Tyrone - Cavan Interconnector

Volume 2

Consolidated Environmental Statement

Main Text

Part funded by
EU TEN-E Initiative

Northern Ireland Electricity

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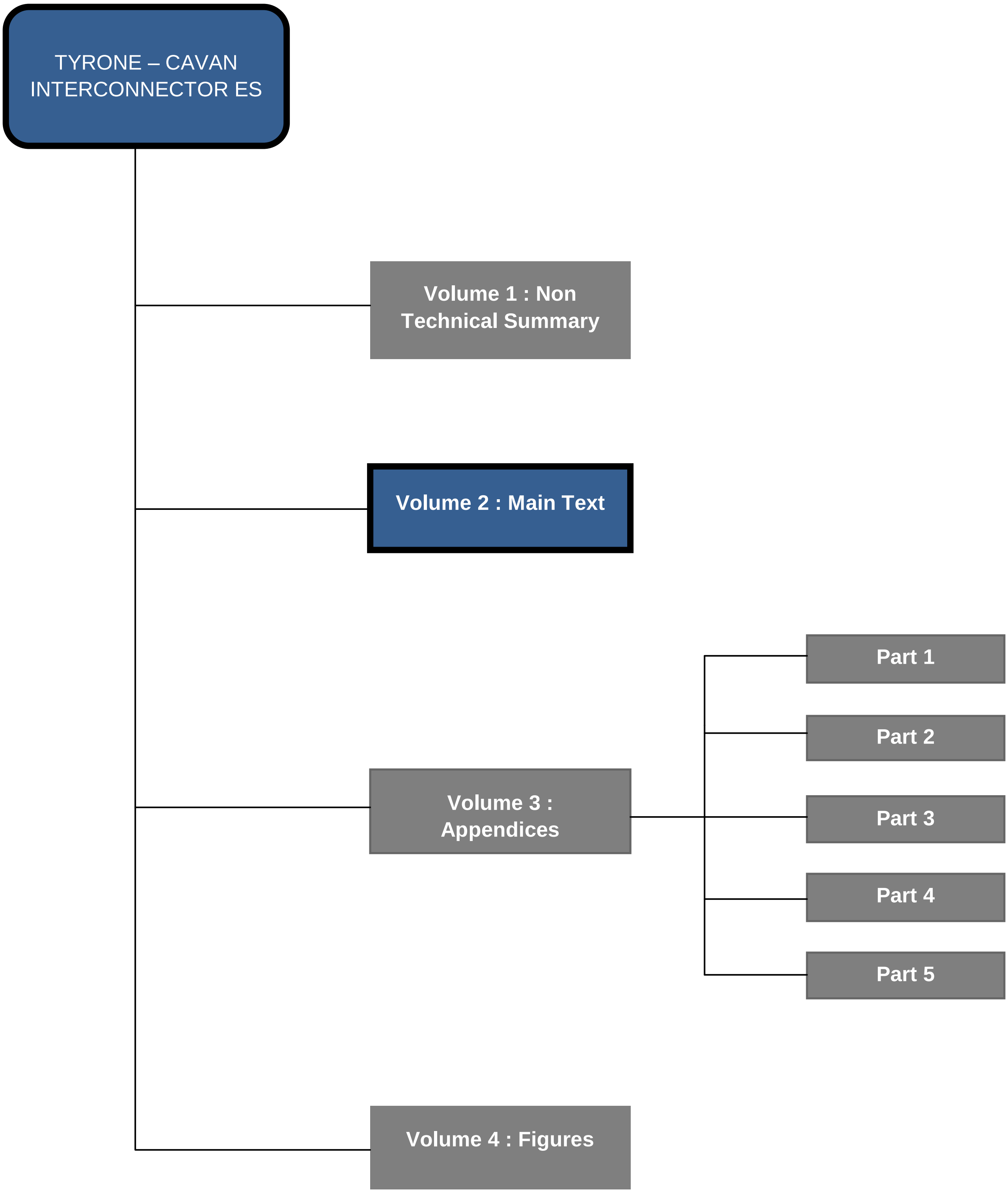
This document is Volume 2 : Main Text of the
Tyrone – Cavan Interconnector Environmental Statement (ES).
The whole ES consists of a number of documents and should be read together.



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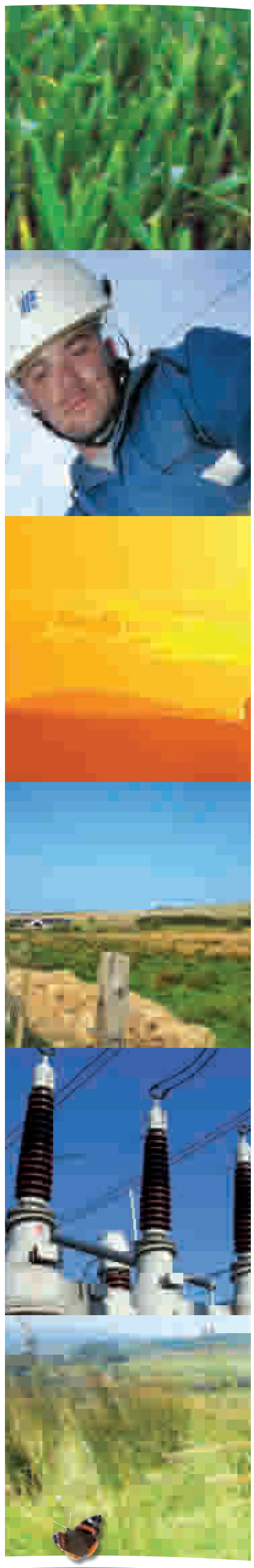

