclosure, nearest the proposed line route is described as possibly being a landscape feature. Approximately 450m to the east of Tower 175 is a crannóg (SMR No. – MO027-034) on the eastern shore of Bocks Lough.

14.4.5.6 Towers: 176-193

Townlands: Tullyglass, Cornasassonagh, Corrinenty, Ummerafree, Sreenty, Ardragh, Corvally

131 West of Bocks Lough the line route traverses Cornasassonagh townland passing 190m east of a well screened ringfort (SMR No. - MO027-037). Further south at Tower 181 the proposed line route passes 70m to the west of an enclosure (SMR No. - MO027-077) described as a sub-rectangular area (c. 12.5m x 15.5m) surrounded by a grass-covered low stone wall with an entrance on the west side.

132 At Tower 184 the line route diverts to the west passing approximately 118m north of a ringfort (SMR No. - MO027-076001 and MO027-076002) which contains the remains of a hut site. Set back from the road, the site is heavily vegetated and was not visible from roads in the surrounding area due to its elevated position and intervening hedgerows. Further west is a rath at Sreenty (SMR No. - MO027-074) defined as a circular area (diameter 31m) with a bank visible to the west. This site is located on a ridge and the line route angles around it to the west. No visible trace remains as it was bulldozed in 1996.

133 To the immediate west of Tower 186 are an earthwork (approximately 80m from the line route) and an enclosure (approximately 200m from the line route) (SMR No. - MO027-072 and 110), both sites are indicated on the historic mapping but now have no above ground trace.

134 East of Ouvry Cross roads the line route continues through Ardragh towards Corvally. Along this section an examination of historic maps identified a number of old farmsteads and lime kilns. There are two archaeological sites in these townlands (SMR No. - MO027-097) a tree-lined ringfort and an enclosure (SMR No. - MO027-096) that is marked ‗fort' on the 1835 map but of which no trace now survives. MO027-097 is located on a hilltop approximately 315m east of the line route, MO027-096 is located approximately 120m to the west near Tower 193.

14.4.5.7 Towers: 193-211

Townlands: Corvally, Raferagh, Cornalaragh, Doagh, Corlea (ED Drumcarrow), Ballaghnagearn, Scalkill,

135 To the east of Tower 193, approximately 870m from the proposed development, is the small village of Corvally which contains both a church and a school which are listed in the Monaghan RPS (RPS Nos. – 41403002 and 41403001 respectively).

136 South of the R178 road, the proposed line route passes through Corvally and Raferagh and Cornalaragh. This area is characterised by hills and small fields with mature hedgerows scattered with the remains of derelict farmhouses and structures. West of the line route and all in excess of 500m are three ringforts at Corcreeghagh (SMR No's - MO030-003,004 and 005). To the east of the proposed route between Towers 194 and 195 is Manse, a named house on the OSI 2nd edition maps, which was recently added to the NIAH (Reg. No. – 41403014). Approximately 500m to the west of the proposed development between Towers 195 and 196 are St. John the Baptist's Church, Corcreeghagh School and a small corrugated iron cottage all of which have been recently added to the NIAH (Reg. No's – 41403001, 41403002 and 41403003 respectively).

137 In Cornalaragh townland the proposed line route passes within 20m of a ringfort (SMR No. - MO030-021). The ringfort is visible on the aerial photographs as a tree-lined circular area. The archaeological inventory records that the monument is approximately 37m in diameter and is surrounded by an earthen bank with external fosse visible from south-west to north north-west. There are gaps at the east, east south-east, south and south-west but the original entrance is not identifiable. The site is well set back from any roads and is not visible from any public vantage point. South of this, the proposed line route continues through Doagh, Corlea (ED Drumcarrow) and Scakill where it crosses into County Cavan. Between Towers 201 and 211 the proposed line route comes in close proximity of a number of first edition buildings, farmsteads, a lime kiln and two bridges.

14.4.5.8 Towers: 211-224

Townlands: Scalkill, Lisagoan, Drumiller, Corlea (Clankee By), Cornamagh, Corglass (ED Lisagoan), Collops, Dingin,

138 The line route passes from Monaghan into Cavan between Towers 211 and 212 crossing the R162 in the vicinity of two ringforts (SMR No. - MO030-037 and CV029-007) in Scalkill and Lisagoan townlands respectively. The ringfort (SMR No. - MO030-037) in Scalkil is located approximately 124m to the north of the proposed line route and is defined by a tree-lined circular area (approximately 39m in diameter) skirting a laneway leading to a farmhouse. From aerial photography the fort is visible from the road as a copse of trees. The Lisgoan site is in excess of 400m from the proposed line route and is covered in scrub, enclosed by a substantial inner bank and deep fosse. The site is not visible from the road.

139 Further south between Towers 213 and 214, the line route passes 230m to the west of a roadside ringfort (SMR No. - CV029-008). This ringfort has no vegetative cover and is defined by a raised circular area (diameter approximately 39m) enclosed a substantial earthen bank with external fosse, and is located to the rear of a dwelling house. Proceeding south-west the line route traverses the hills of Drumiller and Corlea (Clankee By) townlands bypassing a number of structures that feature on first edition maps. At Tower 220 there is a ringfort (SMR No. - CV029-005) situated on a hilltop 550m to the east. This site is inaccessible and consists of a well-preserved, scrub lined, earthen bank and a wide, deep, waterlogged fosse. There is a break in the bank to the south-east with partially surviving accompanying causeway presumably represents the original entrance. South of this in Corglass (ED Lisagoan) townland the proposed line route passes approximately 400m to the west of a ringfort (SMR No. - CV035-017). This site appears on the historic mapping as a substantial monument marked as a ‗Fort'. The archaeological inventory describes it as having a massive inner bank with an external height of 6m. A review of aerial photographs, dating from 1995 to present however suggests that the site has been cleared away, and only survives as a cropmark.

140 Between a local access route and the R165, the line route enters Collops townland and passes near a number of structures, including a lime kiln and a Spa well (CV035-015) that feature on historic mapping. The well (located approximately 146m from the proposed line route) was visited by a surveyor in 1988 but there is no additional information on the site since then.

14.4.5.9 Towers: 224-236

Townlands: Dingin, Corrycholman, Leiter, Cordoagh (ED Enniskeen), Laragh, Corraneary (ED Enniskeen), Carrowreagh, Clonturkan

141 From Tower 224 the line route diverts to the south-west passing approximately 450m from a ringfort (CV035-033) located to the eastern end of a hilltop in Dingin townland. Crossing the

R165 into Corrycholman near Tower 225 is an unrecorded potential enclosure site visible on the aerial photographs as a bend in a field with a circular platform to the south. This site does not appear on the historic mapping and its significance can only be determined with a field visit.

142 Between Towers 225 and 227 the line route passes in excess of 600m to the east of Heath Lodge (CV-35-N-744970) demesne and approximately 421m from a nearby landscape feature visible on aerial photography as a scrub lined oval enclosure, orientated north-south (CV035-046). The NIAH garden survey describes the demesne as having virtually no recognisable features. The landscape feature is visible from the road as a copse scrub.

143 From Corrycholman townland, past Muff Lough the line route enters into Cordoagh (ED Enniskeen) the former site of a castle and bawn (CV035-016001). The castle was erected by Conor O'Reilly in the 15th century and apparently abandoned after the Plantation. Although there are now no visible remains at ground level, an earlier account (Davies (1947), *The Castles of County Cavan*) described what may have been the remains of three walls of a bawn enclosing an irregular rectangle 58m by 43.8m. The wall on the north-west side, which is likely to have housed the entrance, may have been removed during road construction. The first edition map dated 1835 indicates a ‗Castle‘ in ruins beside two structures and an enclosed rectangular plot.

144 Of note, located approximately 2.2km to the west of Tower 228, there are three unclassified cairns (CV034-041, CV034-058 and CV034-057) located on Lough an Leagh mountain. They will not be directly impacted upon. A photomontage and description of landscape and visual effects on Lough an Leagh are detailed in **Chapter 11** of this volume of the EIS.

145 Situated in a rough field in excess of 500m from the line route between Towers 227 and 228 is a site marked on the first edition map as a ‗Fair Green‘ and gravel pit. The archaeological inventory describes the site as not being an archaeological monument within the remit of the Archaeological Survey of Ireland. The ‗fair green‘ is presently located to the rear of a farmyard.

146 The present day Fair of Muff is held annually on the 12th August and is centred on a nearby road junction. Historically the fair dates to 1608 when King James I granted a licence to Mr. Gareth Fleming of Cabra, Kingscourt to hold a fair and market over three days. It may be of earlier provenance. More recently at the head of a road junction an information panel, plaque and a seating area have been installed. The ‗Fair Green‘ is marked on all editions of the 19th century OS maps and is marked as a sub-rectangular level area. The site of the modern fair is located in a low lying field to the east of the proposed development at a point where the proposed line approaches from the south and then turns to the north. It is not a designated cultural heritage site and will not be directly impacted upon. A photomontage and description of the landscape and visual effects are discussed in **Chapter 11** of this volume of the EIS.

