

RPS

North-South 400 kV Interconnection Development

An Bord Pleanála Reference: PCI0001

Environmental Impact Statement

Volume 3A

Non-Technical Summary

(Updated DAF)



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TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	PURPOSE AND CONTENT OF THE NON-TECHNICAL SUMMARY	1
1.2	REQUIREMENT FOR AN ENVIRONMENTAL IMPACT ASSESSMENT, APPROPRIATE ASSESSMENT AND TRANSBOUNDARY IMPACT	3
1.3	DIFFICULTIES ARISING DURING THE PREPARATION OF THE EIS	4
1.4	SCOPING THE EIS	4
1.5	ENVIRONMENTAL IMPACT STATEMENT STUDY TEAM	5
2	NATURE OF AND NEED FOR THE PROPOSED DEVELOPMENT	7
2.1	INTRODUCTION.....	7
2.1.1	System Operator Northern Ireland Proposed Development	7
2.1.2	EirGrid Proposed Development.....	8
2.1.3	Project of Common Interest.....	11
2.2	STRATEGIC NEED	11
2.2.1	Need for the Proposed Development.....	11
2.2.2	Benefits of the Proposed Development.....	12
3	MAIN ALTERNATIVES CONSIDERED	14
3.1	TRANSMISSION & TECHNOLOGY ALTERNATIVES.....	14
3.1.1	High Voltage Direct Current (HVDC) and High Voltage Alternating Current (HVAC) Technology	14
3.1.2	AC Overhead Line and Underground Cable	15
3.1.3	Partial Undergrounding	16
3.1.4	Overhead Line Design Considerations	18
3.1.5	Route Alternatives	20
4	DESCRIPTION OF THE PROPOSED DEVELOPMENT	32
4.1	ELEMENTS OF THE PROPOSED DEVELOPMENT	32
4.1.1	Description of Line Route	32
4.1.2	Overhead Line Elements.....	36
4.1.3	Fixing of Tower Positions	37
4.1.4	Works to Existing Overhead Line and Works within the Substation Site	38
4.1.5	Construction	38
5	ENVIRONMENTAL TOPICS COVERED IN THE ENVIRONMENTAL IMPACT STATEMENT	42
5.1	INTRODUCTION.....	42
5.2	HUMAN BEINGS – POPULATION & ECONOMIC	42
5.3	HUMAN BEINGS – LAND USE	44
5.4	HUMAN BEINGS – TOURISM AND AMENITY.....	48
5.5	HUMAN BEINGS – ELECTRIC MAGNETIC FIELDS	52
5.6	FLORA AND FAUNA.....	55

5.7	SOILS, GEOLOGY AND HYDROGEOLOGY.....	62
5.8	WATER	65
5.9	AIR – NOISE AND VIBRATION.....	67
5.10	AIR – QUALITY AND CLIMATE.....	70
5.11	LANDSCAPE	71
5.12	MATERIAL ASSETS – GENERAL.....	76
5.13	MATERIAL ASSETS – TRAFFIC	79
5.14	CULTURAL HERITAGE.....	82
5.15	TRANSBOUNDARY IMPACTS.....	88
	5.15.1 Conclusions	92
5.16	CUMULATIVE IMPACTS AND IMPACT INTERACTIONS	92
	5.16.1 Cumulative Impact and the Proposed Interconnector.....	99
	5.16.2 Conclusions	100
5.17	IMPACT INTERACTIONS	101
5.18	SUMMARY OF LIKELY SIGNIFICANT EFFECTS	103
5.19	SUMMARY OF MITIGATION MEASURES	107

LIST OF FIGURES

Figure 3.1:	Outline Drawings of Lattice Steel Towers (not to scale).....	20
Figure 3.2:	Opportunity for Strategic Linkage Between the Second Interconnector Project Option 4(b) and Transmission Reinforcement in the North-East Project Option A2 – at a Location along the Existing Flagford-Louth 220 kV Circuit	22
Figure 3.3:	The Cavan Monaghan Study Area and the Meath Study Area	23
Figure 3.4:	Potential Route Corridor Options A, B and C in the Cavan Monaghan Study Area (previously the Cross Border Study Area) and Potential Route Corridor Options 1, 2, 3A and 3B in the Meath Study Area (previously the North East Study Area).....	25
Figure 3.5:	Preferred Route Corridor A/3B for the Proposed Development.....	28
Figure 4.1:	The Cavan Monaghan Study Area Section of Transmission Circuit	34
Figure 4.2:	The Meath Study Area Section of the Proposed Development.....	35
Figure 4.3:	Towers 402 to 410 (along the existing Oldstreet to Woodland 400 kV transmission line) ...	36

Figure 4.4:	General Arrangement of an IVI Tower	37
Figure 4.5:	Typical Construction Works.....	41
Figure 5.1:	Residual Impacts on the Landscape	75

LIST OF TABLES

Table 1.1:	Structure of the Environmental Impact Statement.....	2
Table 1.2:	Environmental Impact Statement Study Team.....	5
Table 5.1:	Summary of Individual Land Parcel Residual Impacts	47
Table 5.2:	Overview of Potential Interactions / Interrelationships	102

APPENDICES

APPENDIX 1	Schedule of Environmental Commitments (Summary of Mitigation Measures).....	104
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1 INTRODUCTION

1.1 PURPOSE AND CONTENT OF THE NON-TECHNICAL SUMMARY

- 1 EirGrid plc (EirGrid) and System Operator Northern Ireland Ltd (the respective applicants)¹ are jointly planning a major cross-border electricity transmission development between the existing high-voltage transmission networks of Ireland and Northern Ireland. The overall interconnection project (which is termed the „proposed interconnector“), for the purposes of the Environmental Impact Statement is a 400 kilovolt (kV) overhead line circuit linking the existing 400 kV substation in Woodland, County Meath with a planned substation in Turleenan, County Tyrone.
- 2 The North-South 400 kV Interconnection Development (the „proposed development“) comprises that portion of the proposed interconnector located within Ireland in counties Monaghan, Cavan and Meath.
- 3 The proposed development from the jurisdictional border with Northern Ireland to the existing Woodland Substation is evaluated in a single Environmental Impact Statement. However, given the overall geographical extent of this linear development, it is considered appropriate to present that evaluation in two sections namely, the **Cavan Monaghan Study Area** and the **Meath Study Area**². This approach will facilitate review by the public concerned (and other parties) of that portion of the proposed development which is of most importance to them.
- 4 The purpose of this Non-Technical Summary is to ensure that the competent authority An Bord Pleanála (the Board), prescribed authorities, the public and the public concerned are made fully aware of:
 - (a) a description of the development comprising information on the site, design and size of the development;
 - (b) a description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects;
 - (c) the data required to identify and assess the main effects which the development is likely to have on the environment; and

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.

² It is noted that the same specialists have been responsible for the preparation of the environmental appraisal for both the CMSA and MSA sections of the project.

(d) an outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects.

5 The Environmental Impact Statement which accompanies the application for planning approval comprises **Volume 3** of the application documentation and is itself presented in 4 main volumes with associated appendices and figures. The structure of the multi-volume Environmental Impact Statement is set out in **Table 1.1**.

Table 1.1: Structure of the Environmental Impact Statement

Volume 3A of the EIS (this volume) contains the Non-Technical Summary	
<p>Volume 3B of the EIS is a document which deals with strategic issues which are common to the overall proposed development, including Consideration of Alternatives, Cumulative Impacts and Impact Interactions and Transboundary Impacts.</p> <p>Volume 3B Appendices contains the Appendices associated with Volume 3B, some of which are contained on a disc as referenced in Volume 3B.</p> <p>Volume 3B Figures contains the 1:5,000 mapping for the proposed development at A1 scale.</p> <p>Volume 3B Reference Material contains the key reports and documents referred to in this volume of the EIS.</p>	
<p>Volume 3C of the EIS considers the Cavan Monaghan Study Area section of the project.</p> <p>This volume provides an appraisal of the proposed development from the area of the proposed border crossing at locations between the townlands of Doohat or Crossreagh, and Crossbane, County Armagh, and Lemgare, County Monaghan to the townland of Clonturkan, County Cavan.</p>	<p>Volume 3D of the EIS considers the Meath Study Area section of the project.</p> <p>This volume provides an appraisal of the proposed development, from the townland of Clonturkan, County Cavan to the existing Woodland Substation in County Meath.</p>
<p>Volume 3C Appendices contains the Appendices associated with Volume 3C.</p>	<p>Volume 3D Appendices contains the Appendices associated with Volume 3D</p>
<p>Volume 3C Figures contains the Figures associated with Volume 3C.</p>	<p>Volume 3D of the EIS contains the Figures associated with Volume 3D.</p>

6 This volume of the Environmental Impact Statement (**Volume 3A**) provides a non-technical summary of **Volumes 3B, 3C and 3D** which were completed in accordance with the relevant provisions of the codified EIA Directive 2011/92/EU, *Planning and Development Act 2000* (as amended) and the *Planning and Development Regulations 2001* (as amended). The Environmental Impact Statement has also been undertaken having regard to, amongst others, the following documents:

- European Commission: *Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions* (May 1999); *Guidance on EIA Screening* (June 2001); *Guidance on EIA Scoping* (June 2001); *Guidance on the Application of the Environmental Impact Assessment Procedure for Large-scale Transboundary Projects* (May 2013); and *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment* (April 2013).
- Environmental Protection Agency (EPA): *Guidelines on the information to be contained in Environmental Impact Statements* (March 2002); and *Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)* (September 2003) and, in particular, guidelines given for Type 20 projects outlined in that document.
- A Scoping Opinion on the information to be contained in the Environmental Impact Statement, prepared by An Bord Pleanála (December 2013).

7 The Non-Technical Summary is laid out in a similar format to the main Environmental Impact Statement i.e. describing the proposed development, existing environment, impacts of the proposed development and proposed mitigation measures. In this regard, it is noted that the environmental evaluation is presented in summary on a topic-by-topic basis addressing both the **Cavan Monaghan Study Area** and the **Meath Study Area**.

1.2 REQUIREMENT FOR AN ENVIRONMENTAL IMPACT ASSESSMENT, APPROPRIATE ASSESSMENT AND TRANSBOUNDARY IMPACT

8 Having regard to the provisions of the codified EIA Directive 2011/92/EU, Directive 92/43/EEC (the Habitats Directive) and the relevant provisions of the *Planning and Development Act 2000* (as amended) and the *Planning and Development Regulations 2001* (as amended), it is considered that the proposed development requires an Environmental Impact Assessment and an Appropriate Assessment, both to be conducted by the competent authority (in this case, An Bord Pleanála). In this context, both an Environmental Impact Statement and a Natura Impact Statement are required to be (and have been) submitted with the application for planning approval to the Board. The Environmental Impact Statement comprises **Volume 3** and the Natura Impact Statement comprises **Volume 5** of the application documentation.

9 The proposed interconnector is a cross-border project between Ireland and Northern Ireland, accordingly potential transboundary effects and the measures envisaged to reduce or eliminate such effects are relevant. In preparing and submitting the Environmental Impact Statement, cognisance has been taken of the likely significant transboundary (and cumulative) effects associated with the proposed development, and an appraisal of the overall interconnection project and its effects has been prepared by the respective applicants. Refer to the *Joint Environmental Report* (**Volume 4** of the application documentation).

- 10 Whilst the terms Environmental Impact Assessment and Environmental Impact Statement (and, to a lesser extent, Appropriate Assessment and Natura Impact Statement) are often used interchangeably, it should be understood that Environmental Impact Assessment and Appropriate Assessment are ongoing, iterative and participative processes of assessment undertaken by the competent authority, whilst an Environmental Impact Statement and Natura Impact Statement are documents prepared by the developer, and submitted to the competent authority, which set a certain context for the Environmental Impact Assessment and Appropriate Assessment process carried out by the competent authority. Furthermore, submissions and observations made to An Bord Pleanála by all other parties in respect of the proposed development will also form part of the Environmental Impact Assessment and Appropriate Assessment conducted as part of the Board's ultimate decision-making process.

1.3 DIFFICULTIES ARISING DURING THE PREPARATION OF THE EIS

- 11 In many instances, access was denied by landowners or occupiers to personnel attempting to conduct technical or environmental survey work associated with the proposed development, including preparation of the Environmental Impact Statement. While it is always preferable that access to the entirety of a development site occurs for the purposes of assisting in the environmental appraisal, this has not been possible in the case of much of the alignment of the proposed development. However, the approach of EirGrid and its project team has ensured that an adequate and robust Environmental Impact Statement has been prepared in respect of the proposed development. This approach included: the routing of the alignment – avoiding key sensitive receptors; the siting of the proposed structures – and the construction methodology that will be employed; and a range of alternative and complementary tools to gather the necessary information regarding the baseline receiving environment – in particular the use of aerial photography, LiDAR (Light Detection and Ranging) imagery (a remote sensing technology that uses laser scanning to collect height and elevation data), vantage point survey, and extended ecological survey.

1.4 SCOPING THE EIS

- 12 Scoping is an integral part of the preparation of an Environmental Impact Statement. The scoping process involves assessing the project's possible impacts, considering available alternatives and deciding which impacts are likely to occur and likely to be significant based on the proposed development.
- 13 EirGrid informally scoped the content of the Environmental Impact Statement through pre-application consultations and discussions with the Board, and other feedback received from local and prescribed authorities and other interested parties (including the public concerned).

14 In August 2013, EirGrid requested the Board to provide a scoping opinion (in writing) in respect of the proposed development. The Board consulted with various parties, including the local and prescribed authorities (including certain statutory agencies in Northern Ireland), before providing its scoping opinion on 11th December 2013. The scoping opinion confirmed the issues identified during the informal scoping process undertaken by EirGrid.

15 In relation to the Non-Technical Summary the Board's scoping opinion states:

"The summary should contain an objective statement of the environmental effects of the development and all significant effects and mitigation measures should be referred to therein. The description of the development to be contained in the non-technical summary should explain the proposals clearly and unambiguously in terms of their nature, scale and extent in order to allow the public to understand the EIA process and to make submissions in relation to the development."

16 It is confirmed that this Non-Technical Summary has been prepared having regard to the Board's scoping opinion and in particular to the information detailed above. The description of development, the likely environmental effects of the development and all significant effects and mitigation measures are clearly and unambiguously explained to allow the public to understand the environmental evaluation process and to make submissions in relation to the development.

1.5 ENVIRONMENTAL IMPACT STATEMENT STUDY TEAM

17 The Environmental Impact Statement (EIS) study team and the section of the document they prepared are listed in **Table 1.3**.

Table 1.2: Environmental Impact Statement Study Team

Role	Company
EIS Coordinator - Volume 3B	RPS
Specialist Environmental Topics Manager and EIS Coordinator - Volume 3C	ESBI
Specialist Environmental Topics Manager and EIS Coordinator - Volume 3D	TOBIN
Project Designers	ESBI and GasNatural fenosa (previously SOCOIN)
Specialist Environmental Topics	
Human Beings - Population & Economic	ESBI
Human Beings - Land Use	Curtin Agricultural Consultants Ltd
Human Beings - Tourism & Amenity	ESBI
Human Beings - Electric and Magnetic Fields	Exponent
Flora and Fauna	TOBIN

Role	Company
Solis, Geology and Hydrogeology	TOBIN
Water	TOBIN
Air - Noise and Vibration	TOBIN / AECOM
Air – Quality and Climate	ESBI
Landscape	AECOM
Material Assets – General	TOBIN
Material Assets - Traffic	TOBIN
Cultural Heritage	Moore Group

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2 NATURE OF AND NEED FOR THE PROPOSED DEVELOPMENT

2.1 INTRODUCTION

1 The proposed interconnector will provide a second high capacity electricity interconnector between Ireland and Northern Ireland. The existing interconnector is a 275 kV double circuit overhead line which connects the existing Tandragee and Louth substations. The proposed interconnector is planned to traverse the counties of Tyrone, Armagh, Monaghan, Cavan and Meath.

2 Given its location across two jurisdictions, the proposed interconnector consists of two related and complementary developments, as follows:

- 1) A development being proposed by System Operator Northern Ireland for that portion of the overall interconnection project located in Northern Ireland (the SONI proposal); and
- 2) A development being proposed by EirGrid for that portion of the overall interconnection project located in Ireland (i.e. in counties Monaghan, Cavan and Meath), which forms the subject-matter of this application for planning approval submitted to An Bord Pleanála. The application is entitled the „North-South 400 kV Interconnection Development“ and referred to as „the proposed development“ for the purposes of the Environmental Impact Statement (the EirGrid proposal).

2.1.1 System Operator Northern Ireland Proposed Development

Tyrone–Cavan Interconnector Application (2009-present)

3 In December 2009, the SONI proposal was submitted for that portion of the interconnection project located in Northern Ireland, termed the „Tyrone-Cavan Interconnector“ (Ref. O/2009/0792/F). This application was accompanied by an Environmental Statement.

4 In August 2010, the Northern Ireland Environment minister referred the SONI proposal to the Planning Appeals Commission for a public inquiry. Subsequently, further information was requested in respect of the application. Addenda to the Environmental Statement were submitted in January 2011 and October 2011. The public inquiry commenced in March 2012, and as at the date of this Environmental Impact Statement, stands adjourned. At the public inquiry, the Planning Appeals Commission made a number of requests for additional information with regard to the application. When adjourning the public inquiry, the Planning Appeals Commission requested that a consolidated Environmental Statement be prepared. In May 2013 a second application was submitted for planning permission for works associated with the construction of the main infrastructure under the 2009 application (Ref. O/2013/0214/F). Subsequently a consolidated Environmental Statement was submitted in June 2013. The 2013

Environmental Statement assesses the environmental effects of both the main infrastructure works under the 2009 application and the associated works under the 2013 application.

5 The 2009 SONI proposal describes the Northern Ireland element of the proposed interconnector as:

- The construction and operation of a new 275 kV / 400 kV (source) substation at Turleenan townland, northeast of Moy, County Tyrone;
- The construction and operation of two 275 kV terminal towers to enable connection of the Turleenan Substation to Northern Ireland Electricity's existing 275 kV overhead line and the removal of one existing 275 kV tower;
- The construction and operation of a single circuit 400 kV overhead transmission line supported by 102 towers for a distance of 34.1 kilometre (km) from the source substation (at Turleenan) to the border where it will tie into the future ESB network. The overhead line will continue on in the Republic of Ireland with all further towers being promoted by EirGrid for placement within that jurisdiction. Because of the meandering nature of the border, the overhead line will oversail a portion of land within the Northern Ireland townland of Crossbane for a short distance of 0.2km; and
- Associated works to include site levelling, site preparation works, modification of existing access points, construction of new access points, construction of new access lanes, construction of working areas, stringing areas, guarding, site boundary fencing and related mitigation works. Formation of access tracks and other associated works at the substation and at the tower locations.

2.1.2 EirGrid Proposed Development

Meath-Tyrone 400 kV Interconnection Development (2009-2010)

6 Also in December 2009, EirGrid submitted an application to An Bord Pleanála (the Board) for development consent for that portion of the proposed cross-border transmission infrastructure development located in counties Monaghan, Cavan and Meath (An Bord Pleanála Ref. VA0006). That application, known as the „Meath-Tyrone 400 kV Interconnection Development“, was accompanied by an Environmental Impact Statement.

7 During the period January-March 2010, An Bord Pleanála invited written submissions from identified prescribed authorities, other stakeholders, members of the public and all other parties. In May 2010, An Bord Pleanála commenced an oral hearing in respect of the proposed development. However, in June 2010, the EirGrid application was withdrawn. As such, the Board did not make a decision on the previous application for planning approval.

The Re-evaluation Process (2010-2013)

- 8 During the period since the withdrawal of the previous application for planning approval, EirGrid has undertaken a comprehensive re-evaluation of that portion of the proposed interconnector located in Ireland.
- 9 As part of this review process, EirGrid published a *Preliminary Re-evaluation Report* in May 2011, which concluded with the identification of an „Indicative Line Route“ within an emerging „Preferred Route Corridor“. EirGrid has considered documents issued since the publication of the *Preliminary Re-evaluation Report*, which are relevant to the overall re-evaluation process. These documents include the *Meath-Tyrone Report Review by the International Expert Commission August – November 2011*, January 2012; *Government Policy Statement on the Strategic Importance of Transmission and Other Energy Infrastructure*, July 2012; *Grid25 Implementation Programme 2011-2016* and accompanying *Strategic Environmental Assessment* both May 2012; and EirGrid’s *Project Development and Consultation Roadmap, 2012*. The conclusions of these documents, and of feedback received in respect of the *Preliminary Re-evaluation Report*, were set out in a *Final Re-evaluation Report* published in April 2013.
- 10 The *Final Re-evaluation Report* concluded with the identification of an „Indicative Line Route“ for the transmission circuit within an identified „Preferred Route Corridor“ to be located in counties Monaghan, Cavan and Meath. However, no significant detail regarding the specific location and siting of this „Indicative Line Route“ was provided in the report.
- 11 Following on from the *Final Re-evaluation Report*, the *Preferred Project Solution Report* was published in July 2013; which provided detail regarding the „Preferred Line Design“ for the proposed development. The „Preferred Line Design“ is derived from the „Indicative Line Route“ as identified in the *Final Re-evaluation Report*, and also included the identification of feasible locations for, and design of, the planned transmission line infrastructure, such as tower positions, tower types and associated construction related details (e.g. temporary access tracks). The *Preferred Project Solution Report* was subject to public consultation, with a focus on landowner engagement particularly in respect of the specific siting of structures on lands. The ultimate output of this process is the line design of the proposed development, which is the subject of this application for planning approval.

The proposed North-South 400 kV Interconnection Development

- 12 The proposed development, approximately 103.35km long, comprises that portion of the proposed interconnector located in counties Monaghan, Cavan and Meath. The proposed development consists of the following elements:
- i. A new single circuit 400 kV overhead transmission line (covering a distance of approximately 100.5km in the counties of Monaghan, Cavan and Meath) extending in a

generally southerly alignment from the jurisdictional border with Northern Ireland (between the townland of Doohat or Crossreagh, County Armagh, and the townland of Lemgare, County Monaghan) to the townland of Bogganstown (Electoral District (ED)), County Meath. In addition the proposed transmission line crosses the jurisdictional border with Northern Ireland at two points - from the townland of Lemgare, County Monaghan into the townland of Crossbane, County Armagh and back into the townland of Lemgare, County Monaghan. This transmission line comprises 299 No. new lattice steel support structures (ranging in height from approximately 26 metres (m) to 51m over ground level), with associated conductors, insulators, and other apparatus.

- ii. The addition of a new 400 kV circuit for approximately 2.85km along the currently unused northern side of the existing Oldstreet to Woodland 400 kV transmission line, extending eastwards from the townland of Bogganstown (ED Culmullin) to the existing ESB Woodland 400 kV Substation, in the townland of Woodland, County Meath. The existing double circuit lattice steel support structures along this existing line range in height from approximately 52m to 61m over ground level.
- iii. Associated works on a site of approximately 0.544ha within and immediately adjacent to the existing ESB Woodland 400 kV Substation, in the townland of Woodland, County Meath to include: a western extension of the existing compound (of approximately 0.231ha) including associated modifications to the existing 2.6m high palisade boundary fence; the addition of electrical equipment and apparatus including circuit breaker, current transformers, inductive voltage transformers, disconnectors, pantograph disconnecting switches, surge arresters, support insulators and support insulator bars (all ranging in height from approximately 7.4m to 13.7m); gantry structures (approximately 28m); and a lightning monopole (approximately 28m); and all associated ancillary construction and site development works.
- iv. An associated temporary construction material storage yard to be located in the townlands of Monaltyduff and Monaltybane, Carrickmacross, County Monaghan, on a site of approximately 1.42ha, including associated site works, new site entrance onto the L4700 Local Road, associated 2.6m high boundary palisade fencing (with noise barrier affixed) and associated ancillary staff facilities and parking.
- v. All associated and ancillary development works including modifications to existing overhead transmission lines and other permanent and temporary construction and excavation works.

13 Further information on the elements of the proposed development is outlined in **Chapter 4** of this Non-Technical Summary.

2.1.3 Project of Common Interest

- 14 The proposed interconnector, of which this application for planning approval forms part, has been designated a Project of Common Interest (PCI) pursuant to the European Union (EU) Regulation 347/2013, which requires that: *“Projects of common interest should be given „priority status” at national level to ensure rapid administrative treatment. Projects of common interest should be considered by competent authorities as being in the public interest.”*

2.2 STRATEGIC NEED

2.2.1 Need for the Proposed Development

- 15 The need for a second interconnector arises from the required development of the existing high voltage transmission network infrastructure on the island of Ireland. As noted above, the proposed interconnector is designated as a Project of Common Interest by the European Commission. Projects of Common Interest are key infrastructure projects, which will help Member States to, among other things, contribute to market integration and further competition; enhance security of supply, and reduce Carbon Dioxide (CO₂) emissions. EirGrid, as Transmission System Operator in Ireland, has the exclusive statutory function to operate, develop and ensure the maintenance of a safe, secure and cost effective electricity transmission system. Similarly, System Operator Northern Ireland as the holder of a licence to participate in the transmission of electricity under Article 10(1)(b) of the Electricity (Northern Ireland) Order 1992 has a statutory duty to develop and maintain an efficient, coordinated and economical system of electricity transmission which has the long-term ability to meet reasonable demands for the transmission of electricity.
- 16 The existing Louth-Tandragee 275 kV double circuit overhead line (meaning two transmission circuits supported on a single set of structures) forms the primary existing interconnection pathway between the existing transmission networks of Northern Ireland and Ireland. However, additional interconnection is required. Due to the fact the existing 275 kV interconnection circuits are supported on the same set of structures, there is a real risk that they could both be forced out of service simultaneously by a single event for example accidental damage to a tower structure or a lightning strike. In such a scenario, interconnection between the transmission systems of Ireland and Northern Ireland would be lost entirely. This scenario is known as „system separation”; in this situation, the transmission systems in Ireland and Northern Ireland would revert to operating independently of each other. This could result in loss of load in either or both systems as power transfer and mutual support cannot occur. The respective applicants must be capable of dealing with this scenario and this puts a limit on the power transfer which the systems can cater for with the existing interconnection.

- 17 The risk of such an event is unacceptable from a transmission system operations perspective. For this reason the respective applicants currently impose a capacity restriction on the existing interconnector – in other words, the existing interconnector is not operated at anything like its full capacity. This ensures that if there were to be a sudden loss of the interconnector, the shock to the network would be limited to a level that can be managed without risking a collapse of one or both systems. However, as a consequence, this restriction creates a significant „bottleneck“ in the all-island transmission network seriously limiting the scope for commercial exchanges of electricity between generators and suppliers in each part of the all-island electricity market. It also leads to inefficiencies and costs that are passed through to customers as part of their electricity prices. EirGrid and SONI are obliged to remove this bottleneck by virtue of their licence requirements to develop an efficient and effective all island transmission system.
- 18 Another issue of increasing concern is that planned future reductions in generation capacity within Northern Ireland – meaning the actual generation of electricity - could lead to a shortfall in available electricity supply in Northern Ireland in the years beyond 2016. In these circumstances, the „bottleneck“ described above, could seriously threaten electricity supply security in Northern Ireland.
- 19 The proposed second interconnector will resolve the power flow limitations described above. However, it needs to be physically separate from the existing interconnector so that the risk of concurrent failure will be low. Operating the transmission system with both interconnectors in service will provide enhanced security of supply in the event of the failure of either interconnector because the interconnector which remains in service can instantaneously accept additional power flow so that there is no resulting instability in system behaviour, or loss of supply to customers.

2.2.2 Benefits of the Proposed Development

- 20 EirGrid is satisfied that the development of an additional high-capacity electricity interconnector between the electricity networks of Ireland and Northern Ireland is required in order to comply with, and to implement, the obligations of EU and national energy policy guidelines.
- 21 There are a number of significant benefits which arise as a result of the removal of existing constraints on power flow transfers between the two electricity systems on the island of Ireland. These benefits include:
- **Improving competition by reducing the constraints restricting efficient performance of the all-island single electricity market.** The existing reliance on a single interconnector is a significant constraint to ensuring an efficient electricity market (i.e. promoting cross border trading in electricity for the benefit of all consumers on the island of Ireland).

- **Improving security of supply by providing a reliable high capacity link between the two parts of the all-island transmission system.** The transmission systems of Ireland and Northern Ireland are relatively small and isolated, with a low level of interconnection with other systems. The proposed development is necessary to maintain security of supply in both jurisdictions.
- **Supporting the development of renewable power generation by enhancing the flexible exchange of power flows over a large area of the island.** A key constraint to the practical development of wind powered generation on the island of Ireland is the ability of the existing transmission systems to absorb and manage this form of power generation. The second interconnector will assist in ensuring that the all-island electricity transmission network has the infrastructural capacity and technical capability to manage the uptake of renewables safely and securely up to 2020 and beyond.
- **Reinforcement of the North–East Area of Ireland.** Although the need to reinforce the north-east area for security of supply reasons is no longer an immediate driving factor for the delivery of the proposed interconnector (as that reinforcement is not now expected to be required for at least a decade), the early operation of the interconnector will nevertheless provide reinforcement to the area by providing an additional high capacity circuit in the region, thus reducing flows on the existing circuits.