147 From Tower 228 the line route continues south through Laragh townland passing approximately 400m west of Our Lady of Mount Carmel RC Church (RPS No. 184). The church is described in the NIAH as a modest-scale church in a prominent location, which retains its original form and much of its historic detailing. Built in 1858, this church replaced an earlier T-plan church dating from 1787. The altar window, c.1970, is from the Harry Clarke Studios. The belfry is also of interest for the quality of the decoration to the ironwork. Within the same townland are two ringforts (CV035-045 & 044) one of which, according to the survey notes, no above ground trace survives. The other fort (CV035-045) is located beside a dwelling house and a farm building and survives from its south-west circuit to the north-west.

148 From Tower 231 the line route travels directly south through Laragh, Corraneary (ED Enniskeen) and Carrowreagh townlands towards Clonturkan on the Meath border. Between Towers 235 and 236 the line route passes between two ringforts (CV035-014 & 034) one of which is visible as a tree copse along the roadway. Both these forts are located over 300m from the proposed line route.

14.4.5.10 Construction Materials Storage Yard

149 The proposed construction materials storage yard is located in a long rectangular field to the south-east of Carrickmacross along the edge of the N2 primary road. The site straddles the townlands of Monaltyduff and Monaltybane. There are no recorded monuments within the site; however there are two areas to the north-west and south-east where previously unknown archaeological sites were discovered during archaeological resolution of the development of the N2 road. The archaeological sites are classified as Excavation-Miscellaneous and relate to sub-surface features discovered prior to road construction (Excavation Licence No. 03E1298). Excavation of RMP MO031-132 to the north-west revealed a circular charcoal filled pit (diam. 2m; D 0.6m) and excavation of RMP MO031-133 revealed an isolated circular pit (diam. 1.5m; D 0.5m). Both sites were removed are now no longer extant.

150 With regard to the local architectural resource there are two Protected Structures located approximately 250m to the east of the construction materials storage yard on the opposite side of the N2. These sites are Monalty House (Ref. No. 41403111) described as a detached five-bay, three-storey, gable-ended double-pile house with basement, c. 1810 and associated two-storey outbuildings (Ref. No 41403185).

151 From a review of historical mapping including the first edition 6” map and the later second edition 25” map the proposed compound site was an undeveloped field adjacent to a gravel pit. Aerial photographs available on the OSI website show the site as being partially forested in 1995, a green field site in 2000 and in 2005 the site is shown as being entirely stripped of topsoil and being utilised as a spoil deposition area for the construction of the N2. Given the scale of earlier groundworks on the site no archaeological mitigation is required at this location.

14.5 POTENTIAL IMPACTS

14.5.1 Introduction

152 Potential impacts have been considered for both known and previously unrecorded archaeological, architectural and cultural heritage sites, for the construction, operation and decommissioning phases of the proposed development.

14.5.2 Evaluation of Impacts

153 In line with EPAs *Guidelines on the Information to be contained in Environmental Impact Statements* (March 2002) and DoECLGs *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*; the impact upon designated and undesignated archaeological, architectural and cultural heritage sites, structures, monuments or features (as detailed in **Appendices 14.2, 14.3 and 14.4, Volume 3C Appendices** of the EIS) have been evaluated using the following criteria.

14.5.2.1 Quality of Impacts

- Positive Impact: A change that improves or enhances an archaeological, architectural or cultural heritage site, structure, monument or feature or its setting;
- Neutral Impact: A change that does not affect an archaeological, architectural or cultural heritage site, structure, monument or feature or its setting; and
- Negative Impact: A change that will remove or negatively alter, whether in its entirety or not, an archaeological, architectural or cultural heritage site, structure, monument or feature, or detract from an observer‘s enjoyment or appreciation of its setting.

14.5.2.2 Significance of Impacts

- Imperceptible Impact: An impact capable of measurement but without noticeable consequences;
- Slight Impact: An impact, which causes noticeable changes in the character of the environment without affecting its sensitivities;
- Moderate Impact: An impact that alters the character of the environment in a manner that is consistent with existing and emerging trends;
- Significant Impact: An impact, which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment; and

- Profound Impact: An impact, which obliterates sensitive characteristics.

14.5.2.3 Duration of Impacts

- Temporary Impact: Impact lasting for one year or less;
- Short term Impact: Impact lasting one to seven years;
- Medium term Impact: Impact lasting seven to fifteen years;
- Long term Impact: Impact lasting fifteen to sixty years; and
- Permanent Impact: Impact lasting over sixty years.

14.5.2.4 Types of Impacts

- Cumulative Impact: The addition of many small impacts to create one larger, more significant, impact;
- ‗Do Nothing Impact‘: The environment as it would be in the future should no development of any kind be carried out;
- Indeterminable Impact: When the full consequences of a change in the environment cannot be described;
- Irreversible Impact: When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost;
- Residual Impact: The degree of environmental change that will occur after the proposed mitigation measures have taken effect; and
- ‗Worst Case‘ Impact: The impacts arising from a development in the case where mitigation measures substantially fail.

14.5.3 Construction Phase

154 Potential construction impacts may be direct, physical impacts on known and previously unrecorded archaeological, architectural or cultural heritage sites, structures, monuments or features. Care has been taken during the design stage to avoid such impacts, however where there remains a potential for such impacts mitigation measure are recommended. In relation to the proposed development, direct physical impacts on the archaeological, architectural and cultural heritage can manifest themselves in the following ways:

- Where an archaeological, architectural or cultural heritage site, structure, monument or feature is located within an area where works takes place and the works either intentionally or unintentionally entail the alteration or removal of all or part of the site, structure, monument or feature a direct, physical impact will occur.

- Direct, physical impacts can also occur in gaining access to the site. Where archaeological, architectural or cultural heritage sites, structures, monuments or features are intentionally or unintentionally removed or altered when transporting and / or facilitating access for machinery, equipment and / or materials to or from site for tower construction, and / or stringing of OHLs and /or construction of guarding areas, a direct physical impact will occur; and

- There is the potential for direct, physical impacts on previously unrecorded archaeological and architectural sites, structures, monuments or features.

155 If these impacts cannot be remediated, for example if archaeological deposits are destroyed during excavations, then the impacts will be permanent.

14.5.3.1 Archaeological Impacts

156 The following tables contain details of the potential direct, physical impacts that archaeological sites located within the vicinity of the proposed development may experience. To increase the clarity of this evaluation these tables also contain details of site specific mitigation measures. Further details regarding mitigation measures are contained in **Section 14.6**. It should be noted that not all sites of archaeological importance are represented below, only those that have a potential to be directly physically impacted upon by the proposed development. For details of all archaeological sites that are located within the vicinity of the proposed development please refer to **Appendix 14.2, Volume 3C Appendices** of the EIS.

157 Note that:

- The tables are listed in alphanumeric order by Sites and Monuments Record (SMR) number;

- ‗Distance to route‘ for archaeological monuments is the distance from the centre point of the data provided on the www.archaeology.ie website to the centreline of the proposed line route at its nearest point, rounded to the nearest 10m; and

- Similarly the ‗Distance to Nearest Tower‘ is the distance from the centre point of the data provided on the www.archaeology.ie website to the centre point of the tower.

Table 14.5: Potential Construction Phase Impacts on Archaeological Monument SMR No. MO014-021001-, Ringfort - Rath

ROI SMR No. MO014-021001 - Ringfort - Rath					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Lemgare	279806,328706	30	106	100
Potential Direct Physical Impacts: Tower 106 is located 90m from this ringfort and there is the potential that excavations associated with the construction of the tower could impact on associated archaeological deposits. There are also the ruins of a house nearby that appear on the first edition OS map.					
Mitigation: Given the proximity of Tower 106 to the archaeological monument and nearby house that appears on the first edition map it is recommended that pre-construction archaeological testing of Tower 106 site be undertaken under licence granted by the DAHG. Prior to construction a suitably qualified archaeologist will demarcate a buffer not less than 20m from the ringfort to prevent accidental damage.					
Residual impacts: Following demarcation there will be no inadvertent physical impacts on the archaeological monument. In the event that there are archaeological deposits discovered during archaeological testing they will excavated in full consultation with the National Monuments Service of the DAHG.					

Table 14.6: Potential Construction Phase Impacts on Archaeological Monument SMR No. MO014-021002-, Possible Building

ROI SMR No. MO014-021002 - Building possible					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Lemgare	279806,328706	30	106	100
Potential Direct Physical Impacts: Tower 106 is located 90m from this ringfort and there is the potential that excavations associated with the construction of the tower could impact on associated archaeological deposits. There are also the ruins of a house nearby that appear on the first edition OS map.					
Mitigation: Given the proximity of Tower 106 to the archaeological monument and nearby house that appears on the first edition map it is recommended that pre-construction archaeological testing of Tower 106 site be undertaken under licence granted by the DAHG. Prior to construction a suitably qualified archaeologist will demarcate a buffer not less than 20m from the ringfort to prevent accidental damage.					
Residual impacts: Following demarcation there will be no inadvertent physical impacts on the archaeological monument. In the event that there are archaeological deposits discovered during archaeological testing they will excavated in full consultation with the National Monuments Service of the DAHG.					

Table 14.7: Potential Construction Phase Impacts on Archaeological Monument SMR No. MO019-017----, Earthwork

ROI SMR No. MO019-017---- Ringfort - Rath					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Drumroosk	274850,323440	130	133	180
Potential Direct Physical Impacts: This site, which has no above ground trace appears as a 'Fort' on the First edition OSI map but does not feature on the later Second edition survey. Access for Tower 133 passes to the immediate west of the original bank of the fort and there is the potential that construction traffic could have a negative impact on sub surface archaeological remains.					
Mitigation: To prevent disturbance of associated archaeological deposits that may still be extant, during the construction of Tower 133 bog mats will be placed over the area of the ringfort under the supervision of a suitably qualified archaeologist.					

Residual impacts: The use of bog mats will prevent any impacts from construction traffic on any archaeological deposits that may remain *in situ*.

Table 14.8: Potential Construction Phase Impacts on Archaeological Monument SMR No. MO019-037----, Megalithic Tomb - Court Tomb

ROI SMR No. MO019-037---- Megalithic Tomb - Court Tomb					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Cornamucklagh South	275550,320000	50	143	190
Potential Direct Physical Impacts: This megalith is located in the south eastern corner of a steeply sloping field where it is proposed to erect a tower 203m to the north-west. There is the potential that the monument could be inadvertently impacted upon during the stringing of OHL.					
Mitigation: A suitably qualified archaeologist will demarcate a buffer of not less than 20m from the archaeological monument to protect it from accidental impact, archaeological monitoring is recommended for groundworks associated with the construction of Tower 143.					
Residual impacts: Following the demarcation of an appropriate buffer there will be no inadvertent physical impacts on the archaeological monument. In the event that there are archaeological deposits discovered during archaeological monitoring or groundworks they will be excavated in full consultation with the National Monument.					

Table 14.9: Potential Construction Phase Impacts on Archaeological Monument SMR No. MO019-038----, Ringfort - Rath

ROI SMR No. MO019-038---- Ringfort - Rath					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Cornamucklagh South	275770,319710	40	145	160
Potential Direct Physical Impacts: This ringfort is located 27m to the north-west of the OHL. Access for the construction of Tower 145 passes through a neighbouring field. There is the potential that construction and stringing works could inadvertently impact archaeological deposits associated with the site.					
Mitigation: A suitably qualified archaeologist will demarcate a buffer of not less than 20m from the archaeological monument to protect it from accidental impact. Furthermore it is recommended that archaeological monitoring of all groundworks associated with the construction of Tower 145 take place.					
Residual impacts: Following demarcation there will be no inadvertent physical impacts on the archaeological monument itself. In the event that there are archaeological deposits discovered during archaeological monitoring or groundworks associated with the construction of the tower they will excavated in full consultation with the National Monument.					

Table 14.10: Potential Construction Phase Impacts on Archaeological Monument SMR No. MO019-048----, Possible Megalithic Structure

ROI SMR No. MO019-048---- Anomalous stone group					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Derryhallagh (Monaghan By)	275477,323906	80	130	170
Potential Direct Physical Impacts: This stone group (possible) is located 160m to the north-west of the proposed development and 60m from the proposed stringing area. Given this proximity there is the potential that construction and stringing works could inadvertently impact upon the site.					
Mitigation: Given the potential for physical impacts during the construction phase of the proposed					

development, a suitably qualified archaeologist will demarcate a buffer no less than 20m from the outside limit of the monument.
Residual impacts: Following demarcation there will be no inadvertent physical impacts on the archaeological monument itself.

Table 14.11: Potential Construction Phase Impacts on Archaeological Monument SMR No. MO027-032----, Enclosure

ROI SMR No. MO027-032---- Enclosure					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Tullyglass	276782,311340	130	173	140
Potential Direct Physical Impacts: The proposed access track for the construction of Tower 173 passes in close proximity to this enclosure. It is noted that there is a gateway immediately adjacent to the monument that is the preferred access and that the topography in the area is quite steep. There is the potential that construction traffic could inadvertently impact on this site.					
Mitigation: A suitably qualified archaeologist will confirm the access and be on site during construction work to monitor the access. If necessary, bog mats will be used to ensure the preservation of sub surface deposits.					
Residual impacts: Following monitoring of the access and the use of bog mats as required, there will be no impacts on archaeological deposits associated with the adjacent monument.					

Table 14.12: Potential Construction Phase Impacts on Archaeological Monument SMR No. MO027-077----, Enclosure

ROI SMR No. MO027-077---- Enclosure					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Corrinenty	277041,309221	90	181	150
Potential Direct Physical Impacts: This enclosure is located 43m to the NE of the stringing area there is therefore the potential that the site may be inadvertently impacted on by construction traffic.					
Mitigation: A suitably qualified archaeologist will demarcate a buffer not less than 20m from the outer bank of the monument and monitor stringing works in the vicinity of the monument in order to avoid any accidental impacts.					
Residual impacts: Following demarcation there will be no inadvertent physical impacts on the archaeological monument.					

Table 14.13: Potential Construction Phase Impacts on Archaeological Monument SMR No. MO030-021----, Ringfort - Rath

ROI SMR No. MO030-021---- Ringfort - Rath					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Cornalaragh	276656,303851	40	201	90
Potential Direct Physical Impacts: This ringfort is located within 20m of the centreline of the proposed development and there is the potential that stringing works could inadvertently impact the site. Tower 201 is located approximately 70m from the outer bank of this monument and there is the potential that groundworks could impact on archaeological deposits associated with the monument.					
Mitigation: A suitably qualified archaeologist will demarcate a buffer of no less that 20m from the outer bank of the ringfort and carry out archaeological testing under licence to the National Monuments Service of the DAHG during the construction phase.					
Residual impacts: Following demarcation there will be no inadvertent physical impacts on the archaeological monument itself. In the event that there are archaeological deposits discovered during					

archaeological testing they will be excavated in full consultation with the National Monuments Service of the DAHG.

158 There are a number of tower locations where there is no potential for impact on a particular archaeological monument but there is considered to be a high potential of encountering archaeological deposits due to archaeological monuments within the surrounding area. **Table 14.14** details these tower locations.

Table 14.14: Other Tower Locations where there are Potential Archaeological Impacts

Tower number	Potential Impacts
107	There is the potential to impact on previously unrecorded archaeological deposits associated with nearby archaeological monuments, a court tomb (SMR No. MO014-022----) and an enclosure (NISMR No. ARM023-004----)
143	There is the potential to impact on previously unrecorded archaeological deposits associated with a nearby archaeological monument, a court tomb (SMR No. MO019-037----)
144	There is the potential to impact on previously unrecorded archaeological deposits associated with nearby archaeological monuments, a court tomb (SMR No. MO019-037----) and a ringfort-rath (SMR No. MO019-038----)
145	There is the potential to impact on previously unrecorded archaeological deposits associated with a nearby archaeological monument, a ringfort-rath (SMR No. MO019-038----)
180	There is the potential to impact on previously unrecorded archaeological deposits associated with a nearby archaeological monument, an enclosure (SMR No. MO027-077----)
181	There is the potential to impact on previously unrecorded archaeological deposits associated with a nearby archaeological monument, an enclosure (SMR No. MO027-077----)
186	There is the potential to impact on previously unrecorded archaeological deposits associated with nearby archaeological monuments, an enclosure (SMR No. MO027-072----) and an earthwork (SMR No. MO027-110----) and a ringfort-rath (NISMR No. MO027-074----)
193	There is the potential to impact on previously unrecorded archaeological deposits associated with a nearby archaeological monument, an enclosure (SMR No. MO027-096----)

14.5.3.1.1 Temporary Access Routes

159 There are several tower locations noted in Chapter 7, **Volume 3B** of the EIS where, depending on ground conditions, placing of temporary access tracks may be required to facilitate access to working areas, stringing areas and guarding areas. Excavation of topsoil associated with the placement of Type 3 temporary access tracks could have a permanent, negative impact on previously unrecorded archaeological deposits. However, the requirement for Type 3 access tracks has not been identified.

14.5.3.1.2 Guarding Areas

160 Obstacles such as road and distribution lines may have to be guarded by way of temporary guard poles and structures. There is the potential that excavation works associated with the construction of guarding areas could have a permanent, negative impact on previously

unrecorded archaeological deposits. **Tables 14.15 - 14.37** detail locations where there may be an impact.