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3 MAIN ALTERNATIVES CONSIDERED

3.1 TRANSMISSION & TECHNOLOGY ALTERNATIVES

- 1 The consideration of the main transmission and technology alternatives in respect of the proposed interconnector was undertaken jointly by the respective applicants and was informed by a number of studies and reports which evaluated potential transmission alternatives specifically for the proposed interconnector.
- 2 The project objectives and / or design criteria for the proposed development, regardless of the particular technological alternative that is actually employed, are to:
 - a) Comply with all relevant safety standards;
 - b) Comply with all system reliability and security standards;
 - c) Provide an environmentally acceptable and cost effective solution;
 - d) Have a power carrying capacity in the region of 1,500 megawatts (MW), and connect between appropriately robust points on the transmission networks north and south of the border;
 - e) Facilitate future reinforcement of the local transmission network in the north-east area;
 - f) Facilitate future grid connections and reinforcements; and
 - g) Comply with good utility practice or „best international practice“.

3.1.1 High Voltage Direct Current (HVDC) and High Voltage Alternating Current (HVAC) Technology

- 3 The existing electricity transmission system in Ireland is a High Voltage Alternating Current (HVAC or AC) system. Any new transmission project that utilises HVAC would therefore be an extension of the existing technology, and would fit seamlessly into the existing meshed transmission network on the island of Ireland.
- 4 High Voltage Direct Current (HVDC or DC) is an alternative method of transmitting electricity. HVDC technology is mostly used to transmit bulk power from one point to another over long distances where HVAC is not technically or environmentally acceptable a (e.g. a long (> 50 km) high capacity submarine cable, as used for the East–West Interconnector between Deeside in north Wales and Woodland, County Meath in Ireland.

- 5 Inserting a HVDC circuit between any two points in a HVAC network would require the HVAC electricity to be converted into HVDC electricity at one end, transmitted through cable or overhead line to the other end, where it is converted back from DC to AC, and then transmitted back into the HVAC network. This is inefficient (unless the HVDC circuit is very long) and costly (in terms of the requirement for converter stations) but it is technically feasible.
- 6 The respective applicants, in their joint comparative assessment of HVDC as an alternative to HVAC, have concluded that any option using DC technology is not an appropriate option for the intended nature and purpose of the proposed interconnector. Specifically, it would not facilitate the future development of the transmission network as well as any AC option; furthermore, the requirement to introduce complex and bespoke control systems into a strategically important part of the all-island transmission network brings with it considerable risk for system security and stability. In addition to these significant technical constraints, all DC options (underground cable and overhead line) would be significantly more expensive. For these reasons, the proposed interconnector, including EirGrid's proposed development is a standard AC solution.

3.1.2 AC Overhead Line and Underground Cable

- 7 At 400 kV, overhead line technology conventionally utilises steel lattice towers to support the high voltage electricity conductors. Equivalent underground cable technology involves installation of specialised insulated cables under the ground.
- 8 An overhead line has a high level of reliability, with most faults being located easily and quickly repaired; it is a flexible technology which can adapt to a variety of topographies; it has a relatively low physical impact on the land it crosses (limited to the tower locations and land within the overhead line corridor); and is considered very cost effective compared with an underground system which has a more complicated construction and design. Overhead line technology for 400 kV AC transmission networks represents current international best practice and is the technology around which the transmission network in Ireland, and indeed in Europe and internationally, has been developed to date.
- 9 Comparatively, international experience confirms that reliability is an issue with underground cable. In the short-term, there is potential for prolonged unplanned circuit outages with underground cables. In the long-term, the expectation is that as an underground cable gets older, it becomes less reliable. In addition, in the use of underground cable for HVAC transmission, the high capacitance of the cable – meaning that it is able to collect and hold a charge of electricity - presents design and operational difficulties. As a consequence, it is the case that there are no 400 kV HVAC underground cables in the world that are in any way near the length required for the proposed development.

- 10 One of the main advantages of installing underground cables is a reduction in visual impacts associated with the overhead line option. However, installing buried cables introduces other environmental issues specific to that technology, e.g. potential impact on archaeology as a result of excavation works and permanent loss of habitat due to removal of hedgerows. Furthermore, buried cables occupy a significant amount of land and introduce restrictions on the building of any structures over the cable route (due to the risk of damage during construction and preventing cable access if required).
- 11 Indeed, because of their higher cost and lower service availability, underground cable is generally only used in urban areas or wherever a constraint has been identified such that no alternative exists other than to use an underground cable.
- 12 Having regard to the above, in its careful and detailed consideration of alternative technology solutions for the proposed development, EirGrid has concluded:
- A 400 kV AC overhead line is the best technical solution for the proposed development.
 - An entirely underground AC option is not an acceptable solution for the nature, purpose, and extent of this project for technical reasons. The use of long 400 kV AC underground cables on the Irish transmission system is not feasible within the constraints of EirGrid's statutory obligations to ensure a secure and reliable grid.
 - At 400 kV, an overhead line would be significantly less costly than any underground cable alternative.
 - The use of short lengths of underground cable should only be considered in the event that an overhead line solution cannot be found and where it can be confirmed that the use of underground cable does not exceed the system's capacity to absorb such cables.

3.1.3 Partial Undergrounding

- 13 Partial undergrounding is the term used to describe the undergrounding of a short section, or short sections, of a long transmission circuit that is primarily comprised of an overhead line. Partial undergrounding of lower-voltage 110 kV transmission circuits is at this stage common practice in Ireland and internationally. There are no examples of partial undergrounding at the 400 kV level in Ireland; however there are numerous examples elsewhere in Europe. Partial undergrounding of 400 kV AC circuits is therefore technically feasible.

- 14 As part of the previous application for approval, EirGrid identified a short section of the overall proposed circuit where underground cable was deemed to be the most appropriate option. This short section of underground cable was to be fully contained within the confines of Woodland Substation. During the subsequent review and Confirm Design Stage associated with the current application for approval EirGrid decided to alter the point of connection at Woodland Substation of the proposed new 400 kV circuit in order to eliminate the requirement for this short section of 400 kV underground cable. This section of underground cable within the confines of Woodland Substation does not therefore form part of this application for approval.

3.1.3.1 Consideration of Partial Undergrounding for this Development

- 15 When considering partial undergrounding for a 400 kV project, it is essential to understand the environmental, technical and cost implications of such. These implications of partial undergrounding are considered below.
- 16 **Environmental Issues:** The size of the AC underground cables required for the proposed development would be such that they could not be installed under public roads or under disused railway lines, as these roads and railways are not sufficiently wide. The only practical option would be to install the cables directly across farmland. This would among other things: result in much greater disruption to farming and other activities during the construction phase; it would require the cutting of a swathe through every hedgerow in its path (leaving a permanent gap); it would restrict development potential (as no buildings could be permitted to be constructed within a underground cable reserve); and it would also be necessary to have a substation at every location where the 400 kV circuit changes from overhead line to underground cable (known as a „transition station“), thereby requiring an additional land take of about one half of a hectare per transition station. Any partial undergrounding of the circuit would require two transition stations – one at either end of the underground portion unless one end is in a main terminal substation. These transition stations are themselves relatively large, and therefore visually prominent above-ground features.
- 17 **Technical Considerations:** Inserting a section of underground cable into an overhead line circuit will have a negative effect on the reliability performance of the overall circuit. As a result, some transmission system operators in other countries have set down the maximum permissible length of underground cable that can be installed on their transmission system; for example, in the Netherlands the maximum permissible length of a single 400 kV underground cable is 20km; the longest 400 kV underground cable in Europe is a 20km cable installed in an air conditioned tunnel in London. The transmission system on the island of Ireland is much smaller and more isolated than that of Great Britain or indeed mainland Europe and, consequently, can only accommodate much shorter lengths of 400 kV underground cables than is the case in other larger countries. Having carefully considered the issue of partial undergrounding, and based on the present extent and configuration of the Irish network, EirGrid

considers that the maximum length of 400 kV underground cable which it would be technically feasible to install as part of the proposed development (inclusive of that part of the interconnector located in Northern Ireland) is approximately 10km, whether installed in one continuous length or in an accumulation of shorter lengths.

18 **Cost Issues:** 400kV AC underground cable would cost on average €5.4 million euro per km more to install than the proposed AC overhead line. In addition, given that at least one, and potentially two, transition stations would be required for each section of the circuit that is undergrounded, depending upon the length of an underground section (and therefore the facilities required at each end), the required transition stations could add an additional approximately €5 - €15 million per installation.

19 Overall, EirGrid has concluded that partial undergrounding is feasible, if:

- The length to be undergrounded is restricted, for technical and operational reasons, to less than approximately 10km, either in one continuous length or an accumulation of shorter lengths; and
- The cost of using the short length(s) of underground cable can be proven to be an environmentally advantageous and cost-effective way of overcoming an otherwise unavoidable environmental or technical constraint to the preferred overhead line.

20 In this regard, neither of the respective applicants has identified any section of the route of the proposed interconnector where the environmental and / or technical impact of the preferred overhead line is of such significance that partial undergrounding is considered to be a preferable alternative. On the basis of this consideration of alternatives, the respective applicants are therefore proposing that the entire 400 kV circuit be implemented using 400 kV AC overhead line.

3.1.4 Overhead Line Design Considerations

3.1.4.1 275 kV and 400 kV Overhead Line Circuit

21 Having regard to the consideration of alternatives above regarding AC / DC and overhead line / underground cable technology, it is concluded that the only technical alternative that provides an acceptable method for achieving the strategic objectives of the proposed interconnector is AC overhead line with a nominal capacity of 1,500MW. Consideration has been given to constructing the proposed interconnector using a double circuit design of 275 kV, matching existing circuit operation in Northern Ireland, and indeed, the existing north-south interconnector. This alternative would meet minimum technical requirements in the short term. However, such an alternative would have no longer term or lifetime cost saving in comparison

with a single circuit 400 kV option. The 400 kV option will result in better voltage performance and reduced power losses. In addition to this, it would be the case that any 275 kV double-circuit option would also require the use of lattice-steel support structures (see **Section 3.1.4.2**), of a larger design, with consequent visual and other impact.

3.1.4.2 400 kV Overhead Line Support Structures

- 22 In considering alternative designs for the 400 kV overhead line support structures the respective applicants commissioned a number of studies which looked at a range of issues including visual impact on the landscape and technology considerations. The studies evaluated a range of designs that included a number of lattice steel structures, wooden structures and steel monopole structures. The studies concluded that wooden structures would not be technically feasible for the necessary 400 kV overhead lines due to the heavy mechanical loading requirements and electrical clearance requirements. Steel monopole designs were found to be technically feasible with some benefits (such as a smaller footprint requiring a reduced corridor width and relatively shorter construction duration) when compared with traditional lattice steel structures. However, having regard to the various environmental and technical issues, the studies found that for a 400 kV overhead line, located in a rural setting in Ireland, a lattice steel structure is preferred.
- 23 Having identified lattice steel as the preferred design for the support structures for the proposed development, different designs were considered. This resulted in four options being advanced for detailed comparative assessment, which were:
- (i) classic or standard 401 type structure (as used in the mid-1980s for the existing 400 kV overhead lines in Ireland);
 - (ii) modern designs of the „C-IVI“ (IVI) type;
 - (iii) modern design of the VVV type; and
 - (iv) modern design of the inverted delta type.
- 24 The four options are illustrated in **Figure 3.1**.

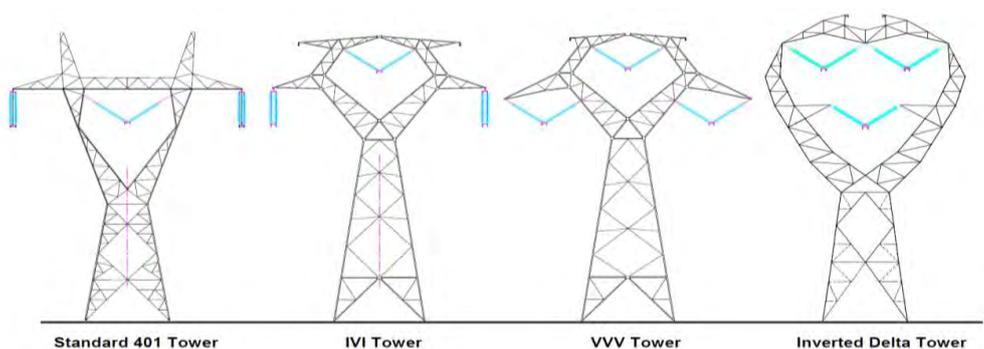


Figure 3.1: Outline Drawings of Lattice Steel Towers (not to scale)

25 EirGrid subsequently compared a conceptual 400 kV monopole and the IVI tower specifically for use on this proposed development. While technically feasible, it was considered that given the rural context, the nature and size of the monopole structures (which are of similar heights to IVI towers), and the requirement for about 25% more structures to support the weight of the proposed 400 kV circuit, a monopole alternative could result in increased visibility. Other construction, cost and deliverable concerns were identified.

26 On the basis of these studies it was considered that the tower design that would most satisfy all required criteria and which represents a balance between landscape and visual impacts and technical requirements for the proposed 400 kV overhead line is the lattice steel structure known as the IVI tower.

3.1.5 Route Alternatives

27 The approach adopted by EirGrid in the route selection process is best understood as occurring in a number of phases. This phased approach included a preliminary phase, undertaken jointly by the respective applicants, to identify the general area within which the proposed second interconnector should be located. The phased approach to route selection is as follows:

Phase 1:

- **To identify Broad Study Area(s)** on the island of Ireland within which the proposed interconnector can best be developed.

Phase 2:

- **To identify Feasible Corridors**, and a preferred corridor (including identification of an indicative potentially feasible route within each corridor), within the identified project study area.

- **To identify a Preferred Route Corridor** (of an indicative width, for comparative purposes, of approximately 1km wide) following a qualitative evaluation of the identified feasible route corridors.

Phase 3:

- **To identify a Preferred Line Design** – an „Indicative Line Route“ within the identified „Preferred Route Corridor“ which would form the basis for the final site specific line design (i.e. the proposed development which forms the subject matter of this application).

3.1.5.1 Phase 1: Identification of Broad Study Area(s) for the Proposed Interconnector

28 Phase 1 included the identification of a „Broad Study Area“ within which to route the proposed interconnector. The studies concluded with the identification of a new circuit between Drumkee and Kingscourt (identified as Option 4(b)) as the preferred broad study area within which to route the proposed interconnector.

29 Separate to (though concurrent with) the process of identification of the alignment of the second north-south interconnector, ESB National Grid undertook a project with the objective of ensuring greater security and reliability of electricity transmission in the north-east area of Ireland. The feasibility studies confirmed that a new 220 kV transmission circuit located to the west of Navan, thereby avoiding highly sensitive environmental and settlement areas to the east was the preferred broad study area for this separate project (Option A2).

30 As highlighted in **Figure 3.2** below, although commencing as separate projects, it became clear that the preferred broad study area alternatives for the second interconnector project, and those for the reinforcement of transmission infrastructure in the north-east area, had a certain extent of potential overlap and this provided a sound basis to investigate the synergies between the two projects. Given that the existing Flagford Louth 220 kV circuit is a major part of the existing electricity infrastructure serving the north-east area, various potential nodal points (for a new substation) along this existing circuit were examined, with a view to identifying an optimum interface area.



Figure 3.2: Opportunity for Strategic Linkage Between the Second Interconnector Project Option 4(b) and Transmission Reinforcement in the North-East Project Option A2 – at a Location along the Existing Flagford-Louth 220 kV Circuit

(NB: arrows are indicative of the Strategic Options, but not of any particular routing solution)

- 31 EirGrid reviewed the effectiveness of the previously identified preferred broad study area alternatives in meeting the identified requirements of the project during the re-evaluation process which followed the withdrawal of the previous application for approval. EirGrid and its consultants remain satisfied that the proposed development between the existing Woodland Substation in County Meath and the planned Turleenan Substation in County Tyrone, should be located within a broad Mid-Country study area comprising in Ireland the counties of Monaghan, Cavan and Meath, and in particular, located to the west of Navan, County Meath.
- 32 On the basis of the above, the „project study area“ for the proposed development in counties Monaghan, Cavan and Meath comprises a single electricity transmission infrastructure development, within an overall project study area. However, given the length of the proposed alignment and the significant geographical extent of the associated study area, for clarity and convenience the overall study area is identified in two sections.

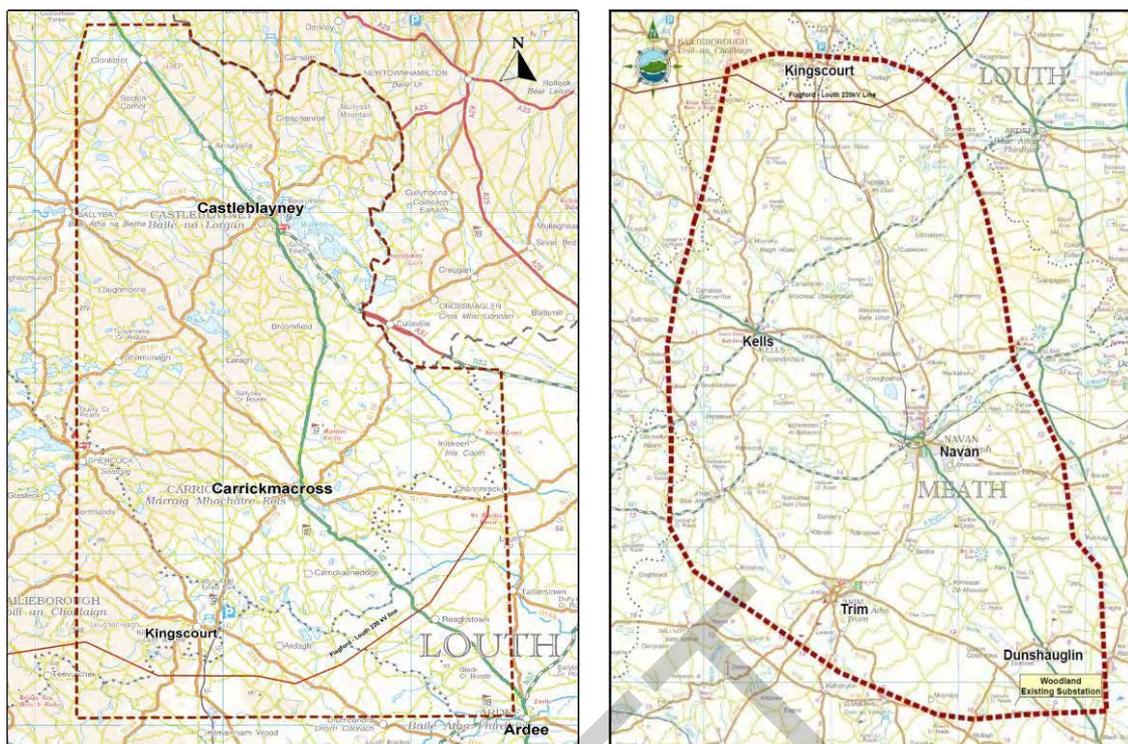


Figure 3.3: The Cavan Monaghan Study Area and the Meath Study Area

- 33 The **Cavan Monaghan Study Area** refers to that section of the overall study area north of the existing Flagford-Louth 220 kV overhead line, and south of the jurisdictional border with Northern Ireland, having regard to the counties located within this area (this was termed the Cross Border Study Area (CBSA) in the previous application for planning approval of the Meath-Tyrone 400 kV Interconnection Development).
- 34 The **Meath Study Area** refers to that section of the study area, south of the existing Flagford-Louth 220 kV overhead line, and extending to, and encompassing Woodland Substation, and which is almost exclusively contained within County Meath (this was termed the North East Study Area (NESA) in the previous application).

3.1.5.2 Phase 2: Identification of Alternative Route Corridor Options and a Preferred Route Corridor for the Proposed Development

- 35 Phase 2 in the route selection process was twofold: firstly, to identify alternative feasible route corridors within the identified study area and, secondly, to identify a preferred route corridor following strategic analysis of technical and environmental constraints. The identified route corridor alternatives are of a nominal indicative width of 1km.

The Cavan Monaghan Study Area (previously the Cross Border Study Area)

- 36 Three „Potential Route Corridor“ options were identified for the Cavan Monaghan Study Area, avoiding (where possible) the most significant identified constraints:

- **Route Corridor Option A** - from the area of the Flagford-Louth 220 kV line within the western part of the study area, west of the N2, Castleblayney and Carrickmacross. Extending generally northwards, it turns in a north easterly direction approximately 1km north of Annayalla to cross the N2 and then turns in north westerly direction at Lemgare to the border crossing location;
- **Route Corridor Option B** runs within the central part of the study area, west of the N2, Castleblayney and Carrickmacross but closer to Castleblayney and Lough Muckno than the western route. It is straighter and slightly shorter than Route A; and
- **Route Corridor Option C** follows Route Option B to a point approximately 4km north-west of Carrickmacross before turning east to run to the east of the N2 and east of Lough Muckno. It is the longest of the routes.

The Meath Study Area (previously the North East Study Area)

37 Three potential route corridor options (with a sub-option of one of the options) were identified for the Meath Study Area, taking cognisance of identified constraints. These were:

- **Route Corridor Option 1** extends from Woodland Substation within the western part of the study area, to the west of Trim, Athboy and Kells and approximately 4km north of Ballivor and east of Mullagh;
- **Route Corridor Option 2** extends from Woodland Substation between the central and western section of the study area, staying to the east of Trim and Athboy, west of Kells and then runs parallel to Route Option 1, running approximately 1.5km to the east of Mullagh;
- **Route Corridor Option 3A** follows route corridor Option 2 initially before extending in a due north direction, running to the west of Navan and to the east of the town of Kells. Approximately 5km north of the M3, this route corridor option splits into two sub-options 3A and 3B. 3A runs to the west of Castletown and Nobber before joining together west of Whitewood Lough; and
- **Route Corridor Option 3B** follows route corridor Option 2 initially before extending in a due north direction, keeping to the west of Navan and to the east of the town of Kells similar to route corridor Option 3A. This route corridor option splits into two options 3A (see above) and 3B. 3B runs to the west of Carlanstown before joining together west of Whitewood Lough.

38 Three potential route corridor options for both the Cavan Monaghan Study Area and the Meath Study Area are shown in **Figure 3.4**.

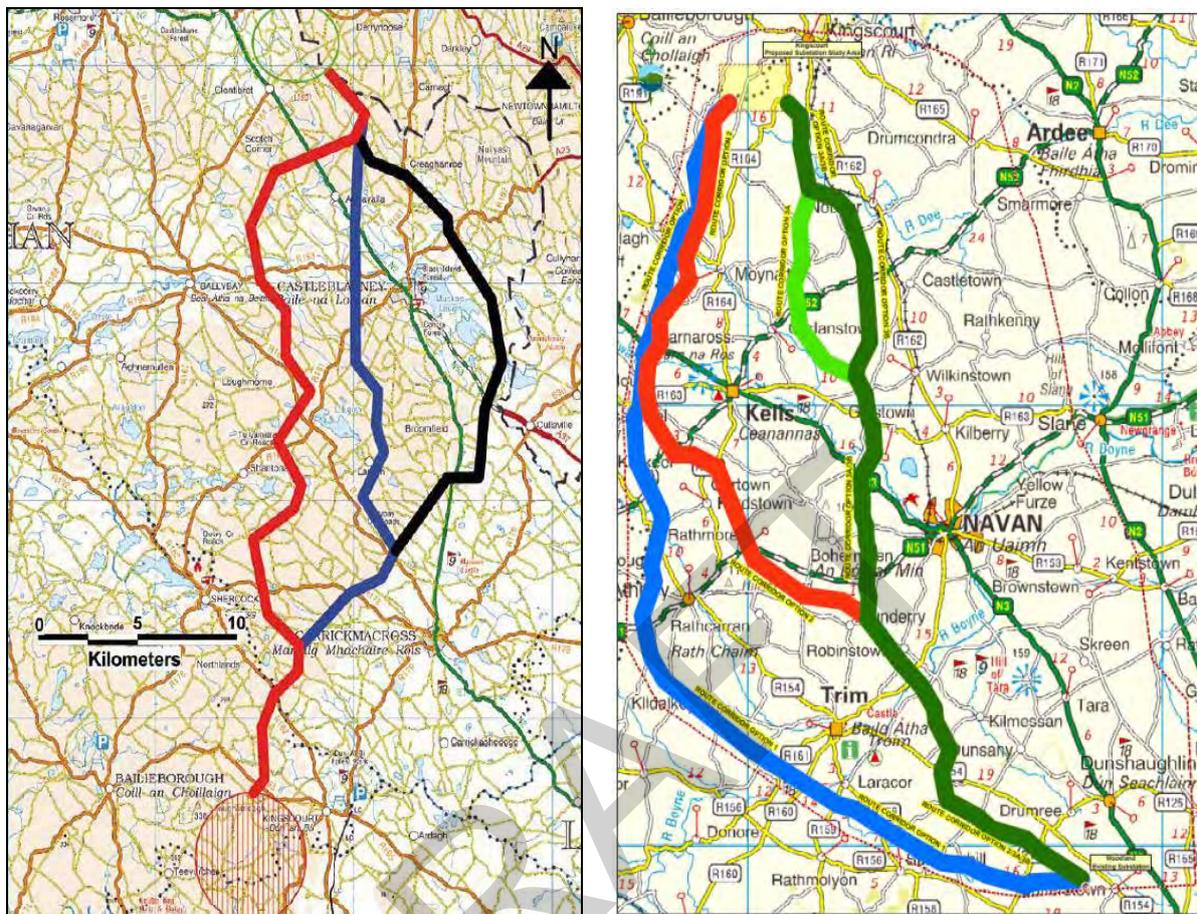


Figure 3.4: Potential Route Corridor Options A, B and C in the Cavan Monaghan Study Area (previously the Cross Border Study Area) and Potential Route Corridor Options 1, 2, 3A and 3B in the Meath Study Area (previously the North East Study Area)

Other Potential Route Corridor Alternatives

39 In addition to the above a number of other potential route corridor alternatives were considered namely:

- **The M3 Corridor.** Locating an overhead line alongside the M3 motorway was ruled out because it was considered that to do so, could have a significant visual impact within a highly sensitive receiving environment such as Brú na Bóinne (an Annex 1 World Heritage Site) and the Hill of Tara. Locating a 400 kV underground cable within the reserve of the M3 was also ruled out in accordance with EirGrid’s opinion, summarised previously in this document, that it would not be appropriate to use 400 kV underground cables in place of 400 kV overhead lines for this project.

- **Disused Railway Line.** EirGrid carried out a comprehensive study of the disused rail beds in the five counties, Meath, Cavan, Monaghan, Armagh and Tyrone to evaluate their suitability for accommodating the size and quantity of the underground cable that would be required for the proposed interconnector. The EirGrid study concluded that the rail bed routes represented a sub-optimal routing option for potential 400 kV underground cable circuits, introducing significant additional environmental impact and cost, as well as safety risks to cables. It was concluded that the use of rail beds was not consistent with the development of a safe, secure, reliable and economical transmission system.
- **East of Navan.** EirGrid was advised by An Bord Pleanála, during formal pre-application consultation in respect of the previous application for the then Meath-Tyrone 400 kV Interconnection Development, to carry out further analysis on possible routes within a study area east of Navan to the eastern coastline. A total of eight corridor options were analysed for the North-East Study Area option - the original four options to the west of Navan and four new corridor options to the east of Navan. The easterly corridor options were rejected because, among other things, they pass in close proximity to Brú na Bóinne (an Annex 1 World Heritage Site) and the Hill of Slane. The Western Route Options A2 broad study area was therefore confirmed.
- **Direct Route Option.** In its Scoping Opinion dated 11th December 2013, An Bord Pleanála requested consideration of alternative corridor option's "*including the most direct route option*". The most direct route or shortest route is generally considered „best practice“ for routing an overhead line; however, it is also necessary to avoid constraints. The direct option between Woodland, County Meath and Turleenan, County Tyrone would bring the route close to large population settlements including Armagh, Ardee, Slane and Dunshaughlin as well as a number of villages. Additionally it would pass over a number of archaeological monuments, sensitive ecological receptors and lakes.

40 The selection of a preferred route corridor for the previous Meath-Tyrone 400 kV Interconnection Development involved a comparative evaluation of the identified route corridor options taking account of a wide range of technical, environmental and other criteria. The multi-criteria comparative evaluation process confirmed the following as the preferred 1km wide corridor:

- **Cross Border Study Area – Border – vicinity of Kingscourt (Option A):** Corridor A was approximately 48km in length. It extended from the border crossing point north-east of Clontibret, County Monaghan, south to a then-proposed substation in the vicinity of Kingscourt, County Cavan.

- **North-East Study Area – Vicinity of Kingscourt – Woodland (Option 3(b)):** Corridor 3(b) was approximately 57km in length. It extended from the proposed substation in the vicinity of Kingscourt, County Cavan to Woodland Substation, near Batterstown, Dunshaughlin, County Meath.