161 Guarding areas are referenced according to the nearest tower, for example, ‗at Tower 107‘, or ‗south of Tower 111‘.

Table 14.15: Potential Impacts on Guarding Areas south-east and adjacent to Tower 107

Location of guarding – South-east and adjacent to Tower 107 (NGR 280120/328320)
Potential Impacts - The guarding area is located approximately 120m from a megalithic tomb (SMR No. MO014-022) that appears as a fort on the first edition OS map. Given the proximity of the archaeological monument there is the potential that groundworks associated with the construction of the guarding could impact on associated archaeological deposits. Also access for the construction of the guarding area is though a farmstead (CMSA_CHS006) that first appears on the first edition OS map and there is the potential that in gaining access associated historic structures or features could be impacted upon.
Mitigation Measures - A suitably qualified archaeologist will confirm the access and monitor groundworks associated with construction of the guarding
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.16: Potential Impacts on Guarding Areas south of Tower 111

Location of guarding - South of Tower 111 (NGR 280360/327020)
Potential Impacts - There is the potential that facilitating access for and the construction of the guarding could impact on the remains of two houses that appears on the first edition OS map (CMSA_CHS012 & CMSA_CHS011).
Mitigation Measures - A suitably qualified archaeologist will confirm the access and monitor groundworks associated with construction of the guarding.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.17: Potential Impacts on Guarding Areas south-west of Tower 121

Location of guarding - South-west of Tower 121 (NGR 277850/325920)
Potential Impacts - The first edition OS map indicates the presence of a lime kiln (CMSA_CHS018) on the north side of the road where the guarding is to be constructed. The kiln is not indicated on the second edition OS map although rough ground is indicated in the area. The area is now densely vegetated.
Mitigation Measures - A suitably qualified archaeologist will monitor groundworks associated with the construction of the guarding on the north-east side of the road.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.18: Potential Impacts on Guarding Areas south-west of Tower 124

Location of guarding - South-west of Tower 124 (NGR 276755/325465)
Potential Impacts - The first edition OS map indicates the presence of a house (CMSA_CHS022) on the north-east side of the road where the guarding is to be constructed. By the time of the second edition survey the house is no longer extant. There is the potential that the construction of the guarding in this area could impact on subsurface remains associated with the structure.
Mitigation Measures - A suitably qualified archaeologist will monitor groundworks associated with the construction of the guarding on the north-east side of the road.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.19: Potential Impacts on Guarding Areas south and adjacent to Tower 129

Location of guarding - South and adjacent to Tower 129 (NGR 275535/324190)
Potential Impacts - The first edition OS map indicates the presence of a house (CMSA_CHS031) on the south side of the road where the guarding is to be constructed. By the time of the second edition survey the house is no longer extant. There is the potential that the construction of the guarding in this area could impact on subsurface remains associated with the structure.
Mitigation Measures - A suitably qualified archaeologist will monitor groundworks associated with the construction of the guarding on the north-east side of the road
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.20: Potential Impacts on Guarding Areas south-west of Tower 131

Location of guarding – South-west of Tower 131 (NGR 274865/323645)
Potential Impacts - The first edition OS map indicates the presence of a house (CMSA_CHS034) on the south-west side of the road where the guarding is to be constructed. A trackway to a lime kiln just to the south-west of the guarding area is also indicated. By the time of the second edition survey the house and lime kiln are no longer extant. There is the potential that the construction of the guarding in this area could impact on subsurface remains associated with these structures.
Mitigation Measures - A suitably qualified archaeologist will monitor groundworks associated with the construction of the guarding on the south side of the road.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.21: Potential Impacts on Guarding Areas south-east of Tower 143

Location of guarding - South-east of Tower 143 (NGR 275510/319970)
Potential Impacts - The guarding area is located approximately 35m to the south-west of a court tomb (SMR No. MO019-037) that appears as 'The Cashel' on the first and second edition OS map. Given the proximity of the archaeological monument there is the potential that groundworks associated with the construction of the guarding could impact on associated archaeological deposits. Given the proximity of the monument there is the potential that it could be inadvertently impacted upon during the construction of the guarding.
Mitigation Measures - Where the guarding is to be constructed, a regime of archaeological testing will be undertaken, under licence to the National Monuments Service of the DAHG. During the construction phase a suitably qualified archaeologist will demarcate a buffer of not less than 20m from the nearby court tomb (SMR No. MO019-037), to ensure that there is no inadvertent damage.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.22: Potential Impacts on Guarding Areas north-west of Tower 144

Location of guarding - North-west of Tower 144 (NGR 275550/319910)
Potential Impacts - The guarding area is located approximately 50m to the south of a court tomb (SMR No. MO019-037) that appears as 'The Cashel' on the first and second edition OS map. Given the proximity of the archaeological monument there is the potential that groundworks associated with the construction of the guarding could impact on associated archaeological deposits. Given the proximity of the monument there is the potential that it could be inadvertently impacted upon during the construction of the guarding. Also the guarding on the south side of the road is located in very close proximity to a house that appears on the fisrt edition OS map (CMSA_CHS058).
Mitigation Measures - Where the guarding is to be constructed, a regime of archaeological testing will be undertaken, under licence to the National Monuments Service of the DAHG. During the construction phase a suitably qualified archaeologist will demarcate a buffer of not less than 20m from the nearby court tomb (SMR No. MO019-037), to ensure that there is no inadvertent damage.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.23: Potential Impacts on Guarding Areas south-east and adjacent to Tower 144

Location of guarding - South-east and adjacent to Tower 144 (NGR 275640/319810)
Potential Impacts - The guarding area is located approximately 120m to the north-west of a rath (SMR No. MO019-038) and 190m south-east of a court tomb (MO019-037). There is the potential that the construction of the guarding could impact on associated archaeological remains.
Mitigation Measures - A suitably qualified archaeologist will monitor groundworks associated with the construction of the guarding area.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.24: Potential Impacts on Guarding Areas south-west of Tower 161

Location of guarding - South-west of Tower 161 (NGR 277685/314595)
Potential Impacts - The guarding area is located where a number of structures appear on the first edition OS map, including a framstead (CMSA_CHS085) a house (CMSA_CHS086) and a well (CMSA_CHS087). These features are no longer extant but there is the potential that construction of the guarding area could impact on associated sub-surface remains.
Mitigation Measures - A suitably qualified archaeologist will monitor groundworks associated with the construction of the guarding area.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.25: Potential Impacts on Guarding Areas north of Tower 167

Location of guarding - North of Tower 167 (NGR 276430/313375)
Potential Impacts - There is the potential that facilitating access for and the construction of the guarding could impact on the remains of house that appears on the first edition OS map (CMSA_CHS094).
Mitigation Measures - A suitably qualified archaeologist will confirm the access and monitor groundworks associated with the construction of the guarding.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.26: Potential Impacts on Guarding Areas south of Tower 167

Location of guarding - South of Tower 167 (NGR 276400/313275)
Potential Impacts - The guarding area is located approximately 120m to the north-east of a rath (SMR No. MO024-032) that appears as a fort on the first edition OS map. Given the proximity of the archaeological monument there is the potential that groundworks associated with the construction of the guarding could impact on associated archaeological deposits.
Mitigation Measures - A suitably qualified archaeologist will confirm the access and monitor groundworks associated with the construction of the guarding.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.27: Potential Impacts on Guarding Areas south of Tower 169

Location of guarding - South of Tower 169 (NGR 276240/312515)
Potential Impacts - The guarding on the south side of the road is located in an area where a house was located during the first edition OS survey (CMSA_CHS099). There is the potential that groundworks associated with the construction of the guarding could impact on associated remains.
Mitigation Measures - A suitably qualified archaeologist will monitor groundworks associated with the construction of the guarding.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.28: Potential Impacts on Guarding Areas south-east of Tower 171

Location of guarding - South-east of Tower 171 (NGR 276635/311845)
Potential Impacts - There is the potential that facilitating access for and the construction of the guarding could impact on a demesne associated with Farm Hill and Tullyglass house.
Mitigation Measures – Confirmation of access by suitably qualified archaeologist subsequent to demarcation of vernacular or demesne features.
Residual Impacts - No predicted residual impacts.

Table 14.29: Potential Impacts on Guarding Areas north of Tower 175

Location of guarding - North of Tower 175 (NGR 277105/311030)
Potential Impacts - There is the potential that facilitating access for and the construction of the guarding could impact on the remains of house that appears on the first edition OS map (CMSA_CHS107).
Mitigation Measures - Confirmation of access by suitably qualified archaeologist
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.30: Potential Impacts on Guarding Areas north of Tower 178

Location of guarding - North of Tower 178 (NGR 277165/309945)
Potential Impacts - The guarding is located in an area where a house was situated during the first edition OS survey (CMSA_CHS111). There is the potential that groundworks associated with the construction of the guarding could impact on associated remains.
Mitigation Measures - A suitably qualified archaeologist will monitor groundworks associated with the construction of the guarding.
Residual Impacts - In the event that there are archaeological deposits discovered during

archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.31: Potential Impacts on Guarding Areas east of Tower 185

Location of guarding - East of Tower 185 (NGR 275950/308440)
Potential Impacts - Access for the construction of the guarding is via a lane servicing buildings that predate the first edition OS survey (CMSA_CHS122). There is the potential that in facilitating access, historic features associated with these buildings could inadvertently be impacted upon.
Mitigation Measures - Confirmation of access by suitably qualified archaeologist subsequent to demarcation of vernacular features.
Residual Impacts - No predicted residual impacts.

Table 14.32: Potential Impacts on Guarding Areas west of Tower 185

Location of guarding - West of Tower 185 (NGR 275675/308430)
Potential Impacts - The guarding area is located approximately 150m to the north-east of a rath (SMR No. MO027-074) that appears as a fort on the first edition OS map. Given the proximity of the archaeological monument there is the potential that groundworks associated with the construction of the guarding could impact on associated archaeological deposits.
Mitigation Measures - A suitably qualified archaeologist will monitor groundworks associated with the construction of the guarding.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.33: Potential Impacts on Guarding Areas east of Tower 186

Location of guarding - East of Tower 186 (NGR 275445/308420)
Potential Impacts - The guarding area is located approximately 100m to the north-west of a rath (SMR No. MO027-074) that appears as a fort on the first edition OS map. Given the proximity of the archaeological monument there is the potential that groundworks associated with the construction of the guarding could impact on associated archaeological deposits.
Mitigation Measures - A suitably qualified archaeologist will monitor groundworks associated with the construction of the guarding.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.34: Potential Impacts on Guarding Areas North and adjacent to Tower 188

Location of guarding - North and adjacent to Tower 188 (NGR 275135/307835)
Potential Impacts - The guarding is located in an area where there are two derelict buildings area in close proximity to the track.
Mitigation Measures - Confirmation of access by suitably qualified archaeologist
Residual Impacts - No predicted residual impacts

Table 14.35: Potential Impacts on Guarding Areas at Tower 195

Location of guarding - At tower 195 (NGR 275560/305460)
Potential Impacts - Access for the construction of the guarding is via a lane servicing buildings that predate the first edition OS survey (CMSA_CHS131). There is the potential that in facilitating access, historic features associated with these buildings could inadvetently be impacted upon.
Mitigation Measures - Confirmation of access by suitably qualified archaeologist, subsequent to demarcation of vernacular features.
Residual Impacts - No predicted residual impacts.

Table 14.36: Potential Impacts on Guarding Areas at Tower 216

Location of guarding - At Tower 216 (NGR 275520/299755)
Potential Impacts - The guarding is located in an area where a house was situated during the first edition OS survey (CMSA_CHS150). There is the potential that groundworks associated with the construction of the guarding could impact on associated remains.
Mitigation Measures - A suitably qualified archaeologist will monitor groundworks associated with the construction of the guarding.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Table 14.37: Potential Impacts on Guarding Areas north of Tower 233

Location of guarding - North of Tower 233 (NGR 274450/294255)
Potential Impacts - The guarding on the north side of the trackway is located in an area where a house was situated during the first edition OS survey (CMSA_CHS164). There is the potential that groundworks associated with the construction of the guarding could impact on associated remains.
Mitigation Measures - A suitably qualified archaeologist will monitor groundworks associated with the construction of the guarding.
Residual Impacts - In the event that there are archaeological deposits discovered during archaeological monitoring they will excavated in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

14.5.3.2 Architectural Impacts

162 There are no predicted construction phase, direct physical impacts on any designated architectural sites listed in either the RPS or NIAH for counties Monaghan and Cavan.

163 Between Towers 170 and 175 the proposed development passes through a region that is associated with Shantonagh House and Tully House historic landscapes. Both are listed in the Buildings of Ireland Garden Survey of the www.buildingsofireland.ie website. As noted in **Section 14.4.4.3**, the demesne landscapes and historic gardens have not been shaded on the first edition OSI maps but their extents were interpreted from the historic mapping. No demesne landscape or historic garden features, including boundary walls, gates, entrance features etc. were noted that will be directly impacted on by the proposed development. There will be a slight negative, permanent impact on these historic landscapes.

14.5.4 Operational Phase

164 The majority of potential operational effects will be impacts on the setting of archaeological, architectural or cultural heritage sites, structures, monuments or features. As has been noted previously, the greatest threat to the archaeological, architectural and cultural heritage of the region from this type of development consists of potential impacts on setting throughout the operational phase. Given the upstanding linear form of the proposed development, it has the potential to alter a person's appreciation or enjoyment of a site, structure, monument, feature or cultural heritage landscape even when these are located at a remove from the development.

Impacts on setting are best mitigated through sensitive routing of the proposed development during the earliest stages of constraints mapping, preliminary corridor selection and route selection. During the earlier stages of this project, sites where there was a high potential for impacts on their setting were highlighted so that they could be avoided as far as was practicably possible taking into account all the other constraints within the study area.

165 In line with the recommendations of the EPAs *Guidelines on the information to be contained in Environmental Impact Statements* (2002), only sites where it was considered that the significance of the impact on their setting would be moderate or greater are included in this section.

14.5.4.1 Archaeological Impacts

166 The following tables (**Tables 14.38 – 14.52**) contain details of the potential impacts that the proposed development could have on the setting of designated archaeological sites during the operational phase of the proposed development. As it is impractical to mitigate these impacts they will persist throughout the operational phase of the development and this is reflected in the residual impacts listed in the tables.

Table 14.38: Potential Operational Phase Impacts on Archaeological Monument SMR No. ARM023:004----, Enclosure

NI SMR No. ARM023:004 Enclosure					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Armagh	Crossbane	280050,328610	140	106	200
Potential Impacts on Setting: The site is well screened with internal trees and adjacent mature hedgerows. There are no vantage points where the site could be seen from local roads. The field report indicates that this earthwork may be an enclosure associated with an abandoned farm. The site is located 135m from the line route. There will be intervisibility with the proposed development, particularly to the south and south-east. The sensitivity of the site impacts on setting was found to be moderate and the magnitude of the impact on the site from the proposed development was considered to be substantial. The overall significance of the impact on the setting of the site will be moderate.					
Mitigation: none					
Residual impacts: There will be a moderate negative, permanent impact on the setting of the site during the operational life of the project.					

Table 14.39: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO014-021001-, Ringfort - Rath

ROI SMR No. MO014-021001- Ringfort - Rath					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Lemgare	279806,328706	30	106	100
Potential Impacts on Setting: This site is visible from a local access road located 400m to the south-west of the monument. The proposed development passes almost overhead, with Tower 105 located approximately 280m to the north-west and Tower 106 approximately 90m to the south-east. Given the proximity to the towers and the OHL the magnitude of the impact will be major. The sensitivity of the site to impacts on setting was found to be moderate. The significance of the impacts on the setting of the archaeological monument was found to be significant.					
Mitigation: None					
Residual impacts: There will be a significant negative, permanent impact on the setting of the site during the operational life of the project.					

Table 14.40: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO014-021002-, Building possible

ROI SMR No. MO014-021002- Building possible					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Dist. to Structure (m)**
Monaghan	Lemgare	279806,328706	30	106	100
Potential Impacts on Setting: MO014-021001 for details.					
Mitigation: See MO014-021001 for details.					
Residual impacts: See MO014-021001 for details.					

Table 14.41: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO014-022----, Megalithic Tomb - Court Tomb

ROI SMR No. MO014-022---- Megalithic Tomb - Court Tomb					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Lemgare	279970,328310	120	107	130
Potential Impacts on Setting: This court cairn is situated in the SE corner of a field 150m away from the nearest access road. The site is well screened and densely overgrown with both blackthorn and white thorn. The nearest Tower 107 is located 130m to the east. The sensitivity of the site to impacts on setting was found to be moderate. The magnitude of the impact on the site was found to be substantial. The overall significance of the impact on the setting of the site was found to be moderate.					
Mitigation: None					
Residual impacts: There will be a moderate, negative, permanent impact on the setting of the site during the operational life of the project.					

Table 14.42: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO019-016----, Megalithic Tomb - Portal Tomb

ROI SMR No. MO019-016---- Megalithic Tomb - Portal Tomb					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Lennan	274517,323253	210	133	220
Potential Impacts on Setting: This portal tomb is located in the saddle of hill, visible on the skyline from the nearby road to the west. The site is elevated and exposed, with expansive views over the surrounding area, particularly to the south. The sensitivity of the site to impacts on setting was found to be high. The proposed development will run from north to south approximately 210m to the east of the monument. The magnitude of the impact of the proposed development was found to be substantial to major. The overall significance of the impact of the proposed development on the setting is considered to be significant.					
Mitigation: None					
Residual impacts: There will be a significant, negative, permanent impact on the setting of the site during the operational life of the project.					

Table 14.43: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO019-037----, Megalithic Tomb - Court Tomb

ROI SMR No. MO019-037---- Megalithic Tomb - Court Tomb					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Cornamucklagh South	275550,320000	50	143	190
Potential Impacts on Setting: This monument is located in the corner of a field under a copse of trees ringed with field clearance stones. The site is not visible in the wider area and can only be appreciated within its immediate setting. The OHL passes 50m to the west with a tower located on the boundary of the field containing the monument to the north-west. Although the court of the tomb opens to the north-west, views of the tower will be limited by vegetation. The impact will be cumulative to an existing OHL crossing almost directly over the site. The sensitivity of the site to impacts on setting was found to be moderate to high. The magnitude of the impact on the site was found to be substantial. The overall significance on the impact on setting of the site was considered to be moderate.					
Mitigation: None					
Residual impacts: There will be a moderate negative, permanent impact on the setting of the site during the operational life of the project.					