- 41 The re-evaluation process, which incorporated consideration of public and stakeholder feedback arising both in respect of the previously proposed 400 kV Interconnection Development, as well as updated studies carried out by or on behalf of EirGrid, has determined that no new significant environmental or other constraints have arisen since the previous application in 2009, which would result in any substantial change to the previously identified route corridor options. It should be noted that some minor localised changes did occur, particularly as a consequence of a decision taken as part of the re-evaluation process not to include a substation in the Kingscourt area, which had comprised an element of the previous proposal; such omission derives from the fact that technical studies have concluded that the substation is not needed for at least another decade. Route corridor Option A/3B therefore remains the preferred route corridor within which to route the proposed transmission circuit. This is presented in **Figure 3.5**.
- 42 In the **Cavan Monaghan Study Area**, route corridor Option A was the „most preferred“ option, by virtue of the fact that it has the lowest potential for creating long-term significant residual impacts which cannot be mitigated. Similarly, in the **Meath Study Area**, route corridor Option 3B was the „most preferred“ option, as it was considered to create the lowest potential visual impact on the landscape, with all other potential significant environmental impacts being localised, and capable of being mitigated
- 43 The omission of the previously proposed intermediate substation in the vicinity of Kingscourt from this current proposal has resulted in a southerly extension, and associated amendments, of the previously identified route corridor Option A so that it meets the Meath Study Area corridor, and a northerly extension, and associated amendments, of the previously identified route corridor Option 3B so that it meets the Cavan Monaghan Study Area corridor. However, it is more appropriate to consider that there is a single route corridor for the proposed development, within a single overall study area.
- 44 Of particular note in this regard, notwithstanding the decision not to proceed with a new substation as part of the proposed development, EirGrid gave consideration to the location of the substation, in anticipation that it will be required at some future point in time. Given, the fact that, while the substation may be in the vicinity of Kingscourt, it may not necessarily be located at Moyhill (the site of the previously proposed substation), EirGrid reviewed the wider area between Nobber (east of Kingscourt) and north of Kingscourt, to determine if it presented any route corridor alternatives that were preferable (in terms of being least constrained) to the previously identified Option A/3B route corridor.

- 45 The analysis confirmed the preferred route corridor A/3B to the west of Kingscourt as the least constrained (and thereby preferred) route corridor option, primarily on the basis of having the lowest number of dwellings within 100m of the indicative line route, and being at a greater distance from all of the key settlements in the area (i.e. Kingscourt, Nobber and Carrickmacross), with particular implications from a visual amenity perspective.

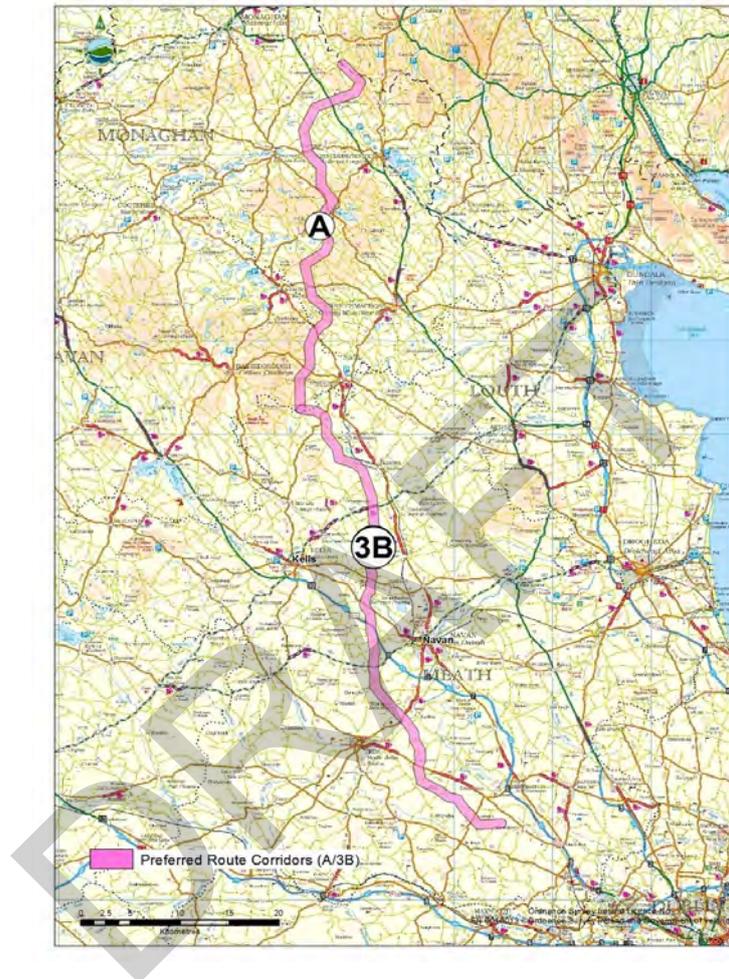


Figure 3.5: Preferred Route Corridor A/3B for the Proposed Development

3.1.5.3 Phase 3: Identification of a Preferred Line Design

- 46 Phase 3 of the route selection process was undertaken to identify an indicative route alignment within the preferred route corridor, following more focussed technical and environmental analysis within the identified preferred route corridor A/3B.
- 47 A line design was developed by, firstly, assessing a potential tower location using a specialised computer aided design programme (PLS CAD) and ordnance survey mapping in order to determine its feasibility and to confirm it meets all technical requirements. Initially, a desk-

based assessment was completed, which includes a review of aerial photography, LiDAR data and other environmental datasets. Following this, vantage point surveys and, where land access was granted, site specific surveys were also carried out. The result of the design process was the identified line route which formed the basis of the 2009 application for approval (which was subsequently withdrawn).

48 The principal recommendation arising from the re-evaluation process is that the general alignment of the previously identified indicative line route within route corridor Options A and 3B remains the „best-fit“ alignment for the proposed new transmission circuit within the preferred route corridor. The re-evaluation process also concluded that on the basis of the re-evaluation of updated environmental constraints and other information, a viable and environmentally acceptable indicative line route for a 400 kV overhead line exists within the preferred route corridor Options A and 3B.

49 The indicative line route identified in the *Final Re-evaluation Report* (April 2013) was broadly similar to the previously proposed line route (i.e. the subject of the 2009 application) but incorporates localised modifications as follows:

- Modifications to the line route in order to take account of the construction and granting of permission for new houses occurring since the preparation and submission of the previous Meath-Tyrone 400 kV Interconnection Development application in December 2009;
- Modification arising as a result of the decision not to proceed with the intermediate substation (in the area to the west of Kingscourt) as part of the proposed application for approval of the proposed development; and
- Modifications arising from technical and environmental considerations during the re-evaluation process.

50 The *Final Re-evaluation Report* also concluded that there were no significant material implications which would require the use of underground cable along any part of the indicative line route, other than on an identified section at the approach to Woodland Substation. However, it was noted that EirGrid would continue to investigate partial undergrounding as part of the detailed line design process and preparation of the Environmental Impact Statement. Subsequent studies have concluded that the approach to Woodland Substation is now best achieved by way of an overhead line.

3.1.5.4 Confirmation of the Final Line Design for the Proposed Development

51 Following on from the *Final Re-evaluation Report*, the *Preferred Project Solution Report* (July 2013) provided detail as to the specific Preferred Line Design for the proposed development.

This Preferred Line Design included identification of feasible alternative locations for, and design of the infrastructure, such as tower positions, tower types and associated construction related details (e.g. temporary access routes).

- 52 In the *Preferred Project Solution Report*, EirGrid identified the main routing principles which guided the line design process for the proposed development. The principles focused on a variety of technical, environmental and landowner considerations. EirGrid also identified that the optimum location for a transposition alignment was a general location 40 to 50km south of the proposed substation at Turleenan. Transposition is the practice of changing or re-arranging the spatial arrangement of the three electricity wires or conductors and takes place over four structures (the transposition alignment). The preferred line design as published in the *Preferred Project Solution Report* provided focus for ongoing landowner engagement, particularly in respect of the specific siting of structures on lands, as well as further environmental survey, design and assessment, primarily in engagement with directly affected landowners, as well as in consultation with prescribed authorities, other stakeholders and members of the public. These discussions informed the final line design which is the subject of this application.
- 53 The local detail of the planned line route, and in particular the siting of tower structures, is where most of the change to the previously proposed development has occurred. Such modifications have arisen for a number of reasons, such as from landowner requests, concern to avoid areas and features of identified potential ecological or other environmental quality and sensitivity, and following both on-the-ground survey and detailed analysis of the receiving environment from high quality up-to-date aerial photography and imaging.
- 54 In the *Preferred Project Solution Report*, EirGrid continued to consider the potential for partial undergrounding of the proposed development. This included having regard to submissions which specifically requested consideration to be given to undergrounding in particular areas and / or for certain sections of the proposed indicative line route, including a request by Cavan County Council to consider undergrounding in the area of Lough an Leagh. This request was examined by the project team and it was concluded that only the upper portions of the proposed towers would be visible in long distance views and therefore no strong justification for partial undergrounding in the vicinity of Lough an Leagh exits.
- 55 With the identification of a preferred overhead line design, EirGrid and its consultants were in a position to identify potential significant environmental impacts and to consider likely mitigation measures - this included among other things the potential for partial undergrounding. Reference is also made to the Scoping Opinion issued by the Board on 11th December 2013, which stated that “*the potential for alternative routing or partial undergrounding in sensitive landscape areas should be addressed*”.

- 56 As previously noted, both overhead line and underground cable technologies result in environmental impacts. These impacts are however different for the different technologies and in most cases, if not all, mitigation measures are available. Accordingly, the potential for undergrounding as a mitigation measure required consideration of the potential environmental impacts associated with partial undergrounding. EirGrid's consideration of partial undergrounding to mitigate potential significant environmental impacts arising from the proposed development, based on an understanding of the environmental issues associated with the project study area concluded that the majority of environmental topics identified an overhead line as having an equal or lesser environmental impact to partial undergrounding. In conclusion, none of the specialists have identified where there is an overriding need for partial undergrounding in order to mitigate significant potential impacts.
- 57 Following ongoing review of the preferred line design as published in the *Preferred Project Solution Report* it is now proposed to connect into Bay E10 of the Woodland Substation, thus avoiding the need for an underground cable section within the substation.
- 58 The route alignment of the proposed development has been subject to an extensive and careful examination of alternatives as part of an iterative project development process, from the broadest study area for the project down to localised alternatives for line routing. The mitigation of environmental impacts by design has been a fundamental aspect of EirGrid's line design process, and the proposed line design is considered to represent the best overall option amongst the main alternatives considered through the route development process.

4 DESCRIPTION OF THE PROPOSED DEVELOPMENT

4.1 ELEMENTS OF THE PROPOSED DEVELOPMENT

- 1 The proposed development comprises that portion of the proposed interconnector located within Ireland in counties Monaghan, Cavan and Meath.

4.1.1 Description of Line Route

- 2 The proposed line route within the two study areas (the Cavan Monaghan Study Area and the Meath Study Area) comprises the following:

- **Cavan Monaghan Study Area – New 400 kV Line:** The proposed development in the CMSA comprises a single circuit 400 kV overhead transmission circuit supported by 134 towers (Tower 103 to Tower 236) extending generally southwards from the jurisdictional border with Northern Ireland (between the townland of Doochat or Crossreagh, County Armagh, and and the townland of 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).³

It also includes an associated temporary construction material storage yard to be located on a site of approximately 1.42ha in the townlands of Monaltyduff and Monaltybane, Carrickmacross, County Monaghan.

- **Meath Study Area – New and Existing 400 kV Line:** The proposed development in the MSA comprises a new single circuit 400 kV overhead transmission circuit supported by 165 new towers (Tower 237 to Tower 401) extending for a distance of approximately 54.5km from Tower 237 in the townland of Clonturkan, County Cavan to Tower 402 (an existing double circuit tower on the Oldstreet to Woodland 400 kV transmission line) in the townland of Bogganstown (ED Culmullin), County Meath.

It includes the addition of a new 400 kV circuit for some 2.85km along the currently unused (northern) side of the existing double circuit 400 kV overhead transmission line (the Oldstreet to Woodland 400 kV transmission line) extending eastwards from Tower

³ Between Tower 106 and Tower 107 the proposed transmission line crosses the jurisdictional border with Northern Ireland at two points - from the townland of Lemgare, County Monaghan into the townland of Crossbane, County Armagh and back into the townland of Lemgare, County Monaghan. This results in a section of the span between Tower 106 and Tower 107 oversailing Northern Ireland. The oversail section forms part of the SONI proposal.

402 in the townland of Bogganstown (ED Culmullin), County Meath to Tower 410 and the Woodland Substation in the townland of Woodland, County Meath.

It also includes an extension to and works within the existing ESB Woodland Substation, in the townland of Woodland, County Meath.

- 3 This proposed circuit is presented in **Figure 4.1**, **Figure 4.2** and **Figure 4.3**.

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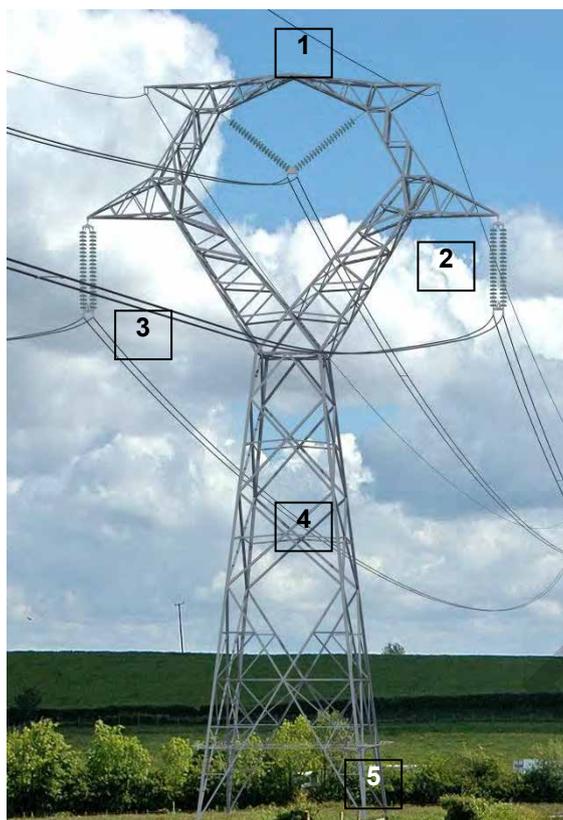
Figure 4.2: The Meath Study Area Section of the Proposed Development



Figure 4.3: Towers 402 to 410 (along the existing Oldstreet to Woodland 400 kV transmission line)

4.1.2 Overhead Line Elements

- 4 An overhead line is made up of a number of elements, the design and approach to which is a primary consideration to the line design process. These elements are:
- Towers and associated foundations; and
 - Conductors & shieldwires (wires) and associated hardware (including insulators and fittings).
- 5 Towers are one of the most significant components of an overhead line. There are three types of tower typically used for overhead line transmission developments: intermediate or suspension towers, angle / tension towers (generally used where the route changes direction), and transposition towers (transposition is the practice of changing or re-arranging the spatial arrangement of the three electricity wires or conductors and takes place over four structures (the transposition alignment). The IVI hot rolled lattice steel tower design, incorporating the three aforementioned tower types will be used for the proposed development.
- 6 The tower's overall shape comprises a diamond located at the top of a relatively narrow body. The general arrangement for the IVI tower design (including conductors and associated infrastructure) is illustrated in **Figure 4.4**.



1. Earthwire / Shield wires (to protect the circuit below from lightning strike)

2. Insulators (to separate the current carrying conductors from the steel tower structure)

3. Conductors (the lines carrying the electrical current)

4. Tower (the structure supporting the conductors and other apparatus)

5. Concrete foundation for each tower footing (to ensure the strength and integrity of the tower)

Figure 4.4: General Arrangement of an IVI Tower

7 Tower heights for the proposed new 400 kV circuit will range from approximately 26m to 51m. Towers are measured above ground level at the centre point of the tower to a height at the centre point of the tallest point of the tower. For the 400 kV towers the tallest points are the earthed shieldwires (refer to **Figure 4.4**). Small variances in measurements will naturally arise with uneven ground conditions.

8 The proposed development also includes approximately 2.85km of the new circuit supported on existing 400 kV double circuit towers - these range in height from 52m to 61m.

4.1.3 Fixing of Tower Positions

9 The line design for the proposed development identifies fixed tower structure positions for the new transmission circuit. This provides clarity to landowners and other interested parties on the precise location of the overhead line and associated infrastructure relative to particular landholdings, nearby dwellings, buildings, other structures and considerations such as environmental constraints. EirGrid is not seeking approval for micro-siting (small deviations from the identified locations of structures) in this application.

4.1.4 Works to Existing Overhead Line and Works within the Substation Site

10 An extension of the existing Woodland Substation is necessary to allow the connection of the new 400 kV circuit. The existing substation has a total size of approximately 7.7 hectares, located within ESB Network's landholding of approximately 27.2 hectares. The proposed works will take place on a site of approximately 0.544 hectares within and immediately adjacent to the substation and include:

- A western extension of the existing compound (approximately 0.231 hectares); and
- Associated works include modifications to the existing 2.6m high palisade fence and the addition of electrical equipment and apparatus including a lightning monopole (all ranging in height from approximately 7.4m to 28m).

4.1.5 Construction

11 The purpose of this section is to outline the construction methods which will be implemented on the proposed development. In the event that approval is granted for the proposed development, and prior to commencement of works, the contractor(s) which will be appointed by the Electricity Supply Board (ESB) (the Transmission System Owner [TAO] which will construct the proposed development, through its internal division ESB Networks), will prepare a detailed *Construction and Environmental Management Plan*. An outline *Construction and Environmental Management Plan* is included as Appendix 7.1, in **Volume 3B** of the Environmental Impact Statement for information purposes. The *Construction and Environmental Management Plan* will include method statements and work programmes that provide more detailed phasing of work and the mitigation measures contained in this Environmental Impact Statement.

12 The appointed contractor(s) will develop a series of detailed plans for the construction of the existing substation elements, the erection of the towers and the stringing of the line. These plans will be required to incorporate the mitigation measures outlined in the Environmental Impact Statement and any undertakings or conditions arising from the planning approval which may be granted by the Board. The detailed contents of the *Construction and Environmental Management Plan* and *Traffic Management Plan* produced by the contractor(s) will incorporate the outline *Construction and Environmental Management Plan*, outline *Traffic Management Plan*, mitigation measures and the requirements of undertakings / conditions, and will be agreed with the other appropriate authorities. ESB will employ a team to monitor the construction phase of the project and ensure works are being carried out by the appointed contractor in accordance with the *Construction and Environmental Management Plan* and agreed method statement, safety procedures, pollution control etc.

- 13 The construction works for the overall project are expected to extend over a period of three years. The following characteristics of overhead line construction are relevant:
- All construction works are temporary activities;
 - Overhead line construction is undertaken over a long linear site which means that construction activities take place in a particular sequence for a limited period of time;
 - This results in isolated areas of construction activities at each structure location which are limited in size (working area is approximately 30m x 30m) for short periods of time; and
 - The type of machinery required for overhead construction, which includes excavators, dumpers, concrete trucks, 4 x 4 vehicles, water pumps, and smaller tools, is generally similar in size and scale to machinery used for construction of domestic dwellings or for normal farming activities.
- 14 Having regard to each stage in the construction sequence, and the estimated duration of construction activities for each stage, the cumulative period of time required to complete construction of the overhead line at any structure location is estimated to be six to eight weeks.
- 15 The different stages of the construction process are illustrated in **Figure 4.5**. As illustrated in **Figure 4.5** the construction of the overhead line 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; standard installation (3 – 6 days), piling installation (5 – 10 days);
 - Stage 3 – Tower Assembly and Erection and Preliminary Reinstatement (3 – 4 days);
 - Stage 4 – Conductor / Insulator Installation (7 days); and
 - Stage 5 – Final Reinstatement of Land (1 – 5 days).
- 16 Typically, Stages 1, 2 and 3 are carried out as part of one contract, and when completed, lands around the construction site are reinstated. Stages 4 and 5 can only be carried out when Stages 1, 2 and 3 are completed.

- 17 On a project of this linear distance, there is likely to be an interval of up to 12 months between the completion of Stages 1, 2 and 3 and commencement of Stages 4 and 5. Lands will be reinstated so that they can continue to be used for agricultural activities during this interval.
- 18 Having regard to the estimated durations detailed previously for each individual stage, it is estimated that Stages 1, 2 and 3 would cumulatively take 7-17 days for standard installation or 9-21 days for piling installations. Lands will be preliminary reinstated and contractors will return approximately 12 months later for 8-12 days to complete the works and final land reinstatement.
- 19 Therefore, the cumulative time required at any one site over the 3 year construction period of the project is estimated at 15-29 days for the standard installation or 17-33 days for piling installation.
- 20 Site preparation works for overhead line construction includes temporary access routes to tower position and may include minor civil works around the tower location including, among other things, clearing the site (e.g. removal of fences, cutting back of trees and vegetation etc.); levelling of the tower foundation area; diversion of field drains; delineation of any on-site working area; erection of temporary guarding positions (where the conductor is to be strung over roads and electricity lines). The protection measures will be positioned both sides of a crossing and will be temporary in nature, for the duration of the stringing operation. The guarding locations will ensure that the stringing operation does not interfere with road users and the supply of electricity.
- 21 Where the proposed 400 kV line route traverses existing transmission, distribution and telecommunication lines and conflict occurs, advance diversion works will be required. The proposed specific advance works are detailed and, an environmental evaluation was undertaken, in the report entitled *North-South 400 kV Interconnection Development Identification and Resolution of Conflicts with Existing Overhead Line Infrastructure* (2015) (see **Appendix 7.2, Volume 3B Appendices**).
- 22 Construction will be facilitated by the use of a temporary construction materials storage compound on a site proposed to be located in the townlands of Monaltyduff and Monaltybane, Carrickmacross, County Monaghan.

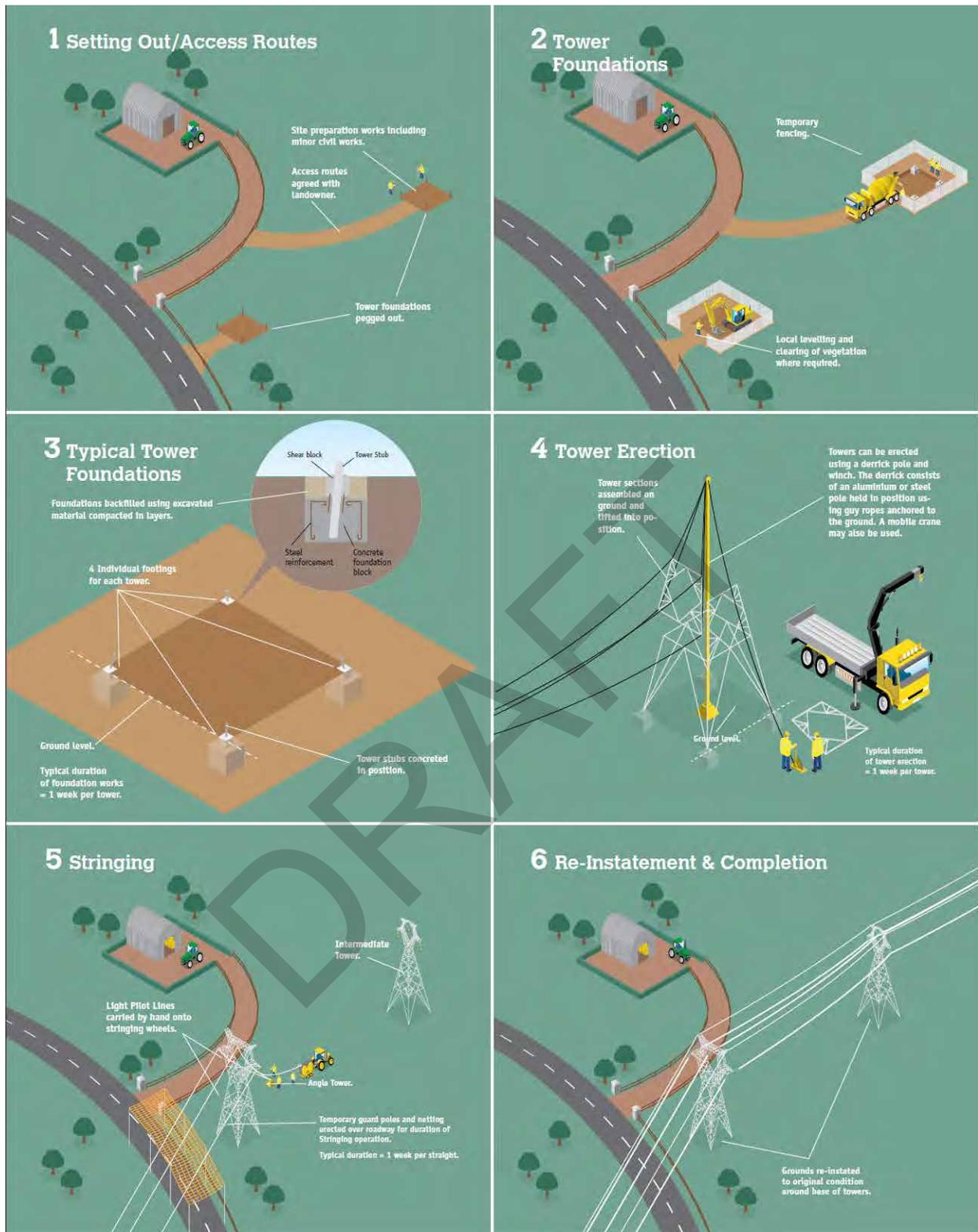


Figure 4.5: Typical Construction Works

(Source: Landowner Information Brochure (July 2013) for illustrative purposes only)

5 ENVIRONMENTAL TOPICS COVERED IN THE ENVIRONMENTAL IMPACT STATEMENT

5.1 INTRODUCTION

- 1 The appraisal of the proposed development is presented in summary on a topic-by-topic basis addressing both the **Cavan Monaghan Study Area** and the **Meath Study Area**. It includes a summary of the existing environment, potential impacts arising as a result of the proposed development, proposed mitigation measures and residual impacts (if any).

5.2 HUMAN BEINGS – POPULATION & ECONOMIC

- 2 The evaluation primarily concentrates on the preferred corridor (1km wide) as identified in the *Final Re-evaluation Report* (April 2013), within which the proposed overhead line is situated, but it also considers the population and economic environment outside of the wider area of the proposed development.
- 3 The types of issues which overhead line developments of this nature typically raise in relation to this environmental topic include the potential for impacts on population, settlement, employment and economic opportunities.

Existing Environment

- 4 The proposed development passes through counties Cavan, Monaghan and Meath, all of which have experienced population growth over the past decade.
- 5 The main population centres in the **Cavan Monaghan Study Area** are Carrickmacross, Castleblayney, Ballybay, Kingscourt and Shercock. Smaller population centres include Annayalla, Clontibret, Corduff and Doohamlet. Single (one-off) dwellings outside established settlements are also a significant feature of settlement patterns in this study area. Notwithstanding the extent of existing scattered one-off dwellings within the area of the proposed development, there are 39 dwellings (including one permitted but as yet unbuilt dwelling) within 100m of the centre of the line route within this study area.
- 6 Community facilities, such as schools, churches and sports clubs, where large numbers of people frequently visit, are often found in rural areas outside both the larger and smaller settlements. Similarly to dwellings, a key design criterion seeks to maximise the distance to such facilities. In this regard the nearest community facilities which are located within 1km of the overhead line in the **Cavan Monaghan Study Area** are: Drumhowan GAA Club (approximately 330m east of Tower 150), Laragh National School and church (approximately 410m east of Tower 230), Corcreaghagh National School (approximately 640m west of Tower

- 195), Ballintra Church (approximately 750m south-west of Tower 142) and Ballaghneagern National School (approximately 820m south-east of Tower 207).
- 7 The main areas of employment in the **Cavan Monaghan Study Area** revolve around the agriculture, rural development, tourism and the service industry sectors. Unemployment in this study area is slightly above the national average.
- 8 The main population centres in the **Meath Study Area** are Navan, Dunshaughlin and Trim. Smaller population centres include Nobber, Summerhill, Kilmainhamwood, Kilmessan and Gibstown. Single (one-off) dwellings outside established settlements are also a significant feature of settlement patterns in the study area. Notwithstanding the extent of existing scattered one-off dwellings within the area of the proposed development, there are 23 dwellings within 100m of the centre of the line route within this study area (not including the existing double circuit line). Nine dwellings are located within 100m of the centreline of the existing Oldstreet to Woodland double circuit line. The nearest community facilities which are located within 1km of the overhead line are: Oristown Church (approximately 150m west of Towers 302 and 303) and Robinstown National School (approximately 570m north-east of Tower 349).
- 9 County Meath contains two separate officially designated Gaeltacht areas namely; (a) Ráth Cairn (Rathcairn), 4.8km south-east of Athboy and (b) Baile Ghib (Gibstown), 9.6km east of Kells. The overhead line runs through the Gaeltacht area of Baile Ghib.
- 10 The economic base in County Meath is relatively diverse amongst many employment sectors. While employment and economic activity is dispersed throughout the county, it is concentrated in the main primary and secondary economic growth towns of Navan, Drogheda, Ashbourne, Dunboyne, Kells and Trim. A significant proportion of the population commutes for work to areas outside the county, in particular to the Dublin area. The main areas of employment in the **Meath Study Area** revolve around the service sector and manufacturing with agriculture, rural development and tourism providing secondary employment sectors. Unemployment in this study area is close to the national average.

Potential Impacts

- 11 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.
- 12 The proposed development which passes through a small area of the Meath Gaeltacht is not a type of development which has the characteristics to significantly affect the promotion of Irish as the community language.

- 13 In terms of meeting the needs of forecast population growth and to ensure that adequate infrastructure is available for future employment and economic activity in both Ireland and Northern Ireland, it is essential that the electricity grid is maintained and improved.
- 14 In economic terms, the capital value of the proposed interconnector is estimated to be in the region of €286million. The project will involve the provision of a significant number of direct and indirect jobs both on and off site over the construction period.

Mitigation Measures

- 15 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.