Table 14.44: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO019-038----, Ringfort - Rath

ROI SMR No. MO019-038---- Ringfort - Rath					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Cornamucklagh South	275770,319710	40	145	160
Potential Impacts on Setting: This heavily overgrown fort is located on the summit of a hill (135m) with good views in all directions. The centre line of the proposed development is located approximately 25m from the site passing to the west of the summit from north-west to south-east. From the monument there will be several towers visible to both the north and south. The sensitivity of the site impacts on setting was found to be moderate. The magnitude of the impact on the monument was found to be major. The overall impact on the setting of the monument will be significant.					
Mitigation: None					
Residual impacts: There will be a significant negative, permanent impact on the setting of the site during the operational life of the project.					

Table 14.45: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO019-048, Megalithic Structure possible

ROI SMR No. MO019-048---- Anomalous stone group					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Derryhallagh (Monaghan By)	275477,323906	80	130	170
Potential Impacts on Setting: Known locally as the ‗Giant‘s Grave, this stone group is located on an elevation overlooking Ghost Lough. The site is not publicly accessible and it is not visible from roads in the vicinity. The proposed development passes from north-east to south-west approximately 80m to the north-west of the site. The sensitivity of the site to impacts on setting was deemed to be moderate to high. The magnitude of the impact on the setting of the site was considered to be substantial. The overall impact on the setting of the site by the proposed development was considered moderate.					
Mitigation: None					
Residual impacts: There will be a moderate negative, permanent impact on the setting of the site during the operational life of the project.					

Table 14.46: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO024-032--, Ringfort - Rath

ROI SMR No. MO024-032---- Ringfort - Rath					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Aghmakerr	276278,313173	90	167	180
Potential Impacts on Setting: From aerial evidence this site is very overgrown with scrub and mature trees, the rath is on the slope of a hill in average pasture with limited views due to high ground both to the north and south. The rath is located 74m to the west of the line route, there is an intervening field boundary with mature trees that will provide some screening, however there will be inter-visibility particularly to the south and the south-east. The magnitude of the impact on this site will be substantial, the sensitivity of this area to impacts was considered moderate. The overall significance of the impact on the setting will be moderate.					
Mitigation: None					
Residual impacts: There will be a moderate negative, permanent impact on the setting of the site during the operational life of the project.					

Table 14.47: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO024-034001-, Church

ROI SMR No. MO024-034001- Church					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Lattonfasky	278700,313990	1160	161	1160
Potential Impacts on Setting: Templemoyle is located on the north eastern shore of Lough Egish 1159m from the nearest Tower 161. Access to the church and graveyard is via a rough lane. From the site, which is a signposted amenity area there will be distant views across the lake towards the scheme. The view to the west north-west will see the development breaks the horizon of a low hill beyond the R181 road. The sensitivity of the site to impacts on setting was found to be high and the magnitude of the impact on the setting of the site moderate to substantial. The overall significance of the impact of the proposed development on the setting of the site was considered to be moderate.					
Mitigation: None					
Residual impacts: There will be a moderate negative, permanent impact on the setting of the site during the operational life of the project.					

Table 14.48: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO027-076001-, Ringfort - Rath

ROI SMR No. MO027-076001- Ringfort - Rath					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Ummerafree	276080,308290	150	184	180
Potential Impacts on Setting: This heavily vegetated ringfort is located on the summit of a ridge and appears to be in good condition. Generally roads in this area follow steep sided valleys limiting the immediate viewshed. The proposed development runs from east to west approximately 180m to the north of the site. There are a number of other recorded monuments to the west and north of this fort all of which have been completely destroyed. The sensitivity of the site to impacts on setting was found to be moderate. The magnitude of the impact was found to be substantial. The overall significance of the impact on the setting of the monument was found to be moderate.					
Mitigation: None					
Residual impacts: There will be a moderate, negative, permanent impact on the setting of the site during the operational life of the project.					

Table 14.49: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO027-076002-, Hut Site

ROI SMR No. MO027-076002- Hut Site					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Ummerafree	276080,308290	150	184	180
Potential Impacts on Setting: See MO027-076001 for details					
Mitigation: See MO027-076001 for details					
Residual impacts: See MO027-076001 for details					

Table 14.50: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO027-077----, Enclosure

ROI SMR No. MO027-077---- Enclosure					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Dist. to Structure (m)**
Monaghan	Corrinenty	277041,309221	90	181	150
Potential Impacts on Setting: This site is defined by a grassed over, sub-rectangular bank in a field of poor pasture with frequent gorse bushes. Within the enclosure there are a number of anomalies that may indicate small scale quarrying and/or the presence of a hut site. The site is oversailed by an existing 110 kV transmission line. The proposed OHL passes 80m to the west of the site with an intervening hedgerow. The sensitivity of the site to impacts on setting was found to be moderate and the magnitude of the impact substantial. The overall significance of the impact from the proposed development was found to be moderate and cumulative to the existing impact from the 110 kV OHL.					
Mitigation: None					
Residual impacts: There will be a moderate negative, permanent impact on the setting of the site during the operational life of the project.					

Table 14.51: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO030-021----, Ringfort - Rath

ROI SMR No. MO030-021---- Ringfort - Rath					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Dist. to Structure (m)**
Monaghan	Cornalaragh	276656,303851	40	201	90
Potential Impacts on Setting: This ringfort lies approximately 20m to the east of the centreline of the proposed development occupying the summit of a ridge with an elevation of 177m. The site is visible as a circular enclosure lined with mature trees with three field boundaries extending from its bank to the north-east, north-west and south south-east. The OHL passes to the west and south-west of the line within the same field. The sensitivity of the site to impacts on setting was deemed to be moderate to high and the magnitude of the impact on the monument was considered to be substantial to major. The overall significance of the impact on the setting of the monument was found to be significant.					
Mitigation: None					
Residual impacts: There will be a significant negative, permanent impact on the setting of the site during the operational life of the project.					

Table 14.52: Potential Operational Phase Impacts on Archaeological Monument SMR No. MO030-037----, Ringfort - Rath

ROI SMR No. MO030-037---- Ringfort - Rath					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Tower (No.)**	**Distance to Structure (m)**
Monaghan	Scalkill	276150,301320	130	211	200
Potential Impacts on Setting: This treelined ringfort occupies the south eastern edge of a ridge within a field surrounded by mature hedgerows (elevation 160m). A lane runs along its northern circuit providing access to a farmyard. From the nearby road, located 130m to the south-west, the fort is visible as a tree copse. This site has a high sensitivity to impacts based on its elevation. The magnitude of the impact of the OHL located 113m to the south-east was considered substantial. The overall impact on the setting of the monument was found to be significant.					
Mitigation: None					
Residual impacts: There will be a significant, negative, permanent impact on the setting of the site during the operational life of the project.					

14.5.4.2 Architectural Impacts

167 **Table 14.53** contains details of the potential impacts that the proposed development could have on the setting of designated architectural sites during the operational phase of the proposed development. In addition the table contains mitigation measures that could reduce the significance of these impacts and detail the residual impacts to be expected.

Table 14.53: Potential Operational Phase Impacts on St. Patrick's Church, Ardragh, RPS No. 41402713 / NIAH Ref: 41402727

St Patrick's Church, 1865-1875. NIAH Rating - Regional RPS Ref: 41402713 / NIAH Ref: 41402727					
County	**Townland**	**NGR**	**Distance to Route (m)**	**Nearest Structure (No.)**	**Distance to Structure (m)**
Monaghan	Ardragh	276189,306201	750	193	750

Potential Impacts on Setting: This roadside church is located on a low hill surrounded by trees, in a particularly attractive and well maintained site. The church faces west overlooking a small lake and ridge, towards the line route 750m away. The development will be visible crossing the high ground. The sensitivity of the site to impacts on setting was considered to be high and the magnitude of the impact substantial. The overall significance of the impact will be moderate to significant.
Mitigation: The planting of screening along the western margin would reduce the impact of the proposed development on the setting of the site but it would also remove a significant view.
Residual Impacts: There will be a moderate to significant permanent negative impact on the setting of this church during the operational phase of the proposed development.

14.5.5 Operational Phase – Maintenance / Upgrade Works

168 There is the potential that archaeological, architectural or cultural heritage sites, monuments, structures or features in the vicinity of the line route could be impacted on during maintenance or upgrade works that may be required throughout the operational phase of the proposed development.

14.5.6 Decommissioning

169 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration.

14.5.7 Indirect Impacts

170 No indirect impacts are predicted in the assessment of impacts for the proposed development.

14.6 MITIGATION MEASURES

14.6.1 Construction Phase - Direct Physical Impacts

171 The best form of mitigation, preservation in situ, is achieved by routing to avoid direct physical impacts upon archaeological, architectural and cultural heritage site, structures, monuments and features. All designated archaeological, architectural and cultural heritage sites, structures, monuments or features have been avoided by the design team as far as was practicably possible, taking into account all the environmental constraints within the CMSA.

172 The *National Monuments Act,* as amended requires that, in the event of the discovery of archaeological finds or remains that the relevant authorities, the National Monuments Service of

the DAHG and the National Museum of Ireland, should be notified immediately. Allowance will be made for full archaeological excavation, in consultation with the National Monuments Service of the DAHG, in the event that archaeological remains are found during the construction phase.

173 In areas where there is the potential that archaeological, architectural or cultural heritage site, structures, monuments or features could be impacted on during the construction phase, one or more of the following mitigations measures have been recommended:

- Archaeological monitoring — in areas of moderate archaeological potential, excavations associated with construction works and / or facilitating access to the construction site and / or stringing areas will be monitored by a suitably qualified archaeologist. In the event that archaeological deposits are discovered, work in the area will cease immediately and the archaeologist will liaise with the National Monuments Service of the DAHG and the National Museum of Ireland.

- Archaeological testing – best practice in areas of high archaeological potential demands caution, to ensure that archaeological deposits are identified as early as possible, thereby ensuring that any loss from the archaeological record is minimised. Under a monitoring remit, an archaeologist will observe normal construction works, usually undertaken with a toothed excavator bucket. During archaeological testing a licensed eligible archaeologist supervises excavations undertaken with a toothless grading bucket, under licence to the National Monuments Service of the DAHG, thereby ensuring the early identification of archaeological deposits and minimal loss to the archaeological record. Undertaking this confirmatory surveying will ensure that sufficient time can be allowed within the construction schedule for the excavation of any archaeological deposits discovered.

- Demarcation – where it has been identified that there is the potential that an archaeological, architectural or cultural heritage site, structure or monument could be impacted upon in gaining access to construct the proposed development then demarcation has been recommended to prevent any inadvertent damage. A suitably qualified archaeologist will access the site prior to the commencement of construction works in the area and demarcate a buffer around the monument that will remain in place throughout any construction works in the vicinity.

- Confirmation of temporary access routes – at a number of locations confirmation of the proposed temporary access routes will take place, in consultation with the construction team and prior to commencement of construction works, to ensure that the surviving historic fabric of buildings is not impacted on in gaining access for construction activities. To this end the temporary access routes may be revised, sensitive features highlighted and demarcated or different construction machinery or methods used that can access the site without impacting on the historic fabric.

- Monitoring of tree surgery – in a couple of instances there is dense vegetation that will have be to be trimmed in the vicinity of upstanding remains of buildings that are indicated on historic mapping. This work will be monitored by a suitably qualified archaeologist to ensure that the historic fabric of the buildings is not impacted upon by the works.

174 It is recommended that a suitably qualified cultural heritage consultancy / consultant be appointed to oversee the effective implementation of the mitigation measures recommended in this chapter for the construction phase of the proposed development. The consultancy / consultant should maintain continuing liaison with the National Monuments Service of the DAHG throughout the construction phase of the development.

175 In line with the *Code of Practice Between the National Monuments Service of the DoEHLG (now DAHG) and ESB Networks* (2009), a project archaeologist will be appointed to oversee the effective implementation of the recommended archaeological mitigation during the proposed works. Appendix I of the Code of Practice defines the role of the project archaeologist and Appendix II sets out the relationship between the project archaeologist and the consultant archaeologist.

14.6.1.1 Tower Locations and Associated Temporary Access Routes

176 For clarity, detailed site specific mitigation measures that relate to designated archaeological and architectural sites are contained in the tables in **Section 14.5**. A summary of the mitigation measures is contained in **Table 14.54**. The mitigation measures are listed by tower number, providing a summary of mitigation measures that apply to the construction of each tower and or works that are associated with facilitating access to the tower. Towers where no mitigation is required are not contained in the table.

Table 14.54: Summary of Mitigation Measures Listed by each Tower Number

Tower number	Mitigation
103	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
104	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
106	Archaeological testing under licence to the National Monuments Service of the DAHG and a suitably qualified archaeologist will confirm the access and demarcate a buffer around nearby monument SMR No. MO014-021001 during the construction phase. Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.

Tower number	Mitigation
107	Archaeological monitoring by suitably qualified archaeologist and confirmation of access by a suitably qualified archaeologist.
108	Confirmation of access by a suitably qualified archaeologist.
110	Monitoring of tree surgery in the area of farm complex to the south of tower that appears on historic mapping.
111	Confirmation of access by a suitably qualified archaeologist.
112	Confirmation of access by a suitably qualified archaeologist.
116	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
117	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
118	Confirmation of access by a suitably qualified archaeologist.
119	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
120	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
123	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
126	Confirmation of access by a suitably qualified archaeologist. Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
127	Monitoring of tree surgery in the area of farm complex to the north of tower that appears on historic mapping.
130	A suitably qualified archaeologist will demarcate a buffer around nearby monument SMR No. MO019-048---- during the construction phase. Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
131	Confirmation of access by a suitably qualified archaeologist.
133	A suitably qualified archaeologist will supervise laying of bog mats in the vicinity of monument SMR No. MO019-017---- during the construction phase.
135	Monitoring of tree surgery in the area of farm complex to the south of tower that appears on historic mapping.
137	Monitoring of tree surgery in the area of farm complex to the south of tower that appears on historic mapping.
143	Archaeological monitoring by a suitably qualified archaeologist and demarcation of buffer around nearby monument SMR No. MO019-037 during the construction phase.
144	Archaeological monitoring by a suitably qualified archaeologist and demarcation of buffer around nearby monument SMR No. MO019-038 during the construction phase.
145	Archaeological monitoring by a suitably qualified archaeologist and demarcation of buffer around nearby monument SMR No. MO019-038 during the construction phase.
150	Monitoring of tree surgery in the area of farm complex to the south of tower that appears on historic mapping.
154	Confirmation of access by a suitably qualified archaeologist.
166	Confirmation of access by a suitably qualified archaeologist.
167	Confirmation of access by a suitably qualified archaeologist.
168	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
171	Confirmation of access by a suitably qualified archaeologist.

Tower number	Mitigation
172	Confirmation of access by a suitably qualified archaeologist.
173	Monitoring of access adjacent to SMR No. MO027-032 by suitably qualified archaeologist and use of bog mats if necessary.
175	Confirmation of access by a suitably qualified archaeologist.
177	Confirmation of access by a suitably qualified archaeologist.
179	Confirmation of access by a suitably qualified archaeologist.
180	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
181	A suitably qualified archaeologist will demarcate a buffer around nearby monument SMR No. MO027-077 during the construction phase and monitor stringing works adjacent to the monument. Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
182	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
184	Confirmation of access by a suitably qualified archaeologist.
186	Archaeological monitoring by a suitably qualified archaeologist.
188	Confirmation of access by a suitably qualified archaeologist.
193	Archaeological monitoring by a suitably qualified archaeologist.
195	Confirmation of access by a suitably qualified archaeologist.
196	Confirmation of access by a suitably qualified archaeologist.
197	Confirmation of access by a suitably qualified archaeologist.
201	Archaeological testing under licence to the National Monuments Service of the DAHG and demarcation of buffer around nearby monument SMR No. MO030-021 during the construction phase.
202	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
211	Confirmation of access by a suitably qualified archaeologist.
218	Confirmation of access by a suitably qualified archaeologist.
219	Confirmation of access by a suitably qualified archaeologist.
222	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
223	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
229	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
232	Should stripping of topsoil be required for the placement of access tracks, then a suitably qualified archaeologist will be employed to monitor this work.
233	Confirmation of access by a suitably qualified archaeologist.
234	Confirmation of access by a suitably qualified archaeologist.

14.6.1.2 Guarding Areas

177 A summary of the mitigation measures is contained in **Table 14.55.** The mitigation measures are listed by guarding area location and national grid reference (NGR) with a summary of

mitigation measures that apply to construction works associated with each guarding area. Locations where no mitigation is required are not contained in the table.

Table 14.55: Mitigations for Guarding Areas

Guarding Area Location	NGR	Mitigation Summary
South-east and adjacent to Tower 107	280120/328320	Confirmation of access by suitably qualified archaeologist and archaeological monitoring of groundworks.
South of Tower 111	280360/327020	Confirmation of access by suitably qualified archaeologist and archaeological monitoring of groundworks.
South-west of Tower 121	277850/325920	Archaeological monitoring of groundworks.
South-west of Tower 124	276755/325465	Archaeological monitoring of groundworks.
South and adjacent to Tower 129	275535/324190	Archaeological monitoring of groundworks.
South-west of Tower 131	274865/323645	Archaeological monitoring of groundworks.
South-east of Tower 143	275510/319970	Archaeological testing under licence to the National Monuments Service of the DAHG and demarcation of nearby court tomb (SMR No. MO019-037).
North-west of Tower 144	275550/319910	Archaeological testing under licence to the National Monuments Service of the DAHG and demarcation of nearby court tomb (SMR No. MO019-037).
South-east and adjacent to Tower 144	275640/319810	Archaeological monitoring of groundworks.
South-west of Tower 161	277685/314595	Archaeological monitoring of groundworks.
North of Tower 167	276430/313375	Confirmation of access by suitably qualified archaeologist and archaeological monitoring of groundworks.
South of Tower 167	276400/313275	Confirmation of access by suitably qualified archaeologist and archaeological monitoring of groundworks.
South of Tower 169	276240/312515	Archaeological monitoring of groundworks.
South-east of Tower 171	276635/311845	Confirmation of access by suitably qualified archaeologist.
North of Tower 175	277105/311030	Confirmation of access by suitably qualified archaeologist.
North of Tower 178	277165/309945	Archaeological monitoring of groundworks.
East of Tower 185	275950/308440	Confirmation of access by suitably qualified archaeologist.
West of Tower 185	275675/308430	Archaeological monitoring of groundworks.
East of Tower 186	275445/308420	Archaeological monitoring of groundworks.
North and adjacent to Tower 188	275135/307835	Confirmation of access by suitably qualified archaeologist.
At Tower 195	275560/305460	Confirmation of access by suitably qualified archaeologist.
At Tower 216	275520/299755	Archaeological monitoring of groundworks.