Residual Impacts

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

5.3 HUMAN BEINGS – LAND USE

- 17 The land use appraisal in the Environmental Impact Statement considers impacts on agricultural, horticultural and forestry land parcels⁴ along the proposed development (including land parcels along temporary construction access routes and one land parcel at the construction material storage yard). The existing agricultural, horticultural and forestry environment was evaluated by interviewing landowners (where possible), roadside surveys and by examination of aerial photography and land registry mapping data.

Existing Environment

- 18 Within 1km corridor centred on the proposed alignment in the **Cavan Monaghan Study Area** 98.5% of the land is agricultural and 1.5% is woodland, peatland and forestry. According to the 2010 Agricultural Census 11% - 13% of the agricultural land owners are dairy farmers. These are regarded as high sensitive farms for the purposes of this environmental appraisal. Approximately 82% - 87% are beef and / or sheep or grass cropping farmers. These are regarded as medium sensitive farms. Approximately 2% - 5% are categorised as other farms. These consist of equine, horticultural, pigs and poultry. These are generally regarded as high or very high sensitive farms. Vantage point surveys were conducted by the agronomist within

the **Cavan Monaghan Study Area**. From these observations, 7% of land parcels were dairy, 53.5% were beef and / or sheep farms, 0.5% were land parcels which had an intensive agricultural enterprise (pigs or poultry), 2% were equine enterprises, and 37% were grass land parcels either cut for hay or silage or where grazing cattle were not seen during the survey. Approximately 89% of the land parcels along the proposed development have been evaluated as being very low, low or medium sensitivity. Approximately 10% are evaluated as being high sensitive and 1% are evaluated as being very high sensitive.

- 19 Within a 1km corridor centred on the proposed development alignment in the **Meath Study Area** 99% of the land is agricultural, and 1% is woodland, peatland and forestry. According to the 2010 Agricultural Census approximately 10% of the agricultural land owners are dairy farmers. These are regarded as high sensitive farms for the purposes of this environmental appraisal. Approximately 79% are beef and / or sheep or grass cropping farmers. These are regarded as medium sensitive farms. Approximately 10% are tillage and / or mixed cropping farmers with tillage and livestock. These are regarded as medium sensitive farms. Approximately 1% are categorised as other farmers (equine, horticultural and poultry). These are generally regarded as high or very high sensitive farms. Vantage point surveys were conducted by the agronomist within the Meath Study Area. From these observations 9% of land parcels were dairy, 38.5% were beef and / or sheep farms (beef cattle or sheep were seen during the survey), 30% were grass land parcels either cut for hay or silage or where grazing cattle were not seen during the survey, 16.5% were tillage and or mixed crops and livestock land parcels, 6% were other type enterprises including equine, poultry and farm yards. Approximately 80.5% of the land parcels along the proposed development have been evaluated as low or medium sensitive. Approximately 14.5% are evaluated as being high sensitive and approximately 5% are evaluated as being very high sensitive. Forestry land parcels are considered as very highly sensitive to overhead line developments for the purposes of this land use appraisal, because trees have to be cleared for a maximum distance of 37m at each side of the centre of the overhead line.

Potential Impacts

- 20 On farms where towers are to be constructed the potential impacts during the construction phase are typical of impacts arising from other farm construction, such as where livestock sheds are being constructed. However, the locations of the proposed towers are generally distant from the farmyard and, therefore, access must be obtained using existing tracks where possible or using temporary routes across green fields.

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.

- 21 Without mitigation, potential impacts may arise during the construction phase where cattle are disturbed and allowed to stray, where land drainage is damaged, where access to land is restricted or if disease precautions are not adhered to. There will be clearing of trees located within falling distance from the proposed development, clearance works may be required at the site of the towers and forestry will be cleared along the alignment. Within the **Cavan Monaghan Study Area** the construction impact is considered to imperceptible for 87% of the land parcels, slight adverse for 12.7% of land parcels and moderate adverse for 0.3% of land parcels (one land parcel at the construction material storage yard). Within the **Meath Study Area** the construction impact is considered to imperceptible for 79% of the land parcels, slight adverse for 18% of land parcels, moderate adverse for 2% of land parcels and major adverse for two land parcels (1%). The moderate adverse and major adverse construction impacts occur in forestry land parcels (within the **Meath Study Area**) where trees have to be cleared for a maximum of 37m at each side of the centreline (74m).
- 22 During the operational phase of the proposed development the presence of the towers will cause localised permanent disturbance to machinery operations such as ploughing and spraying. The area under the towers may harbour weeds and will remain uncropped in tillage fields. The overhead line and towers will be an additional safety risk on the farm; however, it is noted that there are several thousand kilometres of existing high voltage overhead lines across the country and farming is practised safely underneath them. Any damage to soil which persists after the construction phase may have to be addressed by ploughing and reseeded to return land to its original condition. In certain situations, the location of the overhead line on a farm may restrict the potential to build tall agricultural buildings. The noise and electric magnetic fields generated by the overhead line will not have a significant effect on livestock or crops. Commercial forestry plantations will be permanently cleared within a 74m maximum corridor centred on the proposed overhead line and there will be additional hedgerow maintenance under and adjacent to the overhead lines. The site of the construction materials storage yard will be reinstated for agricultural use after construction is completed. During the lifetime of the proposed development there will be regular inspections by the ESB (Electricity Supply Board) and some routine maintenance work. There will be an annual low level helicopter fly-over inspections.
- 23 Within the **Cavan Monaghan Study Area** the bases of the 134 towers will occupy approximately 2.7 hectares and damage to soil will occur on approximately 40 hectares (at construction sites, along temporary access routes, at stringing sites, at guarding locations and at the construction materials storage yard). Within the **Meath Study Area** the bases of the 174 towers (including 9 No. existing towers) will occupy approximately 4.2 hectares, 14.6 hectares of commercial forest will be cleared and there will be damage to soil on approximately 57 hectares (at construction sites, along temporary access routes, at stringing sites and at guarding locations). Overall there will be no significant change in land utilisation beneath the

overhead line. The impact on the land use study area along the proposed development is imperceptible when the line is in operation.

Mitigation Measures

- 24 ESB will employ a team to monitor the construction and operational phase of the development and ensure all construction works are being carried out in accordance with the *Construction and Environmental Management Plan* (an outline *Construction and Environmental Management Plan* is included as an appendix to the Environmental Impact Statement). Personnel involved in the construction phase will receive adequate training in relation to their responsibilities in accessing farms. Precautions will be taken to avoid spreading animal and crop diseases and the contractor will adhere to regulations pertaining to animal and crop diseases. All construction sites will be fenced-off to avoid injury to livestock and gate accesses to fields will be kept securely closed when the contractor enters farm land. The contractor will notify the land owner at least one week in advance of any construction activities. Notifications in advance of helicopter fly-over inspections will be given in local and national media. Many of the mitigation measures for the construction and operational phase are existing work practices carried out by ESB staff, who regularly enter farm land to erect and maintain electricity infrastructure – without significant adverse effects on farms. The aforementioned agreement between the ESB and Irish Farmers Association addresses how works are to be carried out in consultation with the land owner and how lands are to be reinstated.

Residual Impacts

- 25 **Table 5.1** summarises the individual residual impacts on land parcels along the proposed development.

Table 5.1: Summary of Individual Land Parcel Residual Impacts

Study Area	Imperceptible	Slight Adverse	Moderate Adverse	Major Adverse	Profound
Within the Cavan Monaghan Study Area	115	91	14	0	0
Within the Meath Study Area	88	80	7	3	0
Total	203 (51%)	171 (43%)	21 (5.5%)	3 (0.5%)	0

5.4 HUMAN BEINGS – TOURISM AND AMENITY

- 26 An evaluation of the proposed development in relation to tourism and amenity was carried out. The evaluation primarily concentrates on the preferred corridor (1km wide) as identified in the *Final Re-evaluation Report* (April 2013) within which the proposed overhead line 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 .
- 27 The evaluation is based on *Fáilte Ireland Guidelines on the Treatment of Tourism in an Environmental Impact Statement*, which have been developed to facilitate their evaluation of projects and the potential for impacts on tourism and amenities. 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. The guidelines 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 finding as to the likely significance to, or effect on, tourism needs to be summarised in this section.
- 28 The types of issues which overhead line developments of this nature typically raise in relation to this environmental 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.

Existing Environment

- 29 Within the **Cavan Monaghan Study Area** there are a number of tourist attractions and amenities in counties Cavan and Monaghan, offering a variety of tourist experiences, primarily based around the themes of culture, sightseeing, ecology and outdoor activities. From the available tourism and amenity information, the most significant visitor attractions identified by Fáilte Ireland in counties Cavan and Monaghan are: the Monaghan Way (traversed by the overhead line); Lough Muckno (approximately 6.6km east of the overhead line); Lough an Leagh (approximately 2.1km west of the overhead line) and Dun a Rí Forest Park (approximately 3.8km east of the overhead line). In addition to the larger towns, where there is a higher concentration of tourist and amenity facilities, there are a number of smaller towns and villages around counties Cavan and Monaghan which have a number of local attractions and amenities for the surrounding population including Clontibret (close to the historical Battle of Clontibret site) and Donaghmoynne (the location of the ruins of Manan Castle).
- 30 In addition to facilities, there are various visitor activities available in counties Cavan and Monaghan. While many indoor activities are located in towns and villages, there are a variety of outdoor activities available at different locations throughout both counties. These activities include: angling and shooting around Loughs Muckno, Egish, Fea, Descart, Rahans, Creevy, Morne and their tributaries; equestrian; walking; cycling; gaelic games and other recreational

- activities. In addition, Muff Fair (a traditional horse fair) takes place every year on 12th August at Muff cross roads west of Kingscourt, attracting many hundreds of visitors throughout the day.
- 31 There is 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. The nearest registered accommodation providers to the proposed development are Drumhowan Country House (approximately 330m east of Tower 222) and Alice's Loft, consisting of three self-catering cottages (approximately 3km east of Tower 236).
- 32 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 southeast Cavan area and the eastern part of Monaghan is relatively low by comparison with other counties in Ireland. County Monaghan has the second lowest number of visitors in the northwest region. In addition, revenue from these visitors is also relatively low, in comparison to 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 tourism products develop in the future. Development of tourism and leisure is identified as an important area of diversification for agricultural enterprises in the Cavan and Monaghan County Development Plans.
- 33 The **Meath Study Area** has many tourist attractions throughout the county. It is an important tourist destination, with the United Nations, Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Site of Brú na Bóinne, incorporating the passage tombs at Newgrange, Knowth and Dowth area being a particular focus of tourist activity. The importance of the county as a tourist destination arises as a result of the archaeological and architectural heritage, the rural landscape, the towns and villages and the coastline.
- 34 From the information provided, the most significant visitor attractions identified by Fáilte Ireland in County Meath are: The Battle of the Boyne – Oldbridge Estate (approximately 22km east of the overhead line), Brú na Bóinne Visitor Centre including Newgrange, Knowth and Dowth (approximately 18km to 20km east of the overhead line), Trim Castle (approximately 6km west of the overhead line), Hill of Tara (approximately 6km east of the overhead line), Bective Abbey (approximately 800m north-east of the overhead line) and the Boyne Valley Driving Route and surrounding attractions (traversed by the overhead line). It is important to note that with the exception of Trim Castle, Hill of Tara, Bective Abbey and the Boyne Valley Driving Route, the other attractions lie a significant distance from the proposed development and have not been identified by Fáilte Ireland as tourism assets within the MSA.

- 35 There are a number of smaller towns and villages around County Meath which have a number of local attractions and amenities for the surrounding population including: Nobber, Kilmainhamwood, Gibstown (Baile Ghib), Robinstown, Dunderry, Bohermeen, Oristown, Wilkinstown, Castletown, Drumree, Dunsany, Cortown, Teevurcher and Batterstown.
- 36 In addition to facilities, there are various visitor activities available in County Meath. While many indoor activities are located in towns and villages, there are a variety of outdoor activities available at different locations throughout the county. These activities include angling, shooting and hunting, with the main fishing rivers being the Rivers Boyne and Blackwater, equestrian, walking, cycling, gaelic games and other recreational activities. In addition, Fáilte Ireland has completed the Boyne Valley Driving Route Project. The route is 225km long and takes in 22 historic sites including two world heritage sites along the way. The overhead line crosses the driving route at two locations, close to Bective Abbey and close to Gibstown (Baile Ghib). There are various scenic views along the route. Trim Airfield is located approximately 1.2km from the overhead line. The Dunderry area is a high amenity area with both Dunderry Fair and the Dunderry Park festival taking place once a year, in addition to the ongoing courses and training throughout the year at Dunderry House. There are a number of other local festivals and events which take place in the area, including the Drive in Bingo held in a field outside Gibstown (Baile Ghib); this is located adjacent to the proposed overhead line.
- 37 There is a wide variety of accommodation types throughout County Meath, with the majority of them located in or on the outskirts of the main towns. Fáilte Ireland has provided details of all registered accommodation. The nearest registered accommodation provider to the proposed development is Kiltale Holiday Homes and Farms approximately 950m east of Tower 376.
- 38 Tourism is important to County Meath, particularly as it is located adjacent to Dublin, which receives the highest number of overseas tourists and revenue. Fáilte Ireland statistics record that the World Heritage Site of Brú Na Bóinne attracted in excess of 130,000 visitors in 2013. Development of rural tourism and leisure is identified as an important area of diversification for agricultural enterprises in the Meath County Development Plan. There are a number of existing rural tourism enterprises in the county in the vicinity of the proposed development including the Crystal Maze and Royal Breffni Tours. 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 tourism products develop in the future.

Potential Impacts

- 39 The key tourist assets identified by Fáilte Ireland in both the **Cavan Monaghan Study Area** and the **Meath Study Area** have been considered and avoidance of these to the greatest extent possible has been the objective during the route selection stage, thereby avoiding significant

adverse impacts. While there are other tourist attractions and local amenities outside the key tourism assets, these are less sensitive to change when compared to those key assets.

- 40 The tourism profile of the **Cavan Monaghan Study Area** shows that the majority of visitor attractions and amenities lie over 2km from the proposed development, with Lough Muckno, a key tourism asset over 6km to the east. As the line 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. In this regard, an evaluation of the degree to which the line route could potentially affect the ecological and visual amenities of these areas was carried out. As the most significant tourist attractions and activities, with the exception of the Monaghan Way, as identified by Fáilte Ireland and local tourism agencies, are being avoided and existing 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 in this study area arising directly as a result of the proposed development.
- 41 The tourism profile of the **Meath Study Area** shows that the majority of visitor attractions and amenities including: Battle of the Boyne – Oldbridge Estate, Brú na Bóinne Visitor Centre, Newgrange, Knowth and Dowth lie approximately 18km to 22km from the proposed development. As the line will pass through some areas of localised landscape sensitivity, in particular where it traverses short sections of the Boyne Valley Driving Route close to the location of Bective Abbey, it may have slight indirect impacts on the attractiveness and associated tourism and amenity value of these and other areas. As the most significant tourist attractions and activities, as identified by Fáilte Ireland and local tourism agencies, are being avoided, with the exception of the Boyne Valley Driving Route and existing activities can continue in the vicinity of the proposed development, it is reasonable to conclude that overall there may be slight localised impacts on tourism and recreational amenities and associated economic activity in this study area arising directly as a result of the proposed development.

Mitigation Measures

- 42 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 within the **Cavan Monaghan Study Area** and classified as localised slight within the **Meath Study Area**. 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.

Residual Impacts

- 43 Once the proposed development is operational, slight to moderate localised residual impacts on tourism and amenity may be anticipated.

5.5 HUMAN BEINGS – ELECTRIC MAGNETIC FIELDS

- 44 An evaluation of the proposed development in relation to EMF (electric and magnetic fields) was carried out.
- 45 EMFs are present in both natural and manmade environments. Natural sources of EMFs include, for example, the earth's geomagnetic field and the electric field beneath an active thunderstorm. Electricity in Ireland oscillates 50 times each second (i.e. at a frequency of 50 Hertz) and creates both electric and magnetic fields wherever electricity is generated, transmitted, distributed or used in the home, in the workplace, and other areas.
- 46 Since the 1970's, researchers in various scientific disciplines have conducted studies to investigate potential health effects of EMF exposure. These studies include both epidemiology studies and laboratory studies of humans, animals, tissues, and cells. Epidemiology studies investigated whether persons with certain health conditions, including cancer, had greater exposure to EMF. Laboratory studies examined whether exposure to EMF in the laboratory could affect the health of persons and animals or produce biological responses in cells and tissue. While some of the epidemiology studies have reported statistical associations between higher average long-term exposure to magnetic fields and childhood leukaemia, in particular; the role of chance, systematic error, and confounding by other factors cannot be ruled out as explanations. Moreover, a biological basis for these statistical associations is not supported by studies involving lifelong exposures of laboratory animals to magnetic fields. Similarly, studies of cells and tissues have not confirmed a mechanism by which weak magnetic fields commonly encountered in our environment could have toxic effects by either initiating or promoting cancer.
- 47 Everyone in developed and in most developing countries has exposure to EMF wherever they live. The strength of an electric field is directly related to the voltage of the source and so the electric field under a high voltage transmission line is higher than the electric field from the low voltage on home wiring. The unit of measurement for electric fields is kilovolts per metre (kV/m).
- 48 Magnetic fields are created by the flow of electrical current (i.e. by the flow of electric charges through power lines). Magnetic field strength is expressed by flux density and measured in units of microtesla (μT). The earth's geomagnetic field which is used for compass navigation is approximately $50\mu\text{T}$ throughout Ireland.

- 49 Both electric and magnetic field levels quickly diminish with distance away from the source. Electric fields are easily blocked by conductive objects, such as fences, trees, and even the human body.
- 50 Magnetic fields are not easily blocked by objects, so exposures encountered in daily life can range widely from as little as 0.01 μ T away from specific sources and as high as 1-2 μ T at 50 centimetres from home appliances; exposures greater than 10 μ T are uncommon except very close to some household appliances or beneath a high voltage transmission line, both occasions generally occur for very short periods.
- 51 Numerous national and international scientific and health organisations, including the World Health Organisation (WHO), have reviewed the existing scientific literature to assess the potential health risks arising from this widespread exposure to EMF. Following its most comprehensive in-depth review of the scientific literature on potential health effects related to EMF, the World Health Organisation made the following statement “*Based on recent in-depth review of the scientific literature, the WHO concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields*” (World Health Organisation, 2014). A preliminary opinion released by a scientific committee that advises the European Union on the potential for EMF health effects reached a similar conclusion (SCENIHR, 2013).
- 52 Scientifically-based exposure guidelines published in 1998 (updated in 2010) have been recommended by the International Commission of Non-Ionizing Radiation Protection to protect the public and workers from known effects of EMF that occur at high levels of exposure, such as nerve and muscle stimulation and annoyance due to micro-shocks. The International Commission of Non-Ionizing Radiation Protection also determined that evidence from studies with exposures below these guidelines and from studies of long-term health outcomes “*is too weak to form the basis for exposure guidelines*”. The guidelines developed by the International Commission of Non-Ionizing Radiation Protection in 1998 form the basis for the European Commission Recommendation (1999/519/EC) which sets out guidelines for member states on limiting the exposure of the public to EMF in locations where people spend significant time. The EC Recommendation is the de facto guideline applicable in Ireland and “*provides adequate protection for the public from any EMF sources*” (Department of Communications, Marine and Natural Resources, 2007).
- 53 Other topics that are commonly raised in relation to EMF include potential interference with implanted medical devices (such as pacemakers) and potential effects on plants and animals. The European Committee for Electrotechnical Standardization has indicated that exposure to fields below reference levels mentioned for human exposure are sufficient to prevent interference with active implanted medical devices (CENELEC 50527-1 2010). Research accumulated over the past 40 years on plants and animals exposed to extremely low frequency

(ELF) EMF from transmission lines and research conducted in the laboratory does not confirm any harmful effects of EMF on the health, behaviour, productivity or reproductive potential of plants and animals.

Existing Environment

- 54 Over the vast majority of the proposed route the overhead line will be of a single circuit configuration supported on lattice towers. In short sections elsewhere along the route, the line is proposed to be built in two different configurations: single-circuit configuration supported on transposition towers (over a distance of 765m between Towers 118 to 121) in the **Cavan Monaghan Study Area** section of the route; and by utilising existing double-circuit lattice towers (over a distance of 2.85km) in the **Meath Study Area** section of the route.
- 55 In the **Meath Study Area** where it is proposed to use the unused (northern) side of the existing double-circuit lattice towers, which support the Oldstreet to Woodland 400 kV circuit, the EMF from the transmission line will differ from the EMF along the single circuit configuration. Calculations for all configurations have been made which show the different electric and magnetic fields associated with each configuration.

Potential Impacts

- 56 EMF only occurs when an overhead line becomes operational; therefore no effects arise from the overhead line during the construction phase of the proposed development.
- 57 To assess the potential impacts of electric and magnetic fields during the operational phase of the proposed development, the EMFs were calculated at 1m above ground, in accordance with relevant guidelines.
- 58 The magnetic field from the proposed 400 kV transmission line is at its highest directly under the line at the location where the wires are closest to the ground, usually at mid-span. Based on an average loading on the line the magnetic field is calculated to have a maximum level of approximately 16 μ T, but the intensity of the magnetic field diminishes with distance to about 1.0 μ T at a distance of 50m and to approximately 0.25 μ T at a distance of 100m from the centreline, a reduction by a factor of 64. In the case of magnetic field exposure, the International Commission of Non-Ionizing Radiation Protection (1998) specifies that if the level can be shown to be below 100 μ T (Reference Level) then compliance is established. The maximum magnetic field calculated for the proposed development is 49 μ T, a level which is only likely to arise during infrequent exceptional and emergency operating conditions and for a short duration. Normal daily operating levels will be significantly below this level. From a magnetic field perspective, the development will therefore be far below the conservative levels specified in the International Commission of Non-Ionizing Radiation Protection guidelines.

- 59 In the case of electric field exposure, the International Commission of Non-Ionizing Radiation Protection (1998) specifies that the levels should not exceed the Basic Restriction on current density in the body, a value calculated to arise for an exposure of about 9 kilovolts per meter (kV/m). This guideline is applied in the EU to areas where the public spends significant time. The maximum electric field calculated for the majority of the proposed development is approximately 7.9kV/m, with a minor increase to 8.0kV/m at the short transposition section. Hence, electric field exposures will comply with the Basic Restriction in International Commission of Non-Ionizing Radiation Protection guidelines.

Mitigation Measures

- 60 While consideration of low-cost precautionary measures to minimise exposure to EMF in siting or line design have been recommended (Department of Communications, Marine and Natural Resources, 2007; World Health Organisation, 2007) and followed in this project (i.e. avoiding residences to the greatest extent possible and minimising EMF by optimal phasing of the transmission line where it is supported on double-circuit structures), changes to current EMF guidelines were judged inappropriate by the European Commission “*as there are no clear scientific indications that the possible effects on human health may be potentially dangerous*” (European Commission, 2002).

Residual Impacts

- 61 In summary, even making conservative „worst-case” assumptions about the operating conditions assumed for the proposed development, which would thereby not reflect normal operating conditions, the EMF from the proposed 400 kV line is still significantly below EMF guidelines of Ireland and the European Union. A survey of scientific research on topics relating EMF to health of humans and other species did not show that EMF at these or lower levels would have adverse effects on these populations. This evaluation is consistent with reviews by national and international health and scientific agencies. As the proposed development will be operated in compliance with established relevant international guidelines for the control of EMF, specifically with the relevant quantitative exposure guidelines, no significant residual impacts are anticipated.

5.6 FLORA AND FAUNA

- 62 The evaluation of the potential ecological impacts of the proposed development on the flora and fauna of the project study area was undertaken in accordance with the requirements of national and European legislation and guidelines. The baseline ecology of the study area was determined by undertaking a desktop review of ecological datasets and literature together with extensive flora and fauna field surveys of ecological features of the study area undertaken over a number of seasons (2007-2013), and interpretation of high-quality aerial imagery. Based on

the results of desk and field studies, Key Ecological Receptors (features of ecological importance that may be sensitive to impacts from the proposed development) were identified.

63 In accordance with relevant legislation, a Natura Impact Statement was also prepared to address the potential impacts of the proposed development on sites designated as „European sites“ (see **Volume 5** of the application documentation).

64 To inform the ecological appraisal, extensive field surveys throughout the study area were carried out over a seven year period (2007-2014). These included multidisciplinary ecology surveys (habitats, flora and fauna), winter and breeding bird surveys and bat surveys. A breeding bird survey was undertaken in 2009, 2012, 2013 and 2014. Breeding bird surveys targeted key bird species of conservation significance and other potentially sensitive bird species. Extensive multi-annual surveys have been conducted on wintering birds to inform the ecological impact assessment with particular focus on Whooper Swans. These surveys have been conducted annually since 2007/2008 and included regular counts at known sites coupled with aerial observations of the wider study area undertaken from light aircraft.

Existing Environment

65 The following is a summary of the baseline ecological environment identified during the appraisal within the **Cavan Monaghan Study Area**:

- There are no designated European sites or Nationally designated sites occurring within the immediate corridor of the alignment in this study area. The closest designated site is Tassan Lough, a proposed Natural Heritage Area (pNHA), located approximately 250m south of the alignment. The closest European site is Killyconny Bog candidate Special Area of Conservation (cSAC) located approximately 11km to the south-east of the alignment.
- No rare or protected flora species were recorded during the course of field surveys in the vicinity of the proposed development in this study area. Twenty one different habitat types were recorded within the study area, these habitats were categorised into five main types: freshwater, grassland, peatland, woodland & scrub and cultivated & built land. A number of wetland sites occur in low lying areas throughout the alignment in the study area. The design of the development has successfully avoided placing towers and other works areas within any wetland sites of conservation importance.
- An extensive network of hedgerows and treelines provide connectivity between areas of semi-natural habitat throughout the landscape of the study area. The vast majority of hedgerows and treelines have been avoided by placing towers and other works areas in other habitats of low ecological value. Those hedgerows and treelines that will be impacted directly by the development have been assessed in the field and have been

confirmed to be of low or moderate value. Most watercourses that occur within the study area are small streams and are intrinsically of relatively low ecological importance. However they provide a link to aquatic habitats of considerable ecological importance and sensitivity further downstream. Towers and other proposed works areas are removed from all natural watercourses. The alignment does oversail a number of these watercourses throughout its length.

- Whooper Swan are a species considered to be highly vulnerable to collision with overhead lines and early in the development design phase were noted as a species that utilise this study area throughout winter months. For these reasons Whooper Swan are a key target species for consideration regarding potential effects of the proposed development. Overall, three key areas were recorded where swans were recorded, at least in some years, in proximity to the alignment with occasional flights being recorded or confirmed as likely across the route of the alignment. These sites include Comertagh, Mill and Rafteragh Loughs (foraging and roost sites), Lough Egish and Lough Morne (foraging and roost site) and Balintra (foraging site).
- Protected mammal species (in particular badger, otter and bat species) occur within areas of suitable habitat within this study area. Badgers occur amongst suitable habitat throughout the study area, with their setts occurring most commonly in wooded habitat. All badger setts identified during the course of desktop studies and field surveys have been avoided. A single badger sett has been identified as occurring within 50m of the proposed development (located approximately 25m from Tower 151). Otter are relatively scarce throughout this study area, and no evidence of otter was recorded during field surveys. Bats were recorded foraging and commuting in suitable habitat (hedgerows, treelines and wooded areas). No roost sites were identified in proximity to the alignment following desktop studies and field surveys. Potential tree roost sites are scarce in the study area. Mature treelines and woodland identified as possible roost sites were identified. Avoidance of habitats that are potentially suitable for protected mammals ensures that no works associated with tower construction will directly impact protected mammals.

66 The following is a summary of the baseline ecological environment identified during the appraisal within the **Meath Study Area**:

- There are three designated areas for conservation within 5km of the proposed development. Of these, the River Boyne and River Blackwater (cSAC and Special Protection Area (SPA)), which consists of two of these designations, is oversailed by the alignment at two locations, although no towers or other elements of the development (with exception of oversailing conductors) are proposed to be located within the site boundary.

- Two pNHAs and other non-designated habitats of conservation value also occur within 5km of the development and are identified and avoided by the proposed development.
- No rare or protected flora species were recorded during the course of field surveys in the vicinity of the proposed development. Eighteen habitat types were recorded at and adjacent to the proposed development. These habitats were categorised into four main types: freshwater, grassland, woodland & scrub and cultivated & built land. No European protected habitats were recorded during field surveys.
- Lapwing and Kingfisher were both identified as key sensitive bird species that breed within the study area. Two to three pairs of Lapwing were likely to be breeding in the vicinity of Oristown (west of alignment at Towers 294 – 296) during the 2011, 2012, 2013 and 2014 breeding seasons. This area has been impacted by recent land development works (2014). Kingfisher is likely to breed amongst suitable habitat (rivers, streams and associated habitats) throughout this study area. Other bird species of local conservation importance considered include Yellowhammer, water fowl (including Little Grebe, Cormorant, Mute Swan) and Snipe
- Whooper swan were noted as a species that extensively utilised this study area during winter in numbers that regularly exceed nationally significant levels (greater than 150 birds). Overall, a number of Nationally Important sites (or sites close to National Importance) have been identified relatively close to the alignment. These include: Tara Mines Tailings Ponds (roost site), River Blackwater Valley (various foraging sites), Headford Estate (roost site), Yellow river (foraging site) and more Cloony Lough (area), Cruicetown (area) and Balrath Estate (foraging and roost site).
- Protected mammal species, in particular badger, otter and bat species occur within areas of suitable habitat (river sides, woodlands, hedgerows and treelines) within this study area. Towers are typically located away from potentially suitable breeding habitat of these species. Bats were recorded foraging and commuting in suitable habitat (hedgerows, treelines and wooded areas). No roost sites were identified in proximity to the alignment following desktop studies and field surveys. Mature treelines and woodland identified as possible roost sites were identified. Avoidance of habitats that are potentially suitable for protected mammals ensures that no works associated with tower construction will directly impact protected mammals.

67 Following a review of the existing environment of both the **Cavan Monaghan Study Area** and the **Meath Study Area**, key ecological receptors were determined that occurred within the project study area and required consideration regarding potential impacts and mitigation. No direct habitat loss will arise to any habitats evaluated as being of International, National or County level value. No towers locations are proposed in higher value habitats.

Potential Impacts

68 The following potential impacts (prior to mitigation) associated with the construction phase of the proposed development within the project study area (both the **Cavan Monaghan Study Area** and **Meath Study Area**) were identified:

- Within the Meath Study Area, River Boyne and River Blackwater cSAC/SPA (indirect water pollution, disturbance to riparian habitats and qualifying protected fauna) – moderate;
- Within the Meath Study Area and Cavan Monaghan Study Area, local Whooper Swan populations (temporary disturbance from foraging areas during construction) – imperceptible;
- Within the Meath Study Area and Cavan Monaghan Study Area, watercourses and river crossings (indirect water pollutant impacts, disturbance to riparian habitats and species) - moderate;
- Within the Meath Study Area and Cavan Monaghan Study Area, selected sites of linear woodland, mature deciduous woodland, treelines, hedgerows (vegetation removal) - moderate;
- Within the Cavan Monaghan Study Area, non-designated wetland and semi-natural grassland sites (habitat loss and disturbance due to tree trimming and lopping operations) – imperceptible to minor;
- Within the Meath Study Area, breeding Lapwing (temporary disturbance and displacement during construction) – low;
- Within the Meath Study Area, Kingfisher (disturbance risk to potential breeding sites) - moderate;
- Within the Meath Study Area and Cavan Monaghan Study Area, other bird species (disturbance from woody vegetation removal) – low;
- Within the Meath Study Area and Cavan Monaghan Study Area, bats (disturbance and displacement to potential tree roosts) – moderate;
- Within the Meath Study Area and Cavan Monaghan Study Area, otter (disturbance and displacement risk to potential breeding sites) – moderate; and
- Within the Meath Study Area and Cavan Monaghan Study Area, badger (disturbance risk to potential breeding sites) – low to moderate.

69 The following potential impacts (prior to mitigation) associated with the operational phase of the proposed development within the project study area (both the **Cavan Monaghan Study Area** and **Meath Study Area**) were identified:

- Within the Meath Study Area and Cavan Monaghan Study Area, local Whooper Swan populations (collision risk):
 - i. River Blackwater (Meath Study Area) – medium;
 - ii. Cruicetown, Cloony Lough Area (Meath Study Area) – low;
 - iii. Ballintra Area (Cavan Monaghan Study Area) – low;
 - iv. Lough Comertagh area – low;
 - v. Loughs Morne and Egish area – very low; and
 - vi. Other sites (Meath Study Area & Cavan Monaghan Study Area) – imperceptible.
- Within the Meath Study Area and Cavan Monaghan Study Area, other birds (including Mute Swan, Cormorant, Great Crested Grebe, Golden Plover) (collision risk) - imperceptible;
- Within the Meath Study Area, breeding Lapwing (displacement from increased predation / disturbance by corvids / raptors) – moderate;
- Within the Cavan Monaghan Study Area, non-designated wetland and semi-natural grassland sites (habitat loss and disturbance due to tree trimming and lopping operations) – imperceptible to minor;
- Within the Meath Study Area and Cavan Monaghan Study Area, watercourses and river crossings (indirect water pollution during maintenance) – imperceptible to moderate;
- Within the Meath Study Area and Cavan Monaghan Study Area, selected sites of linear woodland, mature deciduous woodland, treelines, hedgerows (vegetation removal) - imperceptible; and
- Within the Meath Study Area and Cavan Monaghan Study Area, protected mammals including Badger, Otter and bat species (disturbance during maintenance) – imperceptible to moderate.

Mitigation Measures

- 70 Key mitigation applied during the development design involved the avoidance of locating tower positions and other works areas in high (local) value habitats. Only semi-natural habitats, including hedgerow field boundaries, which were deemed to be of low or moderate value, were considered to be suitable as tower locations. No towers or associated works areas are located within wetland sites that occur along the alignment.
- 71 Within the **Meath Study Area**, at locations adjacent to the River Boyne and River Blackwater cSAC and SPA, tower bases and all associated construction activity will be located at least 50m from river banks, thereby avoiding any direct impacts to European sites.
- 72 For the project study area a key approach for minimising risks during the construction phase such as disturbance to wildlife and protection of water quality is the appointment of an appropriately experienced Ecological Clerk of Works (ECoW) to advise on the implementation of ecological mitigation as detailed in the Environmental Impact Statement.
- 73 Through careful mitigation, potential impacts to key ecological receptors (including Whooper Swans) will be imperceptible to minor. The effectiveness of mitigation will require monitoring, specifically regarding the success of bird flight diverters in reducing collision risk for Whooper Swans at specified locations. This involves a clearly defined monitoring programme being implemented for Whooper Swans, to assess the effectiveness of line marking. In addition, hedgerow re-establishment at all relevant tower locations will be monitored.
- 74 It is concluded that the impacts of the construction and operation of the proposed development on the ecology 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.

Residual Impacts

- 75 No significant adverse effects are identified to designated sites and in particular the River Boyne and River Blackwater SAC / SPA.
- 76 Within the **Cavan Monaghan Study Area** the residual impacts identified for the construction phase of the project to identified relevant ecological receptors are all imperceptible except impacts to hedgerows / treelines which are assessed as minor. The residual impacts identified for the operational phase of the project to identified relevant ecological receptors are all imperceptible / negligible.

- 77 Within the **Meath Study Area** the residual impacts identified for the construction phase of the project to identified relevant ecological receptors are all imperceptible except impacts to hedgerows / treelines and mature deciduous woodland which are assessed as minor. The residual impacts identified for the operational phase of the project to identified relevant ecological receptors are all imperceptible / negligible except for Whooper Swan and breeding Lapwing which are considered minor / low at specific local areas identified.

5.7 SOILS, GEOLOGY AND HYDROGEOLOGY

- 78 An evaluation of the impacts on soils, geology and hydrogeology arising from the proposed development was carried out. The soils, geology and hydrogeology evaluation of the study area considers an area in excess of 500m either side of the proposed line route. 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.

Existing Environment

- 79 The subsoil underlying the proposed alignment in the project study area is primarily composed of unsorted till deposits while glaciofluvial sands and gravels are also present. Within the **Cavan Monaghan Study Area** and the **Meath Study Area** minor quantities of soft sediments including peat and alluvial deposits are also located along the alignment.

- 80 Within the **Cavan Monaghan Study Area**, the nearest geological heritage site is the Lemgare County Geological Site north-east of the proposed development. Within the **Meath Study Area** two towers will be located in County Geological Sites namely the Galtrim County Geological Site and Altmush County Geological Site, with one tower located near the boundary of the Boyne County Geological Site. The potential impacts were discussed with the Geological Survey of Ireland and mitigation measures are proposed.

Potential Impacts

- 81 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, guard poles, construction materials storage yard and the extension to the existing substation. The extent of the excavations required for the tower bases will vary depending on the precise geological conditions at each tower. During construction, 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. No potentially significant contaminated sites are located within the footprint of the proposed development.

- 82 Within the **Cavan Monaghan Study Area** 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 and the chosen alignment for the proposed development has avoided Cashel Bog. Accordingly, it is considered that the excavations required for the construction of the principal elements of the proposed development (tower bases) would have no adverse impacts on the more sensitive peat ecosystem.
- 83 Within the **Meath Study Area** the proposed development will utilise the existing substation at Woodland thereby minimising the impact on the existing environment. It is not proposed to discharge wastewater to groundwater as part of this development.
- 84 Potential impacts arise where temporary access routes cross areas of cutover peat and soft sediments. Temporary access routes comprising of aluminium tracks or rubber matting may be required at a number of tower locations. It is not proposed to use stone roads or timber sleepers as part of the proposed development.
- 85 Incorrect handling and disposal of surplus material has the potential to impact on the aquatic or ecological environment. Siltation of nearby watercourses may be a potential impact and careful removal and storage of subsoil has been proposed.

Mitigation Measures

- 86 All excavated materials will be visually assessed 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 dealt with appropriately as required under the *Waste Management Acts* and associated regulations.
- 87 To minimise any impact on the underlying subsurface strata from material spillages, all oils, fuels and solvents 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, and generally within the proposed construction materials storage compound. 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.

- 88 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 aquifers, groundwater dependant terrestrial ecosystems and water abstraction boreholes. No tower is located within the inner source protection of public groundwater supply schemes or within 200m of the line route.
- 89 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. The majority of the tower locations are remote from properties and hence it is unlikely that dewatering of the excavations would impact on existing wells and boreholes. Water pumped from the excavations may contain suspended solids and will be treated before discharge.
- 90 No significant impact was identified in consultation with the Geological Survey of Ireland. Within the **Meath Study Area** it is proposed to mitigate the potential impacts on the Altmush County Geological Site, Galtrim County Geological Site and the Boyne County Geological Site. Soils and bedrock will be encountered during the site investigation works / construction of the towers. The Geological Survey of Ireland has been consulted at all stages of the application. The mitigation measures agreed with the Geological Survey of Ireland include limiting excavation to the required footprint at Galtrim moraine and maintaining an adequate distance from the Altmush Stream.
- 91 Due to the nature of the proposed development, there will be machinery periodically located onsite at any given time, which may have the potential for occasional accidental emissions, in the form of oil, petrol or diesel leaks, which could cause contamination if they enter the soil and bedrock environment. 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.
- 92 The mitigation measures outlined in relation to soils, geology and hydrogeology will be implemented as part of the *Construction Environmental Management Plan*.

Residual Impacts

- 93 A negligible impact is predicted on the soils, geology or hydrogeology as a result of the construction or operation of the proposed development.

5.8 WATER

- 94 An evaluation of the impacts on the water environment arising from the proposed development was carried out. The evaluation for the study area considers an area in excess of 500m either side of the proposed line route.

Existing Environment

- 95 Within the **Cavan Monaghan Study Area** a number of small streams / rivers 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. The proposed development is within the catchment of a number of lakes. Based on the available information, the majority of the river catchments are „at Risk of not achieving Good Status“ in relation to Surface Water (1a status) under the Water Framework Directive (2000/60/EC).⁵ 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“. A review of monitoring station results suggests that, in general, the majority of the rivers along the alignment are slightly to moderately polluted in the **Cavan Monaghan Study Area** in 2012/2013.
- 96 Within the **Meath Study Area** the River Boyne, River Blackwater and River Dee dominate the natural surface water of the study area, while the existing Woodland Substation is located in the Tolka River Catchment. A number of small streams / rivers comprising of the Kilmainham River, Yellow River, Clady River, Derrypatrick River, Boycetown River and River Tolka are located along the proposed line route. There is a high drainage density throughout the central and southern regions of the proposed development. North of Nobber in County Meath the drainage density decreases as the relief and the number of lakes increase. Based on the available information, the majority of the Boyne and Tolka Catchments are „at Risk of not achieving Good Status“ in relation to Surface Water (1a status) under the Water Framework Directive. A review of monitoring station results suggests that, in general, the majority of the rivers along the alignment are slightly to moderately polluted in the **Meath Study Area** in 2011 / 2012.

Potential Impacts

- 97 The main potential impacts on the water environment occur during the construction phase. Activities such as felling of forestry, placing of temporary access tracks where necessary, construction of tower foundations and towers, works near watercourses; construction materials,

⁵European Communities Directive 2000/60/EC, which established a framework for community action in the field of water policy (commonly known as the Water Framework Directive (WFD)), requires „good status“ for all European waters by 2015.

stockpiling material and stringing of conductors, may potentially impact on the water environment by causing flow alterations, sediment discharges and contaminant discharges. The installation of guard poles and tree lopping activities will not have a significant impact on the water environment.

- 98 During construction there is potential for increased runoff due to the introduction of temporary access routes and soil disturbance, soil compaction and stockpiling of soils. This may increase the rate and volume of direct surface runoff. There is the potential for the release of sediments into watercourses as a consequence of the construction works. 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 machinery used and the limited scale of construction at any location. Concrete (specifically, the cement component) is highly alkaline and any direct spillage to a local watercourse could potentially impact on water quality and flora and fauna in the short term. Concrete runoff to surface water quality through drains and other watercourses close to the works area is potentially linked to more ecologically important streams, rivers and lakes.
- 99 Within the **Cavan Monaghan Study Area** and the **Meath Study Area** there will be no direct discharges to the water environment during the operational phase. No other potential impacts are anticipated during the operational phase.

Mitigation Measures

- 100 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*. An outline *Construction Environmental Management Plan* is included with this application which will be employed to ensure adequate protection of the water environment, amongst other things. All personnel working on the project will be responsible for the environmental control of their work and will perform their duties in accordance with the requirements and procedures of the *Construction Environmental Management Plan*. In terms of wastewater generated during the construction phase, welfare facilities on site will include self-contained chemical toilets.
- 101 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 curtains will be located down gradient of the works and inspected on a regular basis as well as during and after rainfall events. Additional precautionary measures will be implemented near sensitive locations.

- 102 Where temporary groundwater dewatering is required, the resultant water will be filtered before discharge. Groundwater can be filtered using bunds / tanks filled with filter material. Monitoring will be undertaken on the discharge water quality.
- 103 Precautions will be taken to avoid spillages, which 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.
- 104 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.
- 105 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 off-site or at the location where concrete was sourced.
- 106 The surface water drainage system at the construction material storage yard will take into account the recommendations of the CIRIA C468 and utilises sustainable urban drainage system (SuDs) devices where appropriate. Runoff at the construction material storage yard will pass through a silt trap, an oil interceptor and settlement lagoon before being discharged to surface water. Runoff from the limited hardstand areas at Woodland Substation will be limited to greenfield runoff rates.

Residual Impacts

- 107 The nature of the proposed development dictates that the greatest potential impact for the water environment will be in the construction phase. In the event that the mitigation measures set out in this Environmental Impact Statement are implemented, the impacts associated with the construction phase of the proposed development is predicted to have a negligible impact on the aquatic environment. With regard to the operational phase of the development, a negligible impact on the local water environment is predicted.

5.9 AIR – NOISE AND VIBRATION

- 108 An evaluation of the noise and vibration impacts arising from the proposed development was carried out. 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 study area for the evaluation considers an area in excess of 100m either side of the proposed alignment.

109 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.

Existing Environment

110 The proposed development is located in a predominantly rural area. A comprehensive baseline noise survey was carried out in order to characterise the ambient noise level along the proposed line route.

111 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 roads. However, there are sections of the proposed route, near to busier roads, where transportation noise becomes the predominant noise source.

112 All measurements were recorded in suitably calm conditions using appropriately calibrated Type 1 instrumentation which is in line with current appropriate standards and methodology.

Potential Impacts

113 The majority of potential noise and vibration impacts will occur during the construction phase of the development.

114 The construction phase of the proposed development has the potential to temporarily increase noise levels at noise sensitive locations. The nearest noise sensitive locations are located at least 50m from proposed tower locations. 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 that this is required).

115 There will be no significant operational phase vibration impacts associated with the proposed development and the transmission line will typically operate without significant noise impact. However, under certain local conditions corona noise may be audible. Operational phase noise from the proposed transmission line can include the following noise types: Corona Discharge Noise; Continuous Operational Noise; Aeolian Noise; and Gap Sparking.

116 Corona discharge noise can occur on transmission lines carrying higher voltages. Due to the high voltages associated with 400 kV overhead lines continuous operational noise may be audible but not dominant over the ambient noise levels. Aeolian noise, also known as turbulent

wind noise, may be created due to high wind speeds affecting the towers and conductors. Gap sparking can give rise to electrical noise but at frequencies higher than those that are audible to humans and therefore can be omitted as a source of noise nuisance.

Mitigation Measures

- 117 With regard to construction activities, all plant items used during the construction phase will be required to comply with the relevant standards. It is proposed that various practices will be adopted during construction, including that night time working will typically not occur, the appointment of a site representative responsible for matters relating to noise and establishment of channels of communication between the contractor / developer, local authority and residents.
- 118 In addition, a variety of practical noise control measures will be employed which will 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 and siting of noisy plant as far away from sensitive receptors as permitted by site constraints.
- 119 Any construction works that have the potential to cause vibration at sensitive receptors will be carried out in accordance with the limit values as specified in the National Roads Authority guidance.
- 120 During the operational phase it is not expected that noise arising from the proposed development will cause significant noise impact. Due to the use of modern cable types it is expected that potential for corona discharge will be minimised. Full tension stringing will be used to reduce the chance of damaging the conductor. A clean undamaged conductor will have a smooth surface with less of the sharp points or edges conducive to corona noise.
- 121 The overhead line 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.

Residual Impacts

- 122 Adherence to the mitigation measures will ensure there are no residual noise and vibration impacts associated with the proposed development.

5.10 AIR – QUALITY AND CLIMATE

123 Air quality is essential for human health and well-being and to ensure the maintenance of natural ecosystems. An evaluation of the potential impacts on air and climate arising from the proposed development was carried out.

Existing Environment

124 The existing air quality environment in the project study area is generally very good with low concentrations of pollutants.

Potential Impacts

125 As with the majority of large civil engineering projects, some emissions to air e.g. dust, are inevitable during the construction phase, arising from construction activities, transport of materials and the use of plant and equipment. However, there will be potential for minor temporary short term localised impacts on air quality arising from construction related activity. The impacts on climate change during the construction phase will not be significant.

126 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 (CO₂), sulphur dioxide (SO₂) and nitrous oxides (NO_x). 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 targets with respect to greenhouse gas emissions and renewable energy.

127 Although there will be some emissions of carbon dioxide (CO₂), sulphur dioxide (SO₂) and nitrous oxides (NO_x), from combustion of fuels used in the transport and construction equipment, the levels will be extremely low and insignificant in terms of contribution to climate change.

Mitigation Measures

128 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 reflect those measures which will be set out in the *Construction and Environmental Management Plan*. 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 at each location.

Residual Impacts

- 129 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.

5.11 LANDSCAPE

- 130 A landscape and visual impact assessment of the proposed development on the surrounding environment in the project study area was carried out. Landscape effects result from physical changes to the fabric of the landscape. Visual effects happen when views change.

- 131 Landscape and visual effects are most likely to occur when:

- A large number of towers are visible from a single viewing point;
- The overhead line crosses or is in close proximity to a scenic route;
- The overhead line crosses a national or regional road;
- The overhead line is visible along a wide expanse of open countryside of a dominantly natural character;
- The overhead line crosses a skyline ridge;
- The overhead line is in close proximity to a river or lake at a point where there is visibility from public roads; or
- The overhead line crosses a visually conspicuous upland area.

- 132 The landscape and visual impact assessment considers the overall effects on residences within the study area. The assessment does not consider visual impact of individual towers; rather it looks at the overall effect of the development on the landscape.

- 133 Relevant documents such as County Development Plans and County Landscape Character Assessments were studied for landscape information. Site visits were carried out to gain an understanding of the landscape and to see where it might be best to take photographs for photomontages.

- 134 Zone of Theoretical Visibility mapping has been prepared for the proposed development. This mapping indicates areas from which the proposed development would be visible if there was no vegetation or other above ground features in the landscape. Zone of Theoretical Visibility mapping is useful for identifying locations for photomontages, but does not give a true

presentation of visibility of the proposed development. Photomontages can represent the ways that the proposed development would be seen in the landscape in various locations. The Zone of Theoretical Visibility mapping should therefore be used along with photomontages in order to see the difference between *theoretical* and *actual* visibility.

- 135 There is no meaningful way to illustrate every view within a landscape – the number of potential viewing points is almost infinite. Instead, a representative sample of photomontage views is provided in the Environmental Impact Statement. These include views from elevated areas, in very open landscape, where the alignment crosses higher ground, or at close distances. Other photomontage locations are selected to show the nature of visibility in the wider landscape.

Existing Environment

- 136 The landscape within the **Cavan Monaghan Study Area** forms part of the extensive farmed drumlin belt which stretches east-west across the island of Ireland. The long habitation of this area is reflected in a complex pattern of hedgerows and fields which form part of the story of human influence in Cavan and Monaghan which also includes widespread rural housing, farm and commercial buildings, a dense road network and existing utilities infrastructure. The area includes some uplands, including Lough an Leagh mountain in Cavan, and Mullyash uplands near the border with Northern Ireland, and lower lying areas which contain many lakes.
- 137 Particular parts of the landscape are recognised as being of significant value, in particular the tops of drumlins, upland areas and the vicinity of lakes. Cavan and Monaghan contain a number of recognised scenic viewpoints, walking routes and amenity areas.
- 138 The most sensitive areas within this study area to the introduction of an overhead line are the tops of drumlins, the vicinity of lakes, places where open views are possible from elevated areas and the uplands near the border with Northern Ireland and at Lough an Leagh in Cavan. The rest of the landscape within the study area is generally robust and can accommodate a certain degree of change without altering the underlying general landscape character. The enclosed nature of a drumlin landscape provides screening of the proposal where the line follows the lower parts of the landscape.
- 139 The **Meath Study Area** includes the fertile agricultural lowlands of County Meath, the rivers Boyne and Blackwater, and drumlins as one moves north. The long human influence on this landscape is reflected in a range of visible built heritage features and landscapes as well as widespread rural housing, farm and commercial buildings, a dense road and hedgerow network and existing utilities infrastructure.
- 140 Particular parts of the landscape are recognised as being of significant value – in particular the Boyne and Blackwater Rivers and higher parts of the landscape. Meath also contains a

number of recognised scenic viewpoints, landmarks, walking and driving routes, potential tourism areas and a series of historic designed landscapes as described in the National Inventory of Architectural Heritage.

- 141 The most sensitive areas within the **Meath Study Area** are therefore the Blackwater and Boyne River Valleys and the Highlands of East Cavan. The areas with the least capacity to absorb the transmission line into the broader landscape character are the higher parts of drumlins, very flat and open areas of bog or large fields and the immediate vicinity of the Boyne and Blackwater Rivers. The rest of the landscape within the study area is generally robust and can accommodate a certain degree of change without altering the underlying general landscape character. The dense hedgerow pattern of the landscape provides screening of the proposal where the line follows the lower parts of the landscape.

Potential Impacts

Construction Phase

- 142 Construction machinery, temporary access routes, the construction materials storage yard and increases in vehicular movements will be locally visible within the study area during the construction period. The visual effects of the construction of the towers will be temporary and locally significant, while the landscape and visual impact of traffic movements will have a more widespread effect.
- 143 Hedgerow vegetation around towers will potentially be affected at construction stage. The construction of the proposed development will also require the lopping, trimming or removal of any trees or hedgerow that could potentially damage the towers or conductor. This will affect some mature trees and tree lines along the route of the proposed development. While hedgerows and trimmed tree lines may grow up to and under towers in areas where the line route passes through woodland, this will require the removal of an up to 74m swathe of trees.

Operation Phase

- 144 During the operational phase, there will be significant changes to landscape character in the immediate vicinity of the line (up to 600-800m from unscreened structures), particularly where towers are visible on the upper parts of drumlins, but there will be little alteration to the character of the wider landscape. Where there is no intervening vegetation or topography, the transmission line will be potentially visible from houses and roads within 1-1.5km of the proposed development. However, the towers would generally be difficult to discern at distances beyond 800m. Visual effects reduce with distance, with the most significant effects occurring up to 600-800m from unscreened structures.

- 145 Within the **Cavan Monaghan Study Area** there are no significant effects on towns or villages. In addition there are no significant effects on recognised scenic viewpoints. The line route avoids all the major lakes in this study area but would be visible close to two small lakes; Lough Morne and Tassan Lough. The transmission line crosses the Monaghan Way between Towers 109 and 110 and will be intermittently and openly visible for an approximately 2km stretch of the Monaghan Way walking route at a distance of between 0 and approximately 400m.
- 146 Within the **Meath Study Area**, the line passes within 400m of the villages of Robinstown and Dunderry and would be visible at close distance from the outskirts of the settlements. The line passes within 1km of the village of Kilmainhamwood and distant views would be possible from some parts of the village. The line would be visible from a local scenic view (VP86 in the Meath County Development Plan) looking southwards from the bridge at Bective. The alignment crosses the rivers Boyne, Blackwater and Kilmainhamwood and parallels the river Claudy for approximately 2km. The transmission line will cross the Boyne Valley driving route at two locations. The alignment passes through the edge of Brittas Estate, a historic designed landscape.

Mitigation Measures

- 147 The best way to minimise landscape and visual effects is at routing stage by avoiding the most sensitive parts of the landscape. The routing stages sought to avoid the parts of the landscape most sensitive to the proposed development but it was not possible to avoid all significant landscape and visual effects. Other mitigation measures are proposed to minimise adverse effects at construction and operation stages.
- 148 The key mitigation measures proposed at construction stage are:
- Using existing access routes 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;
 - Reinstatement of the site of the proposed construction materials storage yard;
 - Correct removal, storage and reinstatement of subsoil and topsoil; and
 - Disposal of soil where not required for reinstatement.

149 At specific sensitive locations; for example the Boyne and Blackwater valleys and Brittas Estate, and along the entire route if necessary, micro mitigation is possible through the retention or enhancement of trees and hedgerows in key viewpoints.

Residual Impacts

150 The Environmental Impact Statement contains a full and detailed assessment of the sensitivity of the landscape, landscape features and views, the type of change that the proposed development will cause, and the magnitude of residual impact. Residual impacts are the impacts that will occur if the proposed development is constructed and all mitigation measures are successfully carried out. Residual impacts are described in more detail in the Environmental Impact Statement but only those that are considered significant in accordance with this sliding scale of significance are listed below.

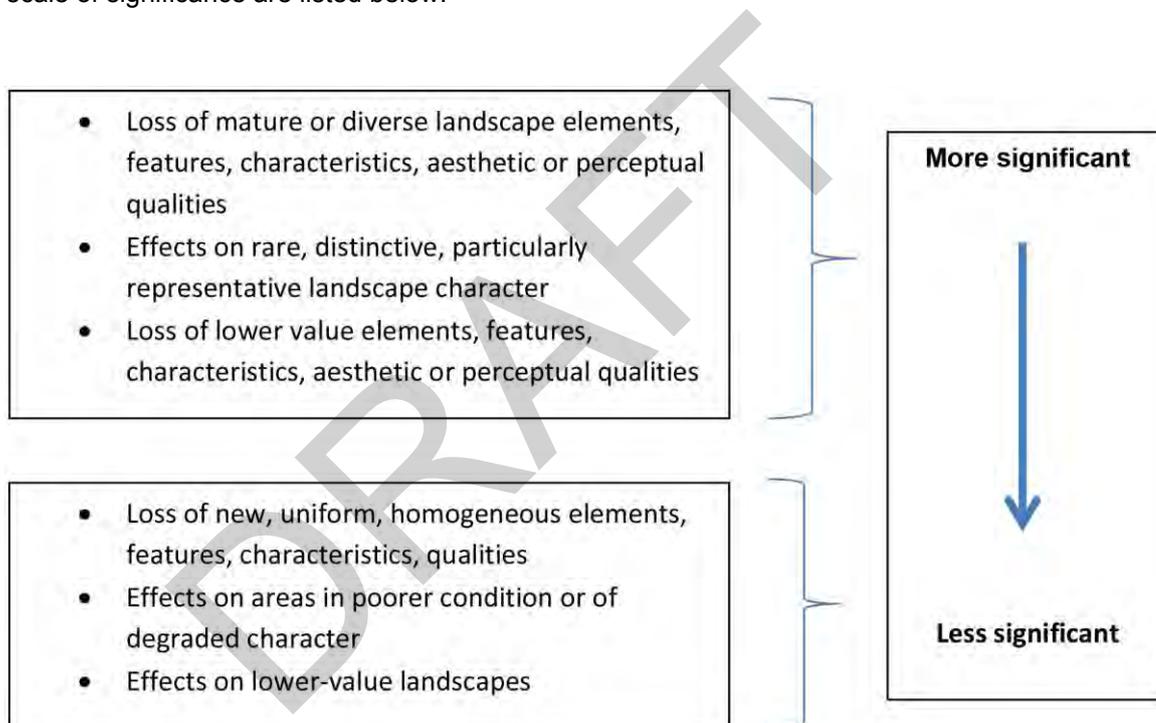


Figure 5.1: Residual Impacts on the Landscape

151 There will be significant effects on the landscape character of unscreened locations up to 600-800m of the proposed development, along the entire length of the line route. There will be significant (but varying) effects on views from unscreened individual properties up to a distance of approximately 600-800m from the proposed development. The magnitude of change to such views is dependent on distance, location of viewer within the property (garden / upper or lower stories) and amount of intervening vegetation or buildings. Visual effects are not significant beyond 600-800m. While almost all of the settlements within 5km of the proposed development will not be significantly affected, there will be significant effects on views from the outskirts of Dunderry and Robinstown in County Meath.