Guarding Area Location	NGR	Mitigation Summary
North of Tower 233	274450/294255	Archaeological monitoring of groundworks.

14.6.2 Operational Phase

178 As has been noted previously in this chapter, impacts on setting are best mitigated through sensitive routing of the proposed development to avoid impacts on particularly sensitive archaeological, architectural and cultural heritage sites, structures, monuments, features or landscapes. From the earliest stages of this project every attempt has been made to minimise the impacts that it will have on the setting on the archaeological, architectural and cultural heritage of the region. Despite this, it has not been possible, given the large influence that an upstanding linear development such as has been proposed and other competing environment and social factors to avoid all impacts on setting. In most instances it is not possible to further mitigate the impacts on setting that have been predicted in the **Section 14.5**.

14.6.3 Operational Phase – Maintenance / Upgrade Works

179 Potential impacts on archaeological, architectural or cultural heritage sites, monuments, structures or features during maintenance or upgrade works that may be required during the operational phase of the proposed development are best mitigated through ongoing liaison with the National Monuments Service and the Architectural Heritage Advisory Unit at the DAHG and local heritage and conservation officers within the County Councils.

14.6.4 Indirect Impacts

180 No indirect impacts were predicted in the evaluation of impacts for the proposed development.

14.7 RESIDUAL IMPACTS

14.7.1 Archaeological

14.7.1.1 Construction Phase

181 Following mitigation there will be no direct physical impacts on the upstanding remains of any known archaeological monuments during the construction phase of the proposed development. There is the potential that archaeological deposits in the vicinity of known archaeological monuments or in areas of high archaeological potential may be encountered during the excavation associated with the construction of tower foundations, guarding areas or other excavation works associated with the proposed development. Following mitigation these will be dealt with in accordance with best practice and in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

14.7.1.2 Operational Phase

182 There will be ongoing impacts on the setting of archaeological monuments throughout the operational phase of the proposed development. **Table 14.56** lists archaeological monuments that are located in the vicinity of the proposed development and the impact that they will experience on their setting. Only sites where the significance of the impact was considered to be moderate or higher are included in the table.

Table 14.56: Residual Impacts on Archaeological Monuments

SMR No.	Classification	Residual Impact
ARM023:004	Enclosure	There will be a moderate negative, permanent impact on the setting of the site during the operational life of the project.
MO014-021001-	Ringfort - Rath	There will be a significant negative, permanent impact on the setting of the site during the operational life of the project.
MO014-021002-	Building possible	See MO014-021001- for details.
MO014-022----	Megalithic Tomb - Court Tomb	There will be a moderate, negative, permanent impact on the setting of the site during the operational life of the project.
MO019-016----	Megalithic Tomb - Portal Tomb	There will be a significant, negative, permanent impact on the setting of the site during the operational life of the project.
MO019-037----	Megalithic Tomb - Court Tomb	There will be a moderate negative, permanent impact on the setting of the site during the operational life of the project.
MO019-038----	Ringfort - Rath	There will be a significant negative, permanent impact on the setting of the site during the operational life of the project.
MO019-048----	Anomalous stone group	There will be a moderate negative, permanent impact on the setting of the site during the operational life of the project.
MO024-032----	Ringfort - Rath	There will be a moderate negative, permanent impact on the setting of the site during the operational life of the project.
MO024-034001-	Church	There will be a moderate negative, permanent impact on the setting of the site during the operational life of the project.
MO027-076001-	Ringfort - Rath	There will be a moderate, negative, permanent impact on the setting of the site during the operational life of the project.
MO027-076002-	Hut Site	See MO027-076001- for details
MO027-077----	Enclosure	There will be a moderate negative, permanent impact on the setting of the site during the operational life of the project.
MO030-021----	Ringfort - Rath	There will be a significant negative, permanent impact on the setting of the site during the operational life of the project.

SMR No.	Classification	Residual Impact
MO030-037----	Ringfort - Rath	There will be a significant, negative, permanent impact on the setting of the site during the operational life of the project.

183 Impacts on any archaeological sites, monuments, structures or features as a result of maintenance or upgrade works during the operational phase will be mitigated through ongoing liaison the National Monuments Service of the DAHG and local heritage officers.

14.7.2 Architectural

14.7.2.1 Construction Phase

184 There are no predicted impacts on any designated architectural sites during the construction phase of the proposed development.

185 There are a number of sites where there is the potential that construction traffic could inadvertently impact on the surviving fabric of structures that appear in the historic maps and in such instances the temporary access routes will be monitored to ensure that such fabric is not impacted upon.

14.7.2.2 Operational Phase

186 There will be ongoing impacts on the setting of architectural sites throughout the operational phase of the proposed development. **Table 14.57** lists architectural sites that are located in the vicinity of the proposed development and the impact that they will experience on their setting. Only sites where the significance of the impact was considered to be moderate or higher are included in the table.

Table 14.57: Residual Impacts on Architectural Sites

RPS No.	County	Name	Residual Impact
41402713	Monaghan	St Patrick's Church	There will be a moderate to significant permanent negative impact on the setting of this church during the operational phase of the proposed development.

187 Impacts on any architectural sites or structures as a result of maintenance or upgrade works during the operational phase will be mitigated through ongoing liaison with the architectural heritage advisory unit at the DAHG and local authority conservation officers.

14.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS

188 There are potential interrelationships with the following environmental topics:

- **Chapter 4** - Human Beings – Tourism and Amenity - some of the more prominent archaeological, architectural or cultural heritage sites, structures, monuments or features may also be tourist attractions. The proposed development may be perceived as reducing the attractiveness of these sites by having an impact on their setting.

- **Chapter 6** - Flora and Fauna - the proposed development can impact on demesne boundaries or planted landscape features within a demesne. The proposed development may be perceived as reducing the attractiveness of these sites by having an impact on their setting.

- **Chapter 9** - Noise and Vibration - noise from high voltage OHLs can impact on the setting of archaeological, architectural or cultural heritage sites, structures, monuments or features. The proposed development may be perceived as reducing the attractiveness of these sites by having an impact on their setting.

- **Chapter 11** - Landscape - the proposed development will form a new feature in the environment and impact visually on sites which are of archaeological, architectural and cultural heritage importance, some of which will be prominent landscape features and may contain important views or prospects.

14.9 CONCLUSION

189 The archaeological, architectural and cultural heritage appraisal for the CMSA evaluates both the direct and indirect impacts on the archaeological, architectural and cultural heritage resource in the vicinity of the proposed development. In accordance with the relevant legislation and DAHG policy, the main mitigation measures involves preservation in situ, thereby avoiding direct, physical impacts on known archaeological sites. All designated cultural heritage sites have been avoided as far as was practicably possible, with due regard to other disciplines and constraints. Recommendations to prevent or mitigate impacts include demarcating appropriate buffers around sites, supervision of vegetation clearance, and / or archaeological pre-development testing or monitoring of groundworks. These mitigation measures will be implemented at the construction phase to minimise and / or eliminate impacts.

190 The appraisal found that there will be no direct, physical impacts on the upstanding remains of previously recorded archaeological monuments. The closest monument to proposed ground works, a ringfort-rath (SMR No. MO030-021) is located approximately 70m from Tower 201. It was noted that there is the potential that subsurface archaeological remains associated with this site could be impacted on by the proposed development. A total of seven monuments are

located between 100m and 200m from the proposed development. It was found that there is a potential that archaeological deposits associated with these seven archaeological monuments could be directly, physically impacted upon during the construction stage. These impacts relate to construction traffic passing in close proximity to archaeological monuments and / or archaeological monuments that are located in close proximity to proposed groundworks (<150m) where there is the potential that associated archaeological remains could be impacted upon. Appropriate mitigation will ensure there are no physical impacts on upstanding archaeological remains, that subsurface archaeological remains associated with previously recorded monuments are protected from construction traffic and inadvertent impacts, and that in areas of high archaeological potential that archaeological deposits discovered during construction are dealt with in accordance with professional best practice in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland. Eight guarding areas are situated at the locations of no longer extant buildings depicted in the 1st or 2nd edition OS maps. There is the potential to encounter cultural heritage remains at these locations. Any archaeological deposits discovered during construction at these locations should be dealt with in accordance with professional best practice in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland. There will be a slight, negative, direct, physical impact on the historic landscapes associated with Shantonagh House and Tully House.

191 With regard to architectural heritage, there are no predicted construction phase, direct physical impacts.

192 Given the upstanding linear form of the proposed development it is acknowledged that the greatest potential for impacts constitutes impacts on the setting of cultural heritage sites during the operational phase. Sites where it was considered that the significance of the impact on their setting would be moderate or greater include 15 SMR‘s and one protected structure.

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