- 152 Some parts of the landscape have been recognised for their value in the county development plan or in national datasets. These include walks, driving routes, natural landscape features, scenic views and designed landscapes. These areas have been assessed for significant impacts. There will be significant effects on a part of the historic designed landscape of Brittas Estate, County Meath including the removal of mature woodland as well as significant effects on the setting of two small lakes; Tassan Lough, County Monaghan and Lough Morne in County Monaghan.
- 153 There will be significant localised effects at the crossing points of the Boyne and Blackwater Rivers, County Meath, as these locations are quite open and sensitive river valley landscapes. There will be significant but localised effects on views from two sections of the Boyne Valley Driving Route, County Meath, west of Bective and south of Donaghpatrick as well as on a locally significant scenic view from Bective Bridge, County Meath. There will be significant but localised effects on views from an approximately 2km stretch of the Monaghan Way, County Monaghan and where the proposed development crosses the walking route.

5.12 MATERIAL ASSETS – GENERAL

- 154 The consideration of Material Assets – General focuses on the potential for impacts on utilities, aviation and waste.

Existing Environment

Utilities

- 155 There are a number of gas pipelines in the project study area, particularly around and connecting the main settlements of Kingscourt, Navan, Trim, Dunshaughlin and Kells.
- 156 There is approximately 217km of existing medium and high voltage overhead electricity lines (91km of 38 kV, 83km of 110 kV and 43km of 220 kV) in the **Cavan Monaghan Study Area** and approximately 359km of existing medium and high voltage overhead electricity lines (161km of 38 kV, 101km of 110 kV, 93km of 220 kV and 4km of 400 kV) in the **Meath Study Area**.
- 157 There are thousands of kilometres of low voltage (20 kV and 10 kV) and telephone overhead lines throughout the project study area.

Aviation

- 158 There are no licensed airfields in the **Cavan Monaghan Study Area**. There are three licensed airfields in the **Meath Study Area**; Trim Airfield, Trevet Airfield and Athboy Airfield. The Irish Aviation Authority has indicated that there may be a number of unlicensed airfields and landing strips in the project study area.

- 159 A ballooning company operates in the Trim area of County Meath, flying from a number of launch sites, including Trim Castle, Athboy, Slane, the Hill of Tara and others depending on the wind direction on the day of the flight.

Waste

- 160 There is one Environmental Protection Agency licensed waste facility within 500m of the overhead line, the Scotch Corner Landfill in County Monaghan.

Potential Impacts

Utilities

- 161 The proposed overhead line traverses gas pipelines at least twice in the **Meath Study Area**.
- 162 It also traverses a number of transmission and distribution electricity lines and telecom services throughout the project study area including; Flagford-Louth 220 kV, Louth - Rathrussan 110 kV, Lisdrum – Louth 110 kV, Arva to Navan 110 kV and Gorman to Maynooth 220 kV overhead lines.

Aviation

- 163 Consultation was undertaken with the prescribed authority for aircraft safety and ballooning, the Irish Aviation Authority. Aircraft operating at Trim Airfield will pass in the vicinity of Towers 355, 356 and 357. The Irish Aviation Authority confirmed that the overhead lines will be below the obstacle limitation surface for Trim Airfield and that the proposed development does not constitute an obstacle for aircraft. This position was also confirmed by a study carried out by an independent aviation expert employed at the line routing stage.
- 164 Scoping was carried out with the Irish Aviation Authority in relation to ballooning activity as they regulate this activity. The advice in this regard from the Irish Aviation Authority is that known hazards, including overhead lines, must be considered when planning flightlines, particularly when landing and launching and that balloons are permitted to fly over electricity lines.

Waste

- 165 The main potential impacts on waste occur during the construction phase. A construction material storage yard is required for the storage of material and other construction activities. This is currently a greenfield site which will need to be prepared for this use. This will generate waste soil (approximately 1,250m³), which will be removed to a licensed waste recovery facility and / or landfill. The proposed extension works at the existing Woodland Substation will similarly involve the generation of waste material (approximately 3,500m³) which will be removed off-site to a licensed waste recovery facility and / or landfill.

- 166 Excavated material will be generated during the construction of the proposed development, specifically in relation to the tower foundations. A worst case scenario would be that all excavated material 24,700m³ (10,500m³ for all the towers in **Cavan Monaghan Study Area** and 14,200m³ for all the towers in **Meath Study Area**) for the proposed development would be sent to landfill. Timber waste will be generated from hedgerows, tree lines and forestry to clear open space for overhead line development.
- 167 Waste generated in the operational phase will include cleaning waste arising in maintenance and cleaning operations, lighting units replaced as required, oils arising from occasional maintenance activities and packaging materials. This will be disposed of in accordance with relevant waste legislation.

Mitigation Measures

Utilities

- 168 A pre-construction survey will be undertaken of gas pipelines during the construction phase, including ground investigations to confirm the conditions which have been anticipated to be encountered in this Environmental Impact Statement. This is a standard requirement for all construction projects.
- 169 A site specific risk assessment must be completed for electricity and telecoms overhead lines. 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.

Aviation

- 170 The proposed line route has been selected taking into account the presence of Trim Airfield in County Meath and the relevant Obstacle Limitation Surfaces for the airfield. Landing aircraft will need to be visually aware of where the towers are located and a formal approach procedure of „visual contact of pylons / cables required before starting field approach“ should be introduced even though there is a clear margin between the top of the towers and the obstacle limitation surface. The overhead lines will be below the obstacle limitation surfaces for Trim Aerodrome, but they will be made more conspicuous through the fitting of marker spheres between Towers 355 and 357.
- 171 Consultation with the Irish Aviation Authority revealed that ballooning activity should not be a reason to prevent changes to the existing landscape, including the construction of electricity lines. The potential presence of electricity lines in the area will have to be considered by the balloon pilots as part of their flight planning.

Waste

- 172 A *Construction Waste Management Plan* (forming part of the *Construction and Environmental Management Plan*) will be implemented to minimise waste and ensure correct handling and disposal of construction waste streams in accordance with the *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects*, Department of the Environment (July 2006). The key principles underlying the plan will be to minimise waste generation and to segregate waste at source. Facilities for segregation of waste will be made available to optimise reuse and recycling of construction waste and correct disposal of domestic waste.

Residual Impacts

- 173 Adherence to the mitigation measures for utilities and aviation enterprises will ensure there are no residual impacts associated with the proposed development.
- 174 Following good waste management practices it is not expected that waste arising from the project will give rise to any significant impacts.

5.13 MATERIAL ASSETS – TRAFFIC

- 175 Due to the nature of the proposed transmission line, the operational phase of the proposed development will generate minimal traffic flows. A detailed inspection of the towers along the line 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 line route to facilitate this inspection. Thereafter, no further traffic would be generated during the operational phase except in exceptional circumstances, such as a fault occurring.
- 176 During the construction phase, however, the primary means of transporting materials and labour to / from site will be by road. This will result in a temporary increase in traffic on public roads in the project study area. The proposed overhead line will effectively result in multiple isolated areas where construction activities will take place. In order to facilitate construction at these areas, materials, personnel and equipment will be transported to / from these sites.
- 177 The construction of each tower will necessitate the use of several different types of road vehicles. The vehicles directly involved in the works shall include: crane(s); excavators; dump trucks; 4 x 4s; tractor and trailers; and concrete delivery vehicles.
- 178 Access to the individual sites will generally be achieved via existing field accesses and existing internal tracks where available. A total of 257 temporary construction accesses are required from the public road network to construct the proposed line.

- 179 A construction material storage yard for the overhead line elements of the project is proposed to be located in the townlands of Monaltyduff and Monaltybane, Carrickmacross, County Monaghan. A new access will be required into the yard to accommodate the volumes of traffic that will be generated in this location in a safe manner.

Existing Environment

- 180 The construction material storage yard is located in the townlands of Monaltyduff and Monaltybane within the **Cavan Monaghan Study Area**, south east of Carrickmacross. The yard will be accessed from the local road L4700 which can be subsequently used to travel to the N2. The likely haul routes that will be used by construction traffic to travel to the proposed access locations from the construction material storage yard have been identified for both the **Cavan Monaghan Study Area** and the **Meath Study Area**.

- 181 The use of national and regional roads will be maximised due to the fact they are generally of a better standard compared to local roads.

- 182 A total of 106 traffic surveys were carried out on the roads identified as likely to be used to haul materials to and from construction sites in order to determine background traffic flows on the haul routes that will be used by construction traffic. These counts provided average daily traffic flows and heavy goods vehicle percentages for these roads which were used to determine the predicted increases in flows during the construction phase.

Potential Impacts

- 183 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.

- 184 Based on a breakdown of traffic that will be generated by each construction site, the peak daily volume of traffic that will be generated by each site has been estimated. For an intermediate tower structure, this has been estimated at 17 vehicles and for an angle tower this has been estimated at 46 vehicles.

- 185 Higher volumes of traffic are anticipated on the roads near the construction material storage yard, located in the townlands of Monaltyduff and Monaltybane, south east of Carrickmacross (i.e. the N2, the L4700 and the N2 to L4700 Link Road) as vehicles will be concentrated in this location prior to dispersing to individual sites. The worst case daily traffic generation at the yard has been estimated to be a total of 378 movements.

- 186 The route proposed to be used to egress from the construction material storage yard will be the N2, via the local road L4700. 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.
- 187 Comparing the generated traffic to the background flows allowed the percentage increases of traffic that will result from the construction of the line route, to be calculated. While some of the percentage increases are quite high, this is generally reflective of the low number of vehicles generally using these roads and these are the peak flows which would only occur for short durations. From a capacity perspective, the road network will be able to cater for the flows predicted.
- 188 Due to the significant levels of flows predicted at the proposed construction material storage yard, a junction assessment has been carried out at the entrance. This junction assessment indicated that the entrance to the proposed construction material storage yard will operate below capacity during the construction phase.
- 189 Guarding will be required at locations where the line route passes over roads, rivers and overhead lines. The volumes 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.
- 190 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.

Mitigation Measures

- 191 A *Construction Traffic Management Plan* shall be prepared prior to the commencement of construction operations. This plan will include:
- A construction programme detailing the sequence of tower construction which shall aim to minimise the likelihood of significant peaks in traffic flows and inform local authorities of proposed activities in the area;

- Details of measures to minimise debris from construction impacting on the road network;
- Road conditions surveys to ensure roads are not damaged as a result of construction traffic;
- Communication plans for ensuring relevant stakeholders are kept up-to-date on construction scheduling and any proposed traffic management measures;
- Details of road signage to be erected to provide warning of the temporary access locations to construction site's entrance or other operations requiring the provision of warning signs; and
- Details of measures to accommodate emergency services.

Residual Impact

192 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.

5.14 CULTURAL HERITAGE

193 The archaeological, architectural and cultural heritage evaluation for the project study area evaluates both the direct and indirect impacts of the proposed development on the archaeological, architectural and cultural heritage resource in the vicinity of the proposed development. From the outset, available inventories relating to archaeological, architectural and cultural heritage sites, structures, monuments and features were used to evaluate and minimise any direct physical impacts and / or impacts on the setting that the proposed development may visit upon such sites in its vicinity, with due regard to other disciplines and constraints. Historic mapping, orthophotography and LiDAR (high-quality aerial imagery and digital terrain modelling in sensitive areas) were also used to further evaluate the potential impacts of the proposed development. All recorded and previously unrecorded cultural heritage sites identified were individually assessed for direct and indirect impacts during the construction and operational phases of the proposed development.

194 Relevant legislation, county development plans, existing guidelines and the Codes of Practice between the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht and both EirGrid and ESB Networks were reviewed in compiling the methodology used in assessing the impacts on the proposed development, along with other relevant sources and guidance documents.

195 When compared to other types of linear infrastructure development, such as roads and pipelines, the proposed development has a relatively small physical footprint where direct, physical impacts can arise, consisting primarily of tower foundations and guarding areas. It has been possible to avoid direct, physical impacts on the upstanding remains of any previously recorded archaeological and architectural heritage sites. 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. Methodologies were introduced from the earliest stages of constraints mapping and route selection to minimise these impacts. This work, as well as considering individual cultural heritage sites had regard for sensitive landscapes including the World Heritage Site of Brú Na Bóinne, candidate world heritage sites, landscape conservation areas, archaeological and historic areas of amenity, architectural conservation areas, protected structures and gardens and demesnes. Local topography and natural screening was utilised as far as possible to reduce the visibility of the towers vis-a-vis cultural heritage sites, monuments, structures and features.

Existing Environment

196 There are no World Heritage Sites in the project study area that will be impacted upon by the proposed development. However within the **Meath Study Area** there are two candidate World Heritage Sites, the early medieval monastic site of Kells and the Tara Complex, located approximately 7km and 6.3km from the proposed development respectively.

197 There are no National Monuments in State care within 5km of the centreline of the proposed development within the **Cavan Monaghan Study Area**. There are two religious sites in this study area that may be in the ownership of the local authority and a single archaeological monument in County Monaghan which is the subject of preservation order. None of these sites will be directly, physically impacted upon, with the closest site approximately 750m from the proposed development.

198 Archaeological landscapes that received particular attention in the **Meath Study Area** were the Tara complex and the Teltown zone of archaeological amenity. The overall significance of the impact on the setting of the Tara Complex was considered to be slight. The proposed development passes through a region highlighted by the National Monuments Service of the Department of the Arts, Heritage and the Gaeltacht as being associated with the ancient assembly site of Teltown. The Teltown area was the subject of a specially commissioned LiDAR survey and two potential additional archaeological features were noted. Other sites of significance, in this study area, include National Monuments in State care of which there are eight within 5km of the proposed development. Of particular note is Bective Cistercian Abbey, the closest National Monument in State Care to the proposed development, which is located approximately 920m to the east of the centreline. There are also 38 religious sites within 2km of the proposed development, many of which are in the ownership of Meath County Council.

Other National Monument sites in the wider vicinity, which will not be impacted on, include Cruicetown Church and Cross and Robertstown Castle.

- 199 Based on the Archaeological Survey Database, on the www.archaeology.ie website, there are 223 recorded monuments within a 2km distance of the centreline of the proposed development in the **Cavan Monaghan Study Area** and a further 10 recorded monuments in the Northern Ireland Sites and Monuments Record. There are 325 recorded monuments within a 2km distance of the centreline of the proposed development in the **Meath Study Area**.
- 200 In relation to architectural features within the **Cavan Monaghan Study Area** there are 35 sites listed in the Record of Protected Structures and the National Inventory Architectural Heritage which are located within 2km of the centreline of the proposed development. The majority of these are churches, school buildings, country houses and mills. The nearest structure is a Manse House located approximately 200m east of the proposed development. There are nine demesne landscapes and historic gardens in various states of preservation and scale within 2km of the proposed development in the study area. The historic landscapes associated with the demesnes of Shantonagh House and Tully House are traversed by the proposed development.
- 201 In relation to architectural features, there are 92 structures listed in the Record of Protected Structures and National Inventory of Architectural Heritage for County Meath and County Cavan within 2km of the centreline of the proposed development, with concentrations in the urban environments of Nobber, Kilmainhamwood and Domhnagh Phádraig (Donaghpatrick). Within the **Meath Study Area** the line route passes 600m to the east of Ardraccon demesne, approximately 2.8km from Dunsany Castle and approximately 4.1km from Headford Demesne Architectural Conservation Areas. Based on the National Inventory of Architectural Heritage garden survey and a review of historic mapping there were found to be 51 demesne landscapes and historic gardens in various states of preservation and scale within 2km of the proposed development. Of particular note, in close proximity to, or traversed by, the proposed development are Ardraccon, Brittas, Mountainstown, Gibstown, Teltown, Philpotstown, Rahood and Whitewood.
- 202 An analysis of first and second edition Ordnance Survey Ireland mapping and available aerial imagery including specially commissioned LiDAR was also undertaken to identify any unrecorded features in the vicinity of the proposed development. This work resulted in the identification of 171 sites in the **Cavan Monaghan Study Area** and 140 sites including features on historic mapping and cartographic and aerial anomalies in the **Meath Study Area**.

Potential Impacts

- 203 It was found that eight previously recorded archaeological monuments in the **Cavan Monaghan Study Area**, most of which are ringforts, may be directly impacted on during the construction stage. The closest monuments to the proposed ground works in the **Cavan Monaghan Study Area**, consists of three ringfort / raths (Sites and Monuments Record (SMR) No.s MO014-021001, MO019-038 and MO030-021001) one of which has an associated possible building (SMR No. MO014-021002) all located approximately 30m from the centreline of the proposed development. A further seven monuments are located between 100m and 200m from the proposed development.
- 204 Within the **Meath Study Area** there are seven sites where it was found there was a potential for direct physical impacts. The closest monument to proposed ground works within the **Meath Study Area** is an enclosure (SMR No. ME005-012). This site is located approximately 50m from the centreline of the proposed development. The next closest recorded archaeological monument is located approximately 100m from the proposed development, with a total of 12 monuments located within approximately 200m of the proposed development.
- 205 For the entire project it was found that there was a potential that archaeological deposits associated with 15 archaeological monuments could potentially be directly, physically impacted upon during the construction stage. These impacts relate to construction traffic passing in close proximity to archaeological monuments (<200m) or where there is the potential that associated archaeological remains could be impacted upon. It should be noted that these impacts will not result in damage to visible or upstanding archaeological features but may affect sub surface deposits associated with the monuments. Recommendations to prevent or mitigate these impacts include demarcating appropriate buffers around sites, supervision of vegetation clearance, and / or archaeological testing or monitoring of groundworks.
- 206 In relation to guarding areas, although temporary structures, there is the potential for impact on archaeological remains whilst gaining access and excavating trenches for their erection. Recommendations to prevent or mitigate these impacts include demarcating appropriate buffers around sites, supervision of their erection, and / or archaeological testing or monitoring of groundworks.
- 207 Any archaeological deposits discovered during construction of the proposed development will be dealt with in accordance with professional best practice in full consultation with the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland.

- 208 Within the **Cavan Monaghan Study Area** there are no previously recorded sites of architectural importance that will be directly, physically impacted on by the proposed development. Historic landscapes associated with the demesnes of Shantonagh House and Tully House are traversed by the proposed development, there are no demesne features noted in the area where the proposed development traverses these landscapes.
- 209 With regard to architectural heritage, it was found that potential direct, physical impacts could occur at four sites in the **Meath Study Area**. These impacts are all related to construction traffic passing through demesne landscapes with associated protected structures at Brittas, Dowdstown, Mountainstown and Dunderry. Appropriate mitigation at these locations will ensure there are no direct physical impacts to any Record of Protected Structures sites or structures. Construction work and access will be required within six demesnes that are listed in the National Inventory of Architectural Heritage (NIAH) garden survey; namely Brittas, Diméin Bhaile Ghib (Gibstown Demesne), Mountainstown, Philpotstown, Tailtin (Teltown) and Rahood. There are no predicted construction phase direct physical impacts on any associated demesne structures, although it is noted that the proposed development does pass over the avenue to Brittas House. Where there is the potential that construction activities could impact on previously unrecorded features, mitigation, in the form of monitoring, has been recommended.
- 210 The most significant impact of the proposed development on the cultural heritage resource of the wider area during its operational life will be its impact on the setting of sites. Sites where it was considered that the significance of the impact on their setting in the **Cavan Monaghan Study Area** would be moderate or greater include 15 Sites and Monuments Record's and one protected structure, a church (Record of Protected Structures (RPS) No. 41402713) in County Monaghan. It is noted that one of these sites is located in County Armagh, Northern Ireland. Within the **Meath Study Area** it is noted that the development, whilst in general only having a slight impact on the setting of individual sites that make up the Teltown Zone of Archaeological Amenity (ZAA), it will have a moderate impact on the setting of the ZAA as a whole. Other sites in the **Meath Study Area** where it was considered that the significance of the impact on their setting would be moderate or greater include 25 SMR's, six demesnes listed on the NIAH garden survey and two protected structures.
- 211 In terms of previously unrecorded sites identified by fieldwork or as anomalies on aerial imagery, LiDAR or features on historic mapping, none were found to experience an impact on their setting of a significance greater than slight.
- 212 Other sites of cultural heritage significance considered include the site of the present day Muff Fair. This is not a designated cultural heritage site and will not be directly impacted upon.

Mitigation Measures

- 213 Overall the main mitigation involves preservation in situ, thereby avoiding direct, physical impacts on known archaeological or architectural sites. All designated cultural heritage sites have been avoided as far as was practicably possible, with due regard to other disciplines and constraints.
- 214 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.
- 215 The following mitigation strategies for the construction stage were formulated in consultation with the National Monuments Service Section of the Department of Arts, Heritage and the Gaeltacht and include:
- On site confirmation of temporary access routes by a suitably qualified archaeologist;
 - Demarcation of sensitive sites with an appropriate buffer and on-site supervision of transport works;
 - Supervision of vegetation clearance in proximity to sensitive sites;
 - Archaeological testing of excavations associated with construction works under licence to the National Monuments Section of the Department of Arts, Heritage and the Gaeltacht;
 - Archaeological monitoring during excavations associated with construction works; and
 - In the event of archaeological features being located in the course of the archaeological monitoring / testing the archaeologist retained by the developer shall immediately contact the National Monuments Service, Department of Arts, Heritage and the Gaeltacht to determine the further archaeological resolution of the site, including if necessary archaeological excavation or the preservation in situ of archaeological remains.

Residual Impacts

- 216 In terms of residual impacts on the cultural heritage resource there will be ongoing impacts on the setting of the Teltown ZAA, a number of archaeological monuments, demesne landscapes and architectural sites throughout the operational phase of the development. There will also be an impact on some demesne woodland, demesne boundaries and field boundaries within

demesne landscapes to achieve clearances required for the overhead line. Mitigation will ensure that there are no residual direct, physical impacts on features associated with designated protected structures.

217 Although there are no predicted residual direct, physical impacts on the upstanding remains of designated archaeological sites, there is the potential that associated subterranean remains or archaeological deposits associated with previously unrecorded archaeological sites or other sites or indeterminate archaeological potential, such as cartographic and aerial anomalies, could experience direct physical impacts. Mitigation will ensure that in the event that such deposits are encountered that they will, through archaeological excavation in full consultation with the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht, be preserved by record.

218 Impacts on any archaeological sites, monuments, structures or features as a result of maintenance works during the operational phase will be mitigated through ongoing liaison the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht and local heritage officers. 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 Department of Arts, Heritage and the Gaeltacht and the local authority conservation officer.

5.15 TRANSBOUNDARY IMPACTS

219 The Environmental Impact Statement has regard to the likely potential significant effects of the development on the environment of an area of a Member State of the European Union, namely Northern Ireland. Potential „transboundary” impacts are summarised below:

Human Beings – Population & Economic

220 The proposed development situated in counties Monaghan, Cavan and Meath will not give rise to transboundary impacts in respect of population demographics, as this is influenced by factors outside this project.

221 Economic impacts during the construction stage are likely to remain local to the Monaghan, Cavan and Meath areas with no significant transboundary impacts anticipated. There will be wider economic benefits arising from improvements to the electricity grid on the island of Ireland; and these will be experienced in both jurisdictions. This is a significant positive transboundary impact.

Human Beings - Land Use

- 222 There are six land parcels along the Northern Ireland border that are in the vicinity of the two border crossings at Lemgare, County Monaghan. The impacts from the overhead line located in County Monaghan on all these land parcels (and land uses therein), are considered Imperceptible.

Human Beings - Tourism

- 223 Due to the intervening distance from tourist attractions in Northern Ireland it is not anticipated that the proposed development located in counties Meath, Cavan and Monaghan will have any impact on tourism and amenity in the Armagh / Monaghan border area.

Human Beings - EMF

- 224 EMF emissions, will comply with the International Commission on Non-Ionising Radiation Protection and European Union guidelines on exposure. Furthermore, as electric and magnetic field levels dissipate within a short distance of the overhead line, no significant transboundary impacts will occur from the proposed development located in counties Meath, Cavan or Monaghan.

Flora and Fauna

- 225 In considering potential transboundary impacts, it is clear that works on the proposed development within counties Monaghan, Cavan or Meath will have no direct impacts on habitats located in Northern Ireland. There is some potential for impacts on mobile species, but these are not likely to be significant. Badgers, otters and bats may have territories that straddle the jurisdictional border, but the nature of the proposed electricity transmission development means that these species are unlikely to be significantly adversely affected. There will be no impacts on sites designated for their conservation interest at either European or national level within Northern Ireland. The impact on Whooper Swans and other mobile bird species that may use sites on both sides of the border is likely to be of imperceptible significance in terms of both population numbers and on availability of feeding sites. Mitigation measures to render the overhead line more visible in those parts considered to present the greatest risk will be implemented in both jurisdictions, and will reduce the overall collision risk identified.

Soils, Geology and Hydrogeology

- 226 Impacts on the soils and geology are limited to the immediate area of the proposed towers (and associated excavations and works). Based on an evaluation of predicted impacts, it is considered a negligible transboundary impact will occur on the geology or groundwater conditions in Northern Ireland from excavation or other works at the sites of proposed towers in counties Monaghan, Cavan or Meath.

Water

- 227 Based on an evaluation of predicted impacts, it is considered that no significant impacts will occur on the surface water environment in Northern Ireland from the construction or operation of the proposed electricity transmission development located in counties Monaghan, Cavan or Meath. Accordingly, it is concluded that the proposed development would have no significant (negligible) transboundary impacts on the surface water environment.

Noise and Vibration

- 228 Construction and operational phase impacts are predicted to meet the relevant noise and vibration limits at the nearest sensitive receptors. There are no sensitive receptors located within 50m of a proposed tower location in County Monaghan, which could have the potential to cause an impact on the environment of any receptor in Northern Ireland. As such, no significant transboundary impacts are therefore predicted.

Climate and Air

- 229 Climate change is a globally occurring phenomenon with impacts on the global climate related largely to atmospheric CO₂ levels and other greenhouse gas levels and emissions. The proposed transmission circuit will contribute positively to transboundary impact on climate through facilitating a reduction in national greenhouse gas emissions in compliance with the EU emission targets for Ireland. This is a key climate change mitigation identified in the European Union's *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*.

Landscape

- 230 There will be localised transboundary landscape and visual effects arising from the part of the alignment between Towers 102 (the actual tower is located in Northern Ireland) and 110, as this section of the proposed development in County Monaghan is closest to the jurisdictional border with Northern Ireland. These transboundary effects will occur at the edge of the Armagh Drumlins Landscape Character Area (LCA 66), which is a relatively small scale and hilly-farmed landscape with high sensitivity.
- 231 The localised landscape character will experience change in the sense of scale with the inclusion of the towers, as the proposed development will introduce a new scale of structure into the man-altered landscape that contains existing houses, farm buildings and roads. This change is considered a locally significant effect on landscape character.
- 232 Due to the enclosed nature of this valley, there will be localised, significant visual effects on views looking south from parts of the Crossbane Road and Doohat Road, located in County

Armagh, where unscreened open views are possible into the valley. Other viewpoints will not experience any visual effects due to the screening provided by intervening vegetation.

- 233 There will be no significant transboundary landscape or visual effects, beyond distances of 600 – 800m from the towers, although views of parts of certain towers will be distantly visible from unscreened locations up to 1-1.5km from the transmission line, particularly from elevated parts of the landscape.

Material Assets - General

- 234 There will be a positive transboundary impact associated with providing a high capacity electricity transmission line between Ireland and Northern Ireland. However, the proposed development will have no transboundary impacts on waste management facilities, gas infrastructure and telecom services in Northern Ireland. Where telecom services traverse the border, consultation will take place as required with service providers prior to any construction works in the proximity of existing telecoms services.
- 235 Aircraft and ballooning companies operating out of Northern Ireland will need to be cognisant of the proposed overhead line close to the jurisdictional border and on the approach to Trim Airfield and factor them into their flight planning procedures. However, this is not considered to be a significant transboundary impact of the proposed development.

Material Assets – Traffic

- 236 It is not expected that traffic delivering materials to site will cross the border into Northern Ireland as the haul routes identified are such that a crossing will not be required. However the possibility remains that some construction materials which are stored at the material storage yard may be sourced from suppliers based in Northern Ireland. Similarly, the location where construction workers reside is not known and these may also commute to the site from Northern Ireland. The volumes of traffic that may be generated by these elements would be small and as such the transboundary traffic impact as a result of the proposed development is considered to be minimal.

Cultural Heritage

- 237 It was found that following mitigation there will be no direct physical impacts on previously recorded archaeological, architectural or cultural heritage sites, structures, monuments or features located in Northern Ireland as a result of the proposed development.
- 238 There is a single archaeological monument, an enclosure (Northern Ireland SMR No. ARM023-004) located in Northern Ireland, where it was found that the site would experience a negative impact on its setting of moderate significance.

5.15.1 Conclusions

239 Based on the evaluations carried out by EirGrid and its consultants, for most environmental topics the transboundary impacts are predicted to range from none / positive / imperceptible to moderate (on the setting of an archaeological site in Northern Ireland); apart from localised significant landscape and visual impacts (specifically a locally significant effect on landscape character).

5.16 CUMULATIVE IMPACTS AND IMPACT INTERACTIONS

240 Cumulative impacts may arise from the combined effects of a number of existing or proposed developments, in combination with the proposed development being evaluated, on a single receptor / source. Proposed developments are those developments or proposals which are considered to have a degree of certainty although they may not yet have been granted approval or consent. The location and nature of such development and proposals is known. They include, amongst other developments, that portion of the proposed interconnector located in Northern Ireland being proposed by SONI (the Tyrone – Cavan Interconnector), the Emlagh Wind Farm, and modification / diversion works required where the proposed 400 kV line route traverses existing distribution and telecommunication lines and conflict occurs. These works will be undertaken by ESB Networks and the relevant telecommunication provider (Eircom).

241 The cumulative impact assessment also considered „potential“ development to include proposals which have not yet been the subject of a planning application but which the Project Team is aware of from plans, strategies and / or local knowledge. This includes, amongst other developments, future transmission infrastructure (including a future substation near Kingscourt, County Cavan), windfarm and other electricity generation proposals (in particular those which are subject to Gate 3 connection offers).

Human Beings and Socio-Economic

242 No proposed or potential projects have been identified in the study area or in Northern Ireland which could give rise to significant cumulative impacts on human beings in terms of population and economic considerations and tourism and amenity, having regard to the tourism assets identified by Fáilte Ireland and Northern Ireland Tourist Board relative to the location of the proposed development.

243 The impacts of the Tyrone – Cavan Interconnector which is also a significant capital investment will be similar in nature to the North-South 400 kV Interconnection development resulting in likely major positive cumulative economic impacts overall both locally during construction and during the operational phase.

- 244 The nature of EMF means that there are unlikely to be cumulative impacts with other developments, as EMF from a particular source dissipates within a relatively short distance. In particular, when the EMFs arising from the proposed development are added to the EMFs arising from the Tyrone – Cavan Interconnector, the cumulative impacts are not just the sum of the individual sources, but depends on the relative direction of the field as well as the distance. Outside of the proposed electrical infrastructure, no other projects have been identified which could give rise to significant cumulative impacts arising from EMF in combination with the proposed development.
- 245 There are a number of land parcels along the line route already traversed by existing high voltage transmission infrastructure and localised cumulative impacts are predicted. The proposed Emlagh Wind Farm will also have significant impacts on a number of land parcels along the line route. These impacts have been considered in Appendix 3.1 of **Volume 3C Appendices** and **Volume 3D Appendices** of the EIS. There are no cumulative impacts on land parcels north of the border (located in the vicinity of towers 103 – 107) arising from the OHL development south of the border in combination with any other known developments north or south of the border.
- 246 It is possible at some point in the future that a new substation may be developed in an area west of Kingscourt. The land use at the location of the substation will likely change from agriculture (the dominant land use in this area) to industrial. The closer the substation site to the existing OHLs the greater the likelihood of cumulative impacts arising from intensification of substation and OHL infrastructure on directly affected land parcels and on adjoining properties. The cumulative land use impacts arising from the construction of Gate 3 projects are also likely to be locally significant. The dominant land use in these areas is agricultural and if the projects are progressed there will be local changes from agricultural use to windfarm or intensified industrial use. The land use impacts will generally range from imperceptible to moderate adverse at the sites of windfarms and imperceptible to profound adverse at the site of the biogas facility.

Flora and Fauna

- 247 Cumulative effects may arise from the combination of effects of the development being assessed with a number of other developments and land management practices including agricultural, industrial, point source pollution and waste water treatment. This can include multiple impacts of varying sources and magnitudes upon the same receptor / resource.
- 248 Other developments that could give rise to potential cumulative impacts were considered in the evaluation. Those proposed developments deemed most relevant included; the SONI element of the proposed interconnector; consented 38 kV overhead line from Tullymalra Station to Shercock Station and Lisduff to Killicard; the proposed Emlagh Wind Farm Development and

- the proposed Raragh, Lisduff, Cregg and Teevurcher Wind Farm Developments. All other projects that were reviewed that were identified as potentially common to the proposed interconnector have appropriate mitigation for minimising potential impacts to ecological receptors. These include water protection measures (relevant to River Boyne and Blackwater cSAC / SPA). No residual impacts are identified to birds including Whooper Swan, and protected mammal species. Cumulative habitat loss is not significant as only a relatively small area is expected to be impacted and this is mostly restricted to habitats of low ecological value.
- 249 Cumulative impact on habitats arising from the construction and operation of the North-South 400 kV Interconnection Development and the Tyrone - Cavan Interconnector is likely to be Not Significant. There is some potential for cumulative impacts on mammal species, but none of these are likely to be significant and with the mitigation (in the Consolidated ES and EIS) applied during the construction of the overall development there will be no cumulative impacts on these species (Not Significant).
- 250 The impact on swans that may use sites on both sides of the border is likely to be of negligible significance in terms both of population numbers and on availability of feeding sites. Standard mitigation measures to render the overhead line more visible in those parts considered to present the greatest risk will be implemented in both jurisdictions, and will reduce the overall risk of collision (Not Significant).
- 251 There is a potential for minor impacts on the habitats of the majority of the breeding bird species that are present in the corridor of the proposed overhead line. In the absence of significant impacts on breeding birds, it is unlikely that cumulative impacts on these species will arise (Not Significant).
- 252 In terms of potential development, a future substation and Gate 3 projects will result in a significant potential impact on the ecology of specific sites, but this is unlikely to be significant in terms of the ecological value of the habitats at the site and /or within the wider area. Potential ecological constraints relate to impacts on water quality which can be avoided by appropriate mitigation during construction and operational phases of the proposed development. Given the scale and nature of these potential projects and the need for planning permission or approval it is likely that, once appropriate mitigation measures are applied, no significant residual impacts will be identified to sensitive ecological receptors including protected species such as Whooper swan.
- 253 Impacts outlined for the proposed and potential development will be reduced with appropriate relevant mitigation measures to low / or imperceptible levels. It is therefore concluded that no significant cumulative (additional) effects will arise to relevant flora and fauna in the wider area from the proposed development in combination with the proposed and potential development identified.

Soils, Geology and Hydrogeology

- 254 There are no significant cumulative impacts arising as a result of the proposed development in association with other proposed or potential development including other overhead powerline projects and substation developments, this includes construction of the Tyrone – Cavan Interconnector.

Water

- 255 Based on a review of the construction methodology, ecology and soils, geology and hydrogeology chapters, there are no significant cumulative impacts as a result of the proposed development in association with other proposed or potential developments including overhead powerline projects and substation developments.
- 256 The North-South 400 kV Interconnection Development is almost identical in nature and similar in scale to the Tyrone–Cavan Interconnector. Cumulative impacts on the water environment are limited due to the limited excavations and associated works during the construction phase. No significant cumulative impacts occur during the operational phase.
- 257 Most surface water catchments currently do not meet Good Status as defined in the Water Framework Directive. The main pressures on surface water catchments along the proposed development are agriculture and wastewater treatment plants. The proposed development will not have a significant impact on the Water Framework Directive status of streams either short term or long term. No significant predicted impacts are likely to occur on the River Boyne and Blackwater cSAC / SPA as a result of this proposed development.

Noise and Vibration

- 258 There a number of areas within the study area where the line route crosses over or near to existing power or other similar infrastructure. The noise impact from these existing sources is catered for in the background noise surveys.
- 259 The North-South 400kV Interconnection Development, if constructed at the same time as the Tyrone - Cavan Interconnector, has the potential to generate a number of working areas in the same general location. However mitigation measures will ensure there will not be cumulative noise and vibration impacts to sensitive receptors.
- 260 The potential cumulative impact with the construction phase of the proposed North-South 400 kV Interconnection Development and that of the Emlagh Wind Farm development is also not expected to be significant at any sensitive receptor. Should the projects construction phases coincide in proximity to a noise sensitive receptor, site management will be used to adhere to

the construction phase noise limits. There will be no significant cumulative impact to sensitive receptors in the operational phase.

- 261 Any future development of a substation in the area west of Kingscourt may give rise to cumulative noise impacts on sensitive receptors in that area. The design of the substation will be required to meet noise and vibration limits values and site management mitigation will also be required to meet construction phase noise limits. Therefore, the cumulative impact is not expected to involve any significant noise and vibration impacts. Given the potential Gate 3 developments are at a distance from the proposed development it is also considered that there should no significant cumulative noise and vibration effects.

Air – Climate and Air

- 262 No proposed or potential projects have been identified in the study area or in Northern Ireland which could give rise to significant cumulative impacts on human beings (Air and Climate), this includes construction of the Tyrone – Cavan Interconnector. At a wider scale with regard to cumulative climate change and greenhouse gas effects, when operational, the Tyrone – Cavan Interconnector and the proposed development will facilitate an increase in the connection of renewable energy sources in Northern Ireland and Ireland. The delivery of these future renewable generator connections including those currently processed through Gate 3 will have cumulative long-term beneficial greenhouse gas and climate change effects.

Landscape

- 263 There are a number of areas within which the alignment of the proposed development crosses over or near to the existing power infrastructure. As a result, there is potential for significant localised cumulative landscape effects between Towers 130 and 131 in the townland of Drumsook at Drumgristin and Coogan’s Lough, County Monaghan and between Towers 233 and 234 in the townland of Corraneary (ED Enniskeen), County Cavan. Localised significant visual cumulative effects will occur between Towers 233 and 234 in the townland of Corraneary (ED Enniskeen), County Cavan.
- 264 The impacts of the Tyrone-Cavan Interconnector and North-South 400kV Interconnection Development have been cumulatively assessed and there will be adverse cumulative effects in terms of landscape and visual impacts as follows:
- Impacts between Tyrone - Cavan Interconnector and North-South 400kV Interconnection Development overhead line on parts of the Mullyash Uplands Landscape Character Area. Where cumulative effects do occur, these are either localised or involving visibility over such distances that do not result in significant cumulative effects.

- Impacts between Tyrone - Cavan Interconnector and North South 400kV Interconnection Development overhead line on properties within 500-600m of the transmission line with open views towards the proposed development.
- 265 As the transmission line travels through an enclosed valley along the border, the potential for extensive cumulative visual effects are reduced. Where cumulative effects with the SONI element of the proposed interconnector occur, these are either localised or involving visibility over such distances that do not result in significant cumulative effects. The continuous nature of the development would result in the SONI and EirGrid sections being perceived as one transmission line in the landscape at and close to the border.
- 266 Cumulative landscape effects will arise from the construction of the proposed wind turbines at Teevcurcher, adding the character layer of energy generation to the overall rural landscape character to the south and east of Lough an Leagh mountain. However, the distances between the proposals means that the cumulative impact is not significant. Similar but higher effects will occur where the line passes close to the proposed Emlagh Wind Farm (46 turbines of 169m height) north-east of Kells. The cumulative effects will be highest when the towers and turbines can be seen at the same time within 600-800m of the line route. The simple form of a wind farm can become visually complex when seen in close context to a high voltage transmission line. This results in a localised intensification in the character of a landscape of energy generation. Cumulative landscape effects will also arise from the construction of the proposed turbines at Raragh, Lisduff and Cregg.
- 267 There is also potential for cumulative landscape and visual effects where development has planning permission but has not yet been built. Along the line route, these generally involve houses or low voltage 38kV transmission lines. There will be localised cumulative landscape and visual impacts arising from the proximity of these developments -once constructed - and the proposed North-South 400 kV Interconnection Development. While new residences within 500-600m of the line would potentially experience significant visual impact where open views are possible, in the context of the dispersed nature of rural housing generally and the pattern of low voltage wirescape no significant cumulative impacts are anticipated to arise.
- 268 There is potential for cumulative landscape and visual effects arising from the future construction of a substation at the point of intersection of the proposed interconnector and the existing Flagford- Louth 220 kV overhead line, near Kingscourt. The landscape effect will depend on the final location of the substation - lower lying locations are likely to have less adverse impact on the character of the drumlin landscape. Site selection will seek to minimise adverse effects on ground contours and existing vegetation. The cumulative landscape and visual effects will depend on the exact location and design of the substation but will most likely be locally significant after construction, reducing as the screening effects of planting come into effect.

269 There is also potential for cumulative landscape and visual effects arising from the possible future construction of the Gate 3 windfarm proposals. The cumulative landscape and visual effects will depend on the exact location of the proposed developments but will most likely be locally significant for any windfarm with five or more turbines within 5km of the proposed development. The cumulative landscape and visual effects of the proposed development and potential windfarms further removed from the proposed development will reduce due to the increased distance, intervening topography and natural screening.

Material Assets - General

270 In terms of material assets general, no other proposed or potential projects have been identified which could give rise to significant cumulative impacts on the existing utilities and infrastructure in the area.

Material Assets - Traffic

271 Traffic generated during the operational phase of the development is minimal and as such will contribute only marginally to any potential cumulative impact that may occur due to the operations of other proposed or potential projects within the project study area. Larger traffic volumes will be generated during the construction stage which, combined with construction traffic anticipated to be generated by Emlagh Wind Farm would magnify the impact caused by the development on traffic flows in the study area, however this is generally reflective of the low number of vehicles generally using these roads and would represent a worst case scenario of short duration.

272 The construction of the North-South 400 kV Interconnection Development could be constructed at the same time as the Tyrone – Cavan Interconnector. However, due to the geographical location of the two elements and associated haulage routes, there are unlikely to be any significant cumulative traffic impacts arising.

Cultural Heritage

273 An adverse cumulative impact on the setting of both Dowdstown House and Mountainstown House and their associated demesne landscapes would arise from the construction of the proposed Emlagh Wind Farm. There are no other known developments that would result in a significant cumulative impact on the cultural heritage resource within the project study area. This is because of the distance, scale and nature of the other developments. As there is a programme of archaeological mitigation proposed herein, no significant cumulative impacts are predicted on previously unrecorded cultural heritage sites.

274 As both the SONI and EirGrid sections of the proposed interconnector propose a standard programme of archaeological mitigation, cumulative impacts on the previously unrecorded cultural heritage resource will be Not Significant.

5.16.1 Cumulative Impact and the Proposed Interconnector

275 A Joint Environmental Report (JER) has been prepared by EirGrid and SONI for the entirety of the proposed interconnector (i.e. the overall project from Turleenan to Woodland (i.e. both the SONI and EirGrid sections⁶).

276 The purpose of the JER is to provide the reader with an overview of impacts and the transboundary issues of the proposed interconnector, taking into account the EC Transboundary Guidance document *Guidance on the Application of the Environmental Impact Assessment Procedure for Large-scale Transboundary Projects*. A summary of the findings of this report is as follows:

- The cumulative impact of the proposed interconnector on Human Beings and Socio-Economic considerations is imperceptible.
- The proposed interconnector will not adversely impact upon populations of European and/or Nationally protected habitats/ species in both jurisdictions; however it does have potential to impact upon local populations of protected fauna. Mitigation measures will be implemented at the construction and operation phase to eliminate or minimise identified impacts. Where impacts are minimised this residual impact is outlined. The level of residual impacts were assessed from an entire project perspective with the highest impact being minor negative to hedgerows / treelines, Wintering birds (Whooper Swans) and Breeding birds (Lapwing). All other impacts are considered negligible.
- No significant impacts will occur in terms of the cumulative impact of the proposed interconnector on the geology and groundwater conditions in Ireland or Northern Ireland.
- The predicted impact on the water environment in Ireland or Northern Ireland arising from the proposed interconnector is considered to be long term and imperceptible.

⁶ The proposed interconnector comprises: the Tyrone – Cavan Interconnector: That portion of the proposed interconnector located in Northern Ireland being proposed by SONI; and the North-South 400 kV Interconnection Development: That portion of the proposed interconnector located in Ireland being proposed by EirGrid

- The proposed interconnector will not result in any cumulative significant noise and vibration effects.
- An overhead line of the length and nature of the overall EirGrid and SONI proposed interconnector will inevitably have landscape and visual impacts. However, considerable efforts have been made in the routeing and design processes to avoid or minimise these impacts as much as possible. Based on the detailed consideration of alternative routes, SONI and EirGrid developed a route for the proposed interconnector which will result in the least impacts to the landscape and visual resource of the assessed area, bearing in mind the constraints of features protected by legislation and the nature of an overhead transmission line.

The landscape appraisal indicates that there would be significant adverse impacts upon the landscape of some parts of the assessed area. There would also be significant adverse effects on the visual amenity afforded from many locations from within the immediate area following the line route. However, notwithstanding these conclusions, it is considered that the landscape and visual resource of the wider assessed area along the proposed interconnector would not deteriorate to a significant degree and the overall impact upon landscape and visual amenity in general is therefore restricted to those receptors/areas within close proximity to the towers and overhead line.

- The operational stage of the proposed interconnector will generate minimal volumes of traffic.
- While the overall proposed interconnector will not have a direct physical impact on the upstanding remains of any known archaeological sites or architectural features, it will have such an effect on a number of demesne landscapes. The impact on one of the demesnes landscapes, Brittas, was found to be significant. A further 4 demesne sites will experience a moderate negative impact in terms of setting. There will be likely significant effects to the setting of a number of features. In summary there will be 24 moderate negative, seven moderate to significant negative and six significant negative impacts to archaeological sites. In addition there will be three moderate negative and one moderate to significant negative impacts to architectural sites. All other sites in the receiving environment will not be affected by the proposed interconnector or will have a slight negative impact.

5.16.2 Conclusions

277 While there is potential for the impacts to interact and result in a cumulative impact, it is unlikely, as a result of the mitigation measures proposed, that any of these will result in significant additional impacts that are not already anticipated by each environmental topic.

5.17 IMPACT INTERACTIONS

278 While almost all environmental aspects are interrelated to some degree, only significant interrelationships are considered in the Environmental Impact Statement. The potential for interactions arising between environmental topics includes that between:

- **Human beings (population and economic)** tourism & amenity, landscape, and air – noise & vibration;
- **Human beings (land use)** and flora & fauna, soils, geology & hydrogeology, water, air - noise & vibration, and air quality & climate;
- **Human beings (tourism & amenity)** and landscape, cultural heritage, and human beings (population & economic);
- **Human beings (EMF)** and human beings (population & economic), and flora & fauna;
- **Flora & Fauna** and water, human beings (land use), landscape, soils, geology & hydrogeology and material assets - traffic;
- **Soils, geology & hydrogeology** and water, flora & fauna and material assets - traffic;
- **Water** and soils, geology & hydrogeology and flora & fauna;
- **Air – Noise & Vibration** and material assets – traffic and human beings;
- **Air (Air Quality and Climate)** and material assets – traffic;
- **Landscape** and cultural heritage, human beings, flora & fauna, noise & vibration, material assets – general and traffic, water, and soils, geology & hydrogeology.
- **Material Assets** – General and Landscape and Flora & Fauna;
- **Material Assets – Traffic and** Air – Noise & Vibration, Air – Climate and Air Quality, Landscape, Cultural Heritage, Flora & Fauna and Water; and
- **Cultural heritage** - landscape, human beings – tourism, flora & fauna, air - noise & vibration and material assets - traffic.

279 **Table 5.2** shows a matrix of the significant interactions likely to occur between potential impacts arising from the proposed development.

Table 5.2: Overview of Potential Interactions / Interrelationships

		Human Beings				Flora and Fauna	Soils, Geology and Hydrogeology	Water	Air		Landscape	Material Assets		Cultural Heritage
		Population & Economic	Land Use	Tourism & Amenity	EMF				Noise & Vibration	Climate & Air Quality		General	Traffic	
Human Beings	Population & Economic			✓					✓		✓			
	Land Use					✓	✓	✓	✓					
	Tourism & Amenity	✓									✓			✓
	EMF	✓				✓								
Flora and Fauna			✓				✓	✓			✓			
Soils, Geology and Hydrogeology						✓		✓						
Water						✓	✓							
Air	Noise & Vibration	✓											✓	
	Climate & Air Quality												✓	
Landscape		✓				✓	✓	✓	✓			✓		✓
Material Assets - General						✓					✓			
Material Assets - Traffic						✓		✓	✓	✓	✓			✓
Cultural Heritage				✓		✓			✓		✓			

5.18 SUMMARY OF LIKELY SIGNIFICANT EFFECTS

280 Throughout the environmental impact appraisal of the proposed development avoidance by design has been employed in the first instance. The attention and expertise given to the specific routing of the proposal undertaken by experienced professionals has ensured the identification and avoidance of more sensitive ecological and other environmental receptors within the receiving environment. Only where avoidance has not been possible have mitigation measures been proposed to reduce or offset significant adverse effects (see **Section 5.19**).

Human Beings (Population, Land Use, Tourism and Amenity, EMF)

281 There will be wider economic benefits arising from the improvements to the electricity grid in the island of Ireland. It is also considered that the landscape and visual resources of the study area will not deteriorate to a significant degree and the overall impact on population and residential amenity is therefore restricted to those receptors / areas within close proximity to the towers and overhead line.

256 The proposed development will have an imperceptible impact on land use arising from the construction of towers; the residual impacts are either imperceptible or slight adverse on the majority of land parcels along the alignment. Moderate adverse impacts will arise on certain land parcels due to potential restrictions on farm yard development, at the construction storage compound due to damage to soil, and on forestry land parcels where the trees will have to be cleared within a maximum 74m corridor. Major adverse impacts will arise on a very limited number of land parcels due to potential restrictions on the operation of an intensive horticultural enterprise and on two forestry land parcels where the trees will have to be cleared within a maximum 74m corridor.

257 Impacts to tourism and amenity will not be direct as no tourist sites will be physically impacted by the proposed development. Negative impacts on tourism and amenity are anticipated to be limited to indirect localised visual impacts on the landscape in close proximity to the overhead line. The Boyne Valley Driving Route, Bective Abbey and a localised short section of the Monaghan Way are the tourism assets with the potential to experience such visual impacts.

258 Notwithstanding conservative assumptions about the operating conditions assumed for the electric and magnetic fields (EMF) calculations (that would tend to overestimate field levels), the electric and magnetic fields from the proposed 400 kV line are still below electric and magnetic fields guidelines of Ireland and the EU. A survey of scientific research on topics relating electric and magnetic fields 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.

Flora and Fauna

259 The project design has sought to minimise ecology impacts insofar as possible by locating towers off relevant receptors such as hedgerows of potentially high ecological value, and away from rivers / streams (and associated riparian habitats). This is a key approach and best practice for minimising impacts to ecology receptors. The study area is also a highly managed landscape dominated by habitats of low ecological value. The key ecology features are rivers (including the River Blackwater and Boyne – European sites), boundary hedgerows / treelines and Whooper Swans. It is concluded that impacts to key ecological receptors including key groups identified will be minor or imperceptible once construction, reinstatement and management follow best practice procedures and the recommended mitigation measures are implemented.

Noise

260 It is predicted that the development as designed, inclusive of recommended mitigation will not have a significant noise and vibration impact on sensitive receptors.

Soils, Geology and Hydrogeology

261 The construction phase of the proposed development will impact on the ground and geological conditions (including soil, subsoil and bedrock) through the use of temporary access routes and excavations required for the tower bases and the substation. Potential impacts include accidental spillages of fuels, which could impact on soil, bedrock and groundwater quality, if allowed to infiltrate to ground. However, with the implementation of the mitigation measures proposed, the predicted impact is considered to be short-term and imperceptible.

262 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. 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.

263 With regard to the operational phase of the development, no significant impacts are predicted on the local geological or hydrogeological environment with the implementation of mitigation measures. The overall predicted impact on the soils and geology is therefore considered to be short term and imperceptible.

Water

- 264 The construction phase of the proposed development may impact on the water conditions through the use of temporary access routes and excavations required for the tower bases. Potential impacts to the underlying water environment could derive from accidental spillages of fuels. However, with the implementation of the mitigation measures proposed no significant adverse effects are predicted on the water environment as a result of the construction phase of the proposed overhead line. With regard to the operational phase of the development, no significant impacts on the local water environment are predicted. The predicted impact on the water environment is therefore considered to be short term and negligible.

Air – Quality and Climate

- 265 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. In terms of dust no significant impacts are predicted following the implementation of good construction practice and appropriate mitigation measures. Traffic emissions themselves will not give rise to significant air quality effects. With the implementation of mitigation measures no significant local air quality effects are predicted.

Landscape

- 266 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. These effects will be particularly noticeable where the transmission line crosses roads, where hedgerows are low and / or panoramic views are available. Some areas that are particularly flat or elevated in relation to the line will experience visual effects at distances up to 1km.
- 267 Specific identified sensitive locations along the alignment which will experience residual unavoidable impact include: a plateau and valley close to the jurisdictional border with Northern Ireland (including a section of the Monaghan Way), the setting of the Fair of Muff, a scenic view east of Shantonagh, the vicinity of a number of small lakes, the locations where towers need to cross drumlins to avoid other constraints, the Kilmainhamwood river valley west of Kilmainhamwood, Brittas Estate, the Blackwater River valley at Teltown and the Boyne River valley at Bective.

Material Assets - General

- 268 The construction and operation of the proposed development will have no significant impacts on material assets; adherence to mitigation measures during construction will ensure there are no residual impacts associated with the proposed development.

Material Assets - Traffic

- 269 Due to the length of the proposed line, traffic will be dispersed over a large area during the construction phase. Access to the individual sites will generally be achieved via existing field accesses and existing internal tracks where available. It is proposed that a material storage yard, located in the townlands of Monaltyduff and Monaltybane, Carrickmacross, County Monaghan will be used to store materials for distribution to the individual sites. Higher volumes of traffic are anticipated at this location as vehicles will be concentrated in this location prior to dispersing to individual sites.
- 270 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.
- 271 The operational phase of the proposed development will generate minimal volumes of traffic. The construction phase of the proposed 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. 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.

Cultural Heritage

- 272 The appraisal found that there will be no direct, physical impacts on the upstanding remains of previously recorded archaeological monuments. It was noted that there is the potential that subsurface archaeological remains associated with a number of sites could be impacted on by the proposed development during the construction stage (including those arising from construction traffic passing in close proximity). Recommendations to prevent or mitigate impacts include demarcating appropriate buffers around sites, supervision of vegetation clearance, and / or archaeological pre-construction monitoring of groundworks. These mitigation measures will be implemented at the construction phase to minimise and / or eliminate impacts.

- 273 With regard to architectural heritage, potential direct impacts may occur at four sites. These impacts are all related to construction traffic and appropriate mitigation will ensure there are no direct, physical impacts. Similarly construction work and access will be required within eight demesnes that are listed in the NIAH (National Inventory of Architectural Heritage) garden survey.
- 274 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 40 SMR's (Sites and Monuments Record), six demesnes listed on the NIAH garden survey and 3 protected structures.

5.19 SUMMARY OF MITIGATION MEASURES

- 275 EirGrid has undertaken a comprehensive route selection process for the proposed development based on the preferred technology solution. In this regard, the proposed alignment has been subject to an extensive examination of locational alternatives. The mitigation of environmental and other impacts by design has been a fundamental aspect of EirGrid's route selection and line design process, and the proposed line design is considered to represent the best overall option amongst the main alternatives considered through the route development process.
- 276 The evaluation of potential impacts of the proposed development as described throughout the Environmental Impact Statement includes recommendations for specific remedial or mitigation measures. These measures are considered necessary to minimise environmental impacts associated with the proposed development during both its construction and operational phases. A summary of these are included in **Appendix 1**.

APPENDIX 1

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Schedule of Environmental Commitments (Summary of Mitigation Measures)

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
CONSTRUCTION (CHAPTER 7, VOLUME 3B) – NOTE ALL OTHER MITIGATION MEASURES ARE ALSO RELEVANT TO CONSTRUCTION MITIGATION					
1.1	General construction	Construction Management	<p>In the event of approval being granted for the proposed development and prior to commencement of works, the contractor(s) which will be appointed by the Electricity Supply Board (ESB) will prepare a detailed <i>Construction and Environmental Management Plan</i> (CEMP). An outline CEMP is included as, Appendix 7.1, Volume 3B Appendices in the EIS for information.</p> <p>The scope of the final CEMP will detail <i>inter alia</i> the implementation and management of environmental controls and mitigation measures (detailed in the EIS and summarised below). Monitoring of the construction phase shall be carried out by an Environmental Officer, in association with an ecologist (Ecologist Clerk of Work (ECoW)) and archaeologist to ensure that all mitigation measures contained in the EIS and CEMP are implemented.</p>	Pre-construction Phase	Yes. Detailed CEMP produced by contractor and agreed by ESB and subsequently with local and relevant prescribed authorities.
1.2	General construction	Construction Management – Client Engineer	A Client Engineer will be appointed and shall monitor and inspect the detailed designs, plant, material, and works including scheduling to ensure that these meet the requirements of the functional specification, designs and transmission standards.	Pre-construction Phase	Yes
1.3	General construction	Construction Management	Prior to construction, Notices and Schedules, as well as maps confirming the position of towers as approved by the Board, will be issued to landowners. EirGrid representatives will meet with landowners to deal with any queries the landowner may have following the issuing of the Notice.	Pre-construction Phase	None

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
1.4	General construction	Construction Management – working hours	Access to the site will be during daylight for all construction stages. It is not anticipated that construction works will be carried out on Sunday, or Bank Holidays or that any construction works will be carried out in hours of darkness.	Construction Phase	None
1.5	General construction	Landowner Liaison	Prior to commencing the works, discussions will take place between the appointed landowner agents and landowners to ensure awareness of the specific works that will take place pursuant to the proposed development. All landowners will be contacted prior to access being required on their lands and a date of commencement for the works will be provided to the landowner before any work begins. The detailed design of access routes and construction methodology to be used, chosen from the methodologies identified in the EIS, will be based on the condition of land at the time of construction and will be discussed with the landowner prior to the commencement of works.	Pre-construction Phase	None
1.6	General construction	Construction Management	Prior to commencement of construction a full traffic management plan will be produced and implemented.	Pre-construction Phase	None
1.7	General construction	Construction Management	A Construction and Waste Management Plan (forming part of the CEMP) will be implemented to minimise waste and ensure correct handling and disposal of construction waste streams.	Pre-construction Phase	None
1.8	General construction	Reinstatement	Once all the works are complete, the land used for temporary access routes and construction areas around the overhead structures will be reinstated as close as possible to their original condition.	Post Construction Phase	None

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
HUMAN BEINGS – POPULATION & ECONOMIC (CHAPTERS 2 VOLUMES 3C and 3D) - No specific mitigation measures. Refer to other topics.					
HUMAN BEINGS – LAND USE (CHAPTERS 3 VOLUMES 3C and 3D)					
2.1	General construction	Construction Management	A method statement and work programme that shows the detailed phasing of work will be prepared prior to commencement of work.	Pre-construction Phase	None
2.2	General construction and operational maintenance works	Landowner Liaison	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. Land owners will be notified in advance of the commencement of any construction or maintenance works.	Construction Phase and Operation Phase	None
2.3	General construction	Comply with ESB / IFA agreement	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.	Construction Phase	None
2.4	General construction	Maintain access to agricultural land	The contractor will ensure that land owners have reasonable access to all parts of their farm during the construction phase.	Construction Phase	None
2.5	General construction	Minimise the risk of spreading animal and crop diseases	Disease protocols will be adhered to. The contractor will comply with any Department of Agriculture, Food & the Marine regulation pertaining to crops and livestock diseases.	Construction Phase	Yes
2.6	N/A – general construction	Fencing of construction areas to prevent disturbance	Where required, appropriate fencing will be erected to exclude livestock from sites of construction.	Construction Phase	None
2.7	General construction	Minimise impact of rock breaking or piling, if required	In the unlikely event that rock breaking or piling are required, owners of livestock in adjoining fields will be notified in advance.	Construction Phase	None

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
2.8	General construction	Minimise impacts to soil	<p>Where top soil is stripped back it will be replaced. All disturbed field surfaces will be re-instated.</p> <p>It will be the construction policy to minimise non-tracked vehicular access to sites in wet weather. Temporary access tracks (aluminium or panel tracks) will be laid in certain sites to avoid damage to soil.</p> <p>Vehicles which leak oil or fuel will not be allowed on construction or access sites. Any soil contaminated by fuel or concrete spillage will be removed from the site and dealt with appropriately as per legislative requirements.</p>	Construction Phase	None
2.9	General construction	Minimise impacts to land drains	Affected land drains will be directed in a manner that maintains existing land drainage.	Construction Phase	None
2.10	General construction and operation phase	Ensure health and safety	<p>ESB will provide safety information directly to all affected land owners e.g. <i>Guidelines for Safe Working near Overhead Electricity Lines in Agriculture</i> and <i>Code of Practice for Avoiding Danger from Overhead Electricity Lines</i>.</p> <p>These publications will enable farmers to fulfil their statutory requirements under Health and Safety Regulations.</p>	Construction Phase and Operation Phase	None
2.11	General construction and operation phase	Minimise impact on livestock	Helicopter inspections will be announced in local newspapers and the Farmer's Journal.	Operation Phase	None

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
HUMAN BEINGS – TOURISM (CHAPTERS 4 VOLUMES 3C and 3D) – No specific mitigation measures. Refer to other topics.					
HUMAN BEINGS – EMF (CHAPTERS 5 VOLUMES 3C and 3D)					
3.1	MSA	Minimise EMF levels	The configuration of the phases (that is the spatial arrangement of the two sets of three vertically aligned electricity wires) on the existing double circuit towers will be optimised to ensure EMF levels are minimised.	Pre-construction	None
FLORA AND FAUNA (CHAPTERS 6 VOLUMES 3C and 3D)					
4.1	General	Minimising risks such as disturbance to wildlife and protection of water quality	<p>The key approach for minimising risks such as disturbance to wildlife and protection of water quality is the appointment of an appropriately experienced Ecological Clerk of Works (ECoW) on site during construction, to monitor the effectiveness of proposed mitigation measures in relation to known environmental effects and mitigation measures proposed in the EIS:</p> <p>The role of the ECoW will include:</p> <ul style="list-style-type: none"> • 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 	Construction Phase and initial Operation Phase (5 years plus)	Yes. Monitored by ECoW.

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
			required. In addition to the construction phase, it is recommended that a site ecologist (ECoW) also be appointed during the pre-construction (landowner liaison stage) and post construction phases (up to 5 years) in particular to monitor mitigation measures regarding wintering birds.		
4.2	General	Construction Management	A CEMP will be implemented for the construction phase of the project with respect to all mitigation.	Construction Phase	Yes. Monitored by Environmental Officer
4.3	General	Construction Management	Work method statements which will incorporate all the mitigation measures identified in the EIS 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.	Construction Phase	Yes. Monitored by Environmental Officer
4.4	General	Protection aquatic ecology	As required, temporary silt screens will be installed in drains /small streams deemed to be at possible risk of water pollutant discharge. Where possible, towers (access routes, stringing areas and indicative works areas) have been located away from sites of ecological importance. Furthermore, where possible, access to tower locations will be via existing tracks that are regularly used by farm machinery. Existing field access points (e.g. gaps / farm gates) to local roads will be used to avoid creating additional hedgerow gaps.	Construction Phase	Yes. Monitored by ECoW.
4.5	General	Minimise impacts to habitats	Semi natural habitats such as wetlands and hedgerows will be avoided.	Construction Phase	Yes. Monitored by ECoW.
4.6	General	Avoid the spread and introduction of invasive	Any invasive plant material noted on site will be removed off site and disposed of at appropriate licensed waste disposal facility. Any invasive	Construction	Yes. Monitored

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
		species and noxious weeds	species found to occur within 15m of working areas will require its eradication to avoid the spread of invasive species, to ensure compliance with the <i>European Communities (Birds and Natural Habitats) Regulations 2011</i> (S.I. No. 477 of 2011).	Phase	by ECoW.
4.7	General	Maintenance of habitat connectivity	All landscaping / reconnection works must ensure that only native species are utilised. Non-native species will be avoided.	Construction Phase	Yes. Monitored by ECoW
4.8	General	To minimise impacts to habitats	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 5 metres of hedgerows / trees / scrub.	Construction Phase	Yes. Monitored by Environmental Officer
4.9	Towers located at field boundaries	To minimise impacts to habitats i.e. 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 5 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 3 weeks of construction works to avoid flushing of exposed soil downstream.	Construction Phase	Yes. Monitored by ECoW.
4.10	General	To minimise impacts to habitat i.e. trees	Tree cutting and lopping in proximity to 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	Construction Phase	Yes. Monitored by ECoW / Environmental

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
			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.		Officer
4.11	General	To minimise impacts to habitats i.e. trees	Where construction work is required close to mature trees, the National Joint Utilities Group <i>Guidelines for the Planning Installation and Maintenance of Utility Services in Proximity to Trees</i> (NJUG 10) will be followed so as to minimise damage.	Construction Phase	Yes. Monitored by ECoW / Environmental Officer
4.12	General	To minimise impacts to breeding birds	Scrub, hedgerow or tree removal / trimming will 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 <i>Irish Wildlife Act 1976</i> (as amended 2000).	Construction Phase	Yes. Monitored by ECoW / Environmental Officer
4.13	General	Protection aquatic ecology	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 Chapter 6 and 8 of this EIS) to address site specific issues.	Construction Phase	Yes. Monitored by Environmental Officer
4.14	General	Protection aquatic ecology	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.	Construction Phase	Yes. Monitored by Environmental Officer
4.15	General	Protection aquatic ecology	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	Construction	Yes. Monitored by

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
			must be implemented in the unlikely event of an accidental spillage of chemicals, hydrocarbons or release of protection aquatic ecology sediment to the surface or ground water system.	Phase	Environmental Officer
4.16	General	Protection aquatic ecology and sensitive habitats	Excavated materials from construction works will be deposited within the works area where there is no significant risk of runoff into local watercourses.	Construction Phase	Yes. Monitored by ECoW / Environmental Officer
4.17	General	Protection aquatic ecology water	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.	Construction Phase	Yes. Monitored by Environmental Officer
4.18	General	Protection aquatic ecology Compliance with best practice	Oil, petrol and other fuel 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 <i>Best Practice Guide BPGCS005 Oil Storage Guidelines</i> .	Construction Phase	Yes. Monitored by Environmental Officer
4.19	General	Protection aquatic ecology Compliance with best practice	Pouring of concrete will only take place in designated locations and concrete washings will be treated off site following current best practice guidelines including <i>Pollution Prevention Guidelines for Northern Ireland and Scotland</i> . 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.	Construction Phase	Yes. Monitored by Environmental Officer
4.20	General	Protection aquatic ecology	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	Construction Phase	Yes. Monitored by Environmental

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
			the three bay water recycler provided at this location.		Officer
4.21	General	Protection aquatic ecology	Water courses which have been identified as potentially at risk of pollution from construction activities (e.g. drains and smaller streams linked to the River Boyne and Blackwater) will have appropriately designed silt traps (based on drain and potential runoff characteristics) installed in consultation with IFI (where necessary). Refer to Chapter 8 in Volumes 3C and 3D for details.	Construction Phase	Yes. Monitored by Environmental Officer
4.22	General	Protection aquatic ecology	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.	Construction Phase	Yes. Monitored by Environmental Officer
4.23	General	Protection habitats and aquatic ecology	All machinery will be regularly maintained and checked 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.	Construction Phase	Yes. Monitored by Environmental Officer
4.24	General Construction	Protection aquatic ecology	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.	Construction Phase	Yes. Monitored by Environmental Officer
4.25	General construction	Protection aquatic ecology	Weather conditions will be taken into account when planning construction activities to minimise risk of extreme run off from works areas.	Construction Phase	Yes. Monitored by Environmental Officer

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
4.26	General construction	– To minimise impacts to bats	Given the likely timescale (likely to be greater than 2 years) between any decision to grant planning approval and actual site clearance and construction, confirmatory bat surveys / monitoring of specific mature trees identified for felling will be undertaken by a bat specialist prior to tree cutting. In order to proceed with the felling of trees that may be identified as bat roosts, it will be necessary to acquire a derogation licence from NPWS. NRA, (2006) <i>Guidance in relation to tree felling and hedgerow removal</i> will be followed throughout the site clearance phase of the proposed development.	Pre-construction Phase and Construction Phase	Yes. Monitored by ECoW.
4.27	General construction	– To minimise impacts to Otters	Pre-construction surveys surveys to confirm presence / absence of Otter breeding sites in relation to the conditions which have been evaluated this EIS will be undertaken at watercourses and adjacent habitats that occur in close proximity to tower locations and tree felling areas. Details of the pre-construction verification / monitoring 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. No direct impacts are expected to arise as works will require an agreed method statement and be monitored by the ECoW.	Pre-construction Phase and Construction Phase	Yes. Monitored by ECoW.
4.28	General construction.	– To minimise impacts to Kingfishers	Given the likely timescale between any decision to grant planning approval and the commencement of actual actual site clearance and construction, pre-construction surveys to confirm the conditions which have been evaluated will be undertaken at watercourses and adjacent habitats (linked to the River Boyne and Blackwater) that occur in close proximity to tower locations and tree felling areas to confirm presence / absence of Kingfisher breeding sites.	Pre-construction Phase and Construction Phase	Yes. Monitored by ECoW.
4.29	General	– To minimise impacts to	Surveys for Badger setts will be conducted at woody vegetation required for cutting. This is required to confirm that site clearance activities are in	Pre-construction Phase and	Yes. Monitored

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
	construction	Badgers	line with the receiving environment considered in this EIS. A buffer zone will be established around any known Badger setts through the erection of temporary posts and wires with "no entry" signs erected. Any works within 50m of a sett will require a licence from NPWS. No direct impacts are expected to arise as works will require an agreed method statement and be monitored by the ECoW.	Construction Phase	by ECoW.
4.30	General – Operational Phase	To minimise impacts on Whooper Swans	The key operational impacts identified are potential collision risks to Whooper swans. Mitigation by avoidance of feeding and roosting sites has been implemented as far as possible in the route selection for the alignment. Flight Diverters (Swan Flight Diverter markers constructed from high-impact grey PVC (UV stabilised) fitted at approximately 5m apart along each earthwire, are proposed at specific locations identified in the EIS. This line marking is proposed for the earth wire to increase visibility of the earth wire to flying birds.	Operational	Yes. Annually for 10 years.
4.31	General	Hedgerow re-growth and fence maintenance	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 then this will be agreed and implemented with the landowner.	Post construction	Yes. 2 years post construction.
4.32	General		Monitoring will be undertaken to determine the effectiveness of proposed flight diverter mitigation.	Post construction	Yes. Annually for 10 years.
4.33	General – During maintenance works	During maintenance works, consideration will be given to ensure ongoing protection of water quality.	Depending on the nature of the proposed maintenance works; there may be a requirement for risk assessments of potential impacts to surface waters and appropriate mitigation will be implemented where a risk is identified.	Post construction	Yes. Ongoing (depending works requirements)

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
SOILS, GEOLOGY AND HYDROGEOLOGY (CHAPTERS 7 OF VOLUMES 3C AND 3D)					
5.1	Lemgare CGS, Altmush CGS, Galtrim CGS and the Boyne CGS	To mitigate potential impacts	The mitigation measures agreed with the GSI for site investigation works / construction of the towers include the following; <ul style="list-style-type: none"> Continued consultation with the GSI; Limiting excavation by only excavating the required footprint; Maintaining an adequate distance from Lemgare pNHA, and Altmush Stream; and The GSI will be notified about any significant new section / feature that is exposed within the tower footprint. 	Construction Phase	None
5.2	General	Effective treatment of spoil material	Excavated soil and subsoil will be stored adjacent to the excavation area. Excavated material will be reused in situ where possible. In the event no material is suitable / wanted for reuse by landowners, subsoil will be disposed of in accordance with all applicable legislative requirements.	Construction Phase	None
5.3	General	Dealing with unexpected contaminated land	All excavated materials will be visually assessed for signs of possible contamination such as staining or strong odours. Should it be determined that any of the soil excavated is contaminated, this will be dealt with appropriately as per all applicable legislative requirements.	Construction Phase	Monitoring required during construction
5.4	General	To minimise impact 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	Construction Phase	None

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
			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.		
5.5	General	Minimise impacts to soils	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. Soils will be reinstated at the towers and along the temporary access route.	Construction Phase	None
5.6	Tower Locations	Minimise impacts to 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.	Construction Phase	Monitoring required during construction
5.7	General construction	Minimise impacts to existing wells and boreholes. Protection of the quality of the receiving water system.	Water pumped from the excavations may contain suspended solids. 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 streams or rivers will not be permitted.	Construction Phase	Monitoring required during construction
5.8		Tara Mines	Liaison will be undertaken with Tara Mines during construction / operation phase to ensure no conflicts arise.		
WATER (CHAPTERS 8 OF VOLUMES 3C AND 3D)					
6.1	General Construction	To prevent water pollution	All works will be undertaken with due regard to the guidance contained within CIRIA Document C741 2015 <i>Environmental Good Practice on Site</i> .	Construction Phase	None

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
	Phase				
6.2	Where tree felling may be required	To prevent water pollution during felling of forestry	<p>Consultation will be undertaken with Inland Fisheries Ireland (IFI) and 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.</p> <p>On sites where risk of erosion is high (steep slopes and / or adjacent to rivers), brush mats will be used to avoid soil damage, erosion and sedimentation. Brush mat renewal will take place when they become heavily used and worn. Provision will be made for brush 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 during construction phase.</p>	Construction Phase	Monitoring required during Construction Phase.
6.3	Near watercourses (including the River Boyne and Blackwater)	Protection of Watercourses	<p>Silt barrier / silt curtains will be used where towers or works are undertaken near watercourses.</p> <p>In relation to the River Boyne and Blackwater the towers are located a minimum of 60m and 100m respectively from these rivers. However, notwithstanding this distance, it is proposed to use silt barriers / curtains for tower construction near those rivers.</p>	Construction Phase	
6.4	General Construction	Minimise impacts on soils	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	Construction Phase	Monitoring required during

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
			will ensure that any peat encountered is stored in suitable areas.		construction
6.5	Near watercourses	Protection of Watercourses	Where it would be necessary to dewater to construct the tower foundations precautions will be taken to ensure there is no adverse effects on nearby watercourses including the resultant water being filtered before discharge.	Construction Phase	Yes on the discharge water quality.
6.6	Near watercourses	Protection of Watercourses	Precautions will be taken to avoid spillages. These include: <ul style="list-style-type: none"> • 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. 	Construction Phase	Yes during construction
6.7	Near watercourses	Protection of Watercourses	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.	Construction Phase	Yes - equipment
6.8	Near watercourses	Protection of Watercourses	All site personnel will be trained and 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 are trained in their proper use. Any servicing of vehicles will be confined to designated and suitably protected areas. Any pollution incident or spill will be reported to the regulator and remediated to their original condition.	Construction Phase	Ongoing monitoring required during construction

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
6.9	Near watercourses	Protection of Watercourses	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.	Construction Phase	Ongoing monitoring required during construction
6.10	Temporary Access Tracks and Tower Foundations	Protection of watercourses	At certain locations where very poor soft ground is encountered, Type 2 temporary access track may have to be laid. Generally temporary access tracks use rubber or aluminium road panels. Temporary access tracks will be up to 4m wide and routed away from drains where possible. In sensitive locations silt barriers will be used to prevent direct runoff to local watercourses.	Construction Phase	None
6.11	Temporary Access Routes and Tower Foundations	Protection of water quality	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.	Construction Phase	Ongoing Monitoring required during construction.
6.12	Construction-Temporary Access Routes and Tower Foundations	Protection of Water Quality	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 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.	Prior to and during the Construction Phase	Ongoing Monitoring, observing and sampling required during construction.

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
6.13	Construction-Material Storage Yard	Protection of Water Quality	The surface water drainage system at the construction material storage yard will take into account the recommendations of the CIRIA C468 and utilises SuDs (sustainable urban drainage) devices where appropriate. Runoff from site will be limited to greenfield runoff rates. Runoff will pass through a silt trap, oil interceptor and settlement lagoon before being discharge to the surface water.	Prior to and during the Construction Phase	Ongoing observing and sampling required during construction
6.14	Woodland Substation	Protection of Water Quality	Implementing the design standards of the GSDSDS, the surface water drainage system at Woodland takes into account the recommendations of the GSDSDS and utilises SuDs (sustainable urban drainage) devices where appropriate. Runoff from hardstand areas at Woodland Substation will be limited to greenfield runoff rates.	Prior to and during the Construction Phase	Ongoing observation required
AIR – NOISE & VIBRATION (CHAPTER 9 OF VOLUMES 3C AND 3D)					
7.1	Construction Phase	To ensure compliance with appropriate European Standards	The contractor appointed will have to ensure that all plant items used during the construction phase will comply with standards outlined in European Communities (<i>Construction Plant and Equipment</i>) (<i>Permissible Noise Levels</i>) Regulations (1990). The contractor will make reference to BS5228: <i>Noise Control on Construction and Open Sites</i> (2009), which offers detailed guidance on the control of noise from construction activities.	Construction Phase	Ongoing monitoring required during construction
7.2	Construction Phase	To ensure the adoption of appropriate practices during construction	It is proposed that various practices be adopted including: <ul style="list-style-type: none"> Night time working will typically not occur; however, 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 	Construction Phase	Ongoing monitoring required during construction

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
			<p>in one location for a longer period of time;</p> <ul style="list-style-type: none"> • 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/m² 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 • Establishing channels of communication between the contractor / developer, local authority and resident i.e. for notification of requirement of night works, should this be required. 		
7.3	Construction Phase	Use of appropriate noise control measures during construction	<p>Furthermore, it is envisaged that a variety of practicable noise control measures will be employed, these may include:</p> <ul style="list-style-type: none"> • 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/m² and should have no gaps or joints in the barrier material, • As a rough guide, the length of a barrier should be 5 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; and 	Construction Phase	Ongoing monitoring required during construction

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
			<ul style="list-style-type: none"> Positioning of noisy plant as far away from sensitive receptors, as permitted by site constraints. 		
7.4	Construction Phase	Use of appropriate construction phase vibration mitigation	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 the EIS.	Construction Phase	Ongoing monitoring required during construction
7.5	Operational Phase	Use of appropriate operational phase noise mitigation measures	<p>It is not expected that noise arising from the proposed development will cause significant noise impact.</p> <p>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 mitigated by replacement of individual items of hardware.</p> <p>Aeolian noise very rarely occurs on 400 kV lines and is not expected to arise on the proposed development.</p> <p>Recommended mitigation measures for Aeolian noise include the fitting of air flow spoilers on conductors and the fitting of composite insulators.</p>	Operational Phase	Ongoing monitoring required during construction
7.6	Unknown at time of writing	To minimise noise impact to sensitive receptors	Use of temporary noise barriers around rock breaking activity if noise impact to sensitive receptors is deemed likely.	For duration of localised rock breaking	Noise monitoring of closest sensitive receptor or representative location.

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
AIR - QUALITY AND CLIMATE (CHAPTER 10 OF VOLUME 3C AND 3D)					
8.1	General Development wide – construction phase	Protection of properties from significant dust nuisance	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 the construction locations will not be subject to significant dust nuisance.	Construction Phase	Ongoing monitoring required during construction (in the context the CEMP).
LANDSCAPE CHAPTER 11 OF VOLUMES 3C AND 3D)					
9.1	Development wide – construction phase	Minimise physical landscape effects on vegetation	The key mitigation measures described in the Flora and Fauna section (section 4 of this table) will serve to minimise physical landscape effects arising from disturbance to vegetation and soils. The key mitigation measures as described in the Flora and Fauna section in relation to landscape effects are; using existing access routes and gaps in hedgerows, reinstatement of hedgerows and ground vegetation (with similar or better quality planting), protection of retained vegetation, sensitive vegetation pruning methods including pollarding of mature trees to retain hedgerow lines, monitoring of vegetation establishment over 24 months, and replanting in the event of any reinstatement failures. Hedgerows will be maintained to ensure no vegetation is tall enough to potentially interfere with the conductors.	Construction and Operational Phase	Ongoing monitoring required by a qualified Landscape Architect during construction and inspection of reinstated planting over a 24 month period
9.2	Development wide – construction	Minimise physical landscape effects on soil	The mitigation measures in section 5 – Soils, Geology and Hydrogeology will serve to minimise physical landscape effects on soil and subsequent	Construction and Operational	Ongoing monitoring

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
	phase		vegetation establishment. The key mitigation measures as described in this section in relation to landscape effects are; correct removal, storage and reinstatement of subsoil and topsoil, avoidance of soil compaction and removal and disposal of soil where not required for reinstatement.	Phase	required by a qualified Landscape Architect during construction and inspection of earthworks over a 24 month period
9.3	Blackwater Valley	To mitigate landscape character and visual impact in a valley landscape	Micro mitigation is possible through the retention or enhancement of trees and hedgerows in key locations	Construction phase	Ongoing monitoring required by a qualified Landscape Architect during construction and inspection of reinstated planting over a 24 month period
9.4	Brittas Estate	To reduce the potential impact on a historic designed landscape	The clearance of existing vegetation will be minimised in this area and in consultation with the landowner appropriate screening could be planted on either side of the entrance road and other locations within the estate to limit the views towards the proposed development.	Construction phase	Ongoing Monitoring required by a qualified Landscape Architect during construction and

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
					inspection of reinstated planting over a 24 month period.
9.5	Boyne Valley	To mitigate landscape character and visual impact in a valley landscape, on a protected viewpoint and on a view from Bective Abbey	Micro mitigation is possible through the retention or enhancement of trees and hedgerows in key locations.	Construction phase	Ongoing monitoring required by a qualified Landscape Architect during construction and inspection of reinstated planting over a 24 month period
MATERIAL ASSETS – GENERAL (CHAPTER 12 OF VOLUMES 3C AND 3D)					
10.1	Development wide - General	To minimise impacts on electricity, telecoms & gas	A pre-construction survey for utilities such as gas, electricity, telecoms etc. will be undertaken during the construction phase, including ground investigations, to confirm the conditions which have been encountered in the EIS.	Prior to construction	None
10.2	At the crossing of OHL and telecoms services is necessary	To minimise disruption to existing electricity & telecoms services during construction	Certain obstacles along a straight have to be guarded such as road / railway crossings and other transmission or distribution lines by way of temporary guard poles.	Construction phase	None

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
10.3	Development Wide General Construction Phase	To comply with Best Practice Guidelines on the <i>Preparation of Waste Management Plans for Construction & Demolition Projects</i> (2006)	Waste management will be carried out in accordance with <i>Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects</i> (2006) produced by the Department of Environment, Community and Local Government. A Construction Waste Management Plan (which will form part of the CEMP) will be implemented to minimise waste and ensure correct handling and disposal of construction waste streams. The key principles underlying the plan will be to minimise waste generation and to segregate waste at source.	Construction Phase	None
10.4	Development wide General Operational Phase	To ensure the appropriate recovery / disposal of operational waste (such as packaging etc.) arising from occasional maintenance activities	A negligible amount of light waste generated in the operational phase of the proposed development arising in maintenance and cleaning operations, replacement of 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.	Operational Phase	Monitoring required during Operational Phase (during maintenance)
10.5	Development wide General Operational Phase	To ensure safe aviation activity at Trim Airfield	Landing aircraft using Runway 28 would need to be visually aware of where the towers are located and a formal approach procedure of „ <i>visual contact of towers / cables required before starting field approach</i> “ should be introduced. The OHLs will be below the obstacle limitation surfaces for Trim Airfield, but making them more conspicuous through the fitting of marker spheres should be considered between Towers 355 and 357. The landscape consultants propose fitting 60cm diameter spheres at 30 metre intervals alternating orange and white	Operational Phase	None

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
10.6	Development wide - General Operational Phase	To ensure safe Ballooning activity in the vicinity of the proposed development	The potential presence of the proposed development will have to be considered by the balloon pilots as part of their flight planning. The power line will have to be considered by the balloon pilots for launching and landing, but as stated by the IAA balloon pilots are allowed fly over power lines.	Operational Phase	None
MATERIAL ASSETS – TRAFFIC (CHAPTER 13 OF VOLUMES 3C AND 3D)					
11.1	Development Wide General – Construction Phase	The preparation and implementation of a Construction Traffic Management Plan. The objective of this plan will be to minimise the impact caused by the construction stage of the project.	<p>It shall be a requirement of the contractor appointed to construct the project to prepare a detailed Construction Traffic Management Plan prior to the commencement of construction operations. As a minimum, the mitigation measures should include the following:</p> <ul style="list-style-type: none"> • Development of a detailed construction programme aimed at minimising peaks in traffic volumes on specific roads; • Continuous monitoring of the roads used for construction; • Identification of traffic management measures with respect to road closures; • Measures for continuous liaison with local authorities and other relevant stakeholders; • Identification of traffic management measures at site entrances; and • Measures for accommodating emergency response vehicles along the haul routes. 	<p>Prior to the commencement of the construction phase.</p> <p>Continuous updating throughout the construction stage.</p>	Monitoring of roads used during construction stage required.

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
CULTURAL HERITAGE (CHAPTER 14 OF VOLUMES 3C AND 3D)					
12.1	General Construction –	To mitigate against potential impacts during the construction phase	<p>In areas where it has been identified that 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 in the EIS:</p> <ul style="list-style-type: none"> 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. 	Prior to the construction phase and throughout construction	Ongoing assessment, testing and monitoring

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
			<ul style="list-style-type: none"> • Demarcation – where it has been identified that there is the potential that an archaeological, architectural or cultural heritage site, structure, monument or 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 site, structure or 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 construction 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 (as identified in the EIS) may be 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 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. 		
12.2	Development Wide General – Construction	To ensure the implementation of the mitigation measures during the construction phase	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 EIS for the construction phase of the proposed development. The consultancy / consultant should maintain	Construction phase	None

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
	Phase		continuing liaison with the National Monuments Service of the DAHG throughout the construction phase of the development.		
12.3	Development wide general	To comply with the Code of Practice Between the National Monuments Service of the DoEHLG (now DAHG) and ESB Networks (2009)	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.	Construction phase	None
12.4	Teltown Zone of Archaeological Amenity (ZAA)	To mitigate impact on Teltown ZAA	A regime of archaeological testing under licence to the National Monuments Service of the DAHG will be undertaken to confirm, whether in accordance with the predicted impacts set out in the EIS, there are archaeological deposits that could be impacted upon by the construction of towers and poles required for the temporary guarding structures in the ZAA. In the event that archaeological deposits are discovered then the National Monuments Service will be notified immediately and time allocated within the construction schedule to allow for excavation of any archaeological material in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.	Construction phase	None
12.5	Various Locations	To mitigate against potential impacts during the construction phase of tower locations and associated temporary access tracks.	Refer to summary of mitigation measures as listed in Chapter 14, Volumes 3C and Volume 3D .	Construction phase	Monitoring required during construction
12.6	Brittas House (RPS No. MH005-105)	To reduce the potential impact on the setting of entrance avenue to Brittas House (RPS No. MH005-105), Co Meath	The clearance of existing vegetation will be minimised in this area and in consultation with the landowner appropriate screening will be planted on either side of the lane to limit the views towards the proposed development.	Construction phase	Monitoring required during construction

Item	Location (along the proposed route)	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring to Ensure Effectiveness of Mitigation
12.7	Development wide –operational	To mitigate against potential impacts during the operational phase	Potential impacts on archaeological, architectural or cultural heritage sites, monuments, structures or features during maintenance 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.	During maintenance or upgrade works that may be required during the operational phase	Ongoing monitoring required during the operational phase (during upgrading / maintenance works).