Chapter 1

Introduction

Consolidated Environmental Statement

Volume 2

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Northern Ireland Electricity

1 Introduction

1.1 Purpose and Context

1. Northern Ireland Electricity (NIE) is seeking consent from the Northern Ireland Department of the Environment (DOE) for a 400,000 volt (400kV) overhead line in Counties Tyrone and Armagh and an associated 275/400kV substation. The overhead line will run from the townland of Turleenan (near Moy), County Tyrone for a distance of approximately 34km to the Republic of Ireland border, crossing at a position between the townlands of Doohat or Crossreagh, County Armagh, and Lemgare, County Monaghan with a 200m oversail section in the Northern Ireland townland of Crossbane (see Figure 1.1). The overhead line, the substation and associated development are referred to in this Environmental Statement as “the Proposed Development.”

2. The Proposed Development forms the Northern Ireland element of the Tyrone-Cavan Interconnector (“the proposed Interconnector”), which is being jointly promoted by NIE and EirGrid[1] and which forms part of a major transmission system development to improve interconnection between the NIE transmission system in Northern Ireland and the ESB[2] transmission system in the Republic of Ireland. The proposed Interconnector extends for a distance of approximately 80 km from the proposed substation at Turleenan to a transmission system node in the vicinity of Kingscourt, County Cavan, and from that point onwards to an existing 400kV substation at Woodland, Co. Meath, such that the overall interconnection development will extend for a total distance of approximately 140km. Separate planning applications for those elements of the Interconnector within Northern Ireland and within the Republic of Ireland are being submitted, by NIE and EirGrid respectively, to the competent authorities in each jurisdiction.

3. Planning permission for the section of overhead line, proposed substation and associated works within Northern Ireland (including temporary access tracks required to facilitate construction) is being sought under the Planning (Northern Ireland) Order 1991. The Proposed Development has been formally submitted to DOE as two planning applications – the original application (O/2009/0792/F) and the associated works application (O/2013/0214/F – see Section 1.3.4).

4. In addition to planning requirements, NIE will also make a formal application to the Department of Enterprise, Trade and Investment (DETI), under the Electricity (Northern Ireland) Order 1992, for consent to construct overhead lines.

1.2 The Proposed Development

5. The Proposed Development includes:

- The construction and operation of a new 275kV / 400kV (source) substation at Turleenan townland, north-east of Moy, County Tyrone;
- The construction and operation of two 275kV terminal towers to enable connection of the Turleenan substation to NIE’s existing 275kV overhead line and the removal of one existing 275kV tower;

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[1] EirGrid is the company responsible for planning and operation of the electricity transmission system in the Republic of Ireland.

[2] The Electricity Supply Board (ESB) is the company responsible for ownership and maintenance of the transmission system in the Republic of Ireland.

- The construction and operation of a single circuit 400kV overhead transmission line supported by 102 towers for a distance of 34.1km 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 over sail a portion of land within the Northern Ireland townland of Crossbane for a short distance (0.2km as shown on Figure 1.5, contained separately in Volume 4 of the ES); 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.

6. The Proposed Development is described in detail in Chapter 5 (Proposed Development) of this ES.

1.3 Background to the Environmental Impact Assessment

1.3.1 Need for an EIA

7. It was been agreed with the DOE that an Environmental Impact Assessment (EIA) is required for the Proposed Development under Schedule 1 Category 20 of the EIA Regulations in that it involves "*Construction of overhead electrical power lines with a voltage of 220kV or more and a length of more than 15 kilometres."*

8. On 7 September 2006, the DOE provided an opinion under Regulation 6 (1) (b) of the EIA Regulations on the information to be provided in the Environmental Statement (ES). The ES has been prepared in accordance with the requirements of this opinion and upon further consultation with the DOE. It has been prepared in accordance with the applicable EIA Regulations, the European Union (EU) EIA Directive (85/337/EEC), as amended and consolidated by (2011/92/EU) and Development Advice Note 10 – Environmental Impact Assessment (DCAN 10 – DOE 2012) which provides advice on the operation of the EIA Regulations.

9. The purpose of the EIA process is to inform DOE, statutory consultees, the public and interested parties about the likely effects of the Proposed Development on the environment. A minimum four week consultation period will occur with a published notice advising as such.

1.3.2 Previously Published Documents

10. The EIA of the Proposed Development has run over a number of years and several documents have been previously published as part of this ongoing process:

- The **2009 ES** – published in December 2009 and associated with the initial planning application lodged on 15th December 2009, is the original ES for the Proposed Development;
- The **First ES Addendum** – published in January 2011, outlining additional information requested by DOE[3]; and,
- The **Second ES Addendum** – published in October 2011, providing clarifications on the Proposed Development and the results of additional environmental surveys that had been undertaken.

[3] Request for Further Environmental Information under Regulation 15 of The Planning Environmental Impact Assessment Regulations (Northern Ireland) 1999, as amended.

1.3.3 The Consolidated ES

11. In 2012, the Planning Appeals Commission requested a single overall document which combined (or consolidated) the 2009 ES and Addenda. This document has been assembled and published to satisfy that request and is referred to as the **Consolidated ES**.

12. The purpose of this Consolidated ES is to incorporate the findings of the previously published reports but also takes the opportunity to outline and assess updates to the Proposed Development. This includes updates to the proposed design, changes in legislation, results of further environmental surveys and ultimately to provide an assessment of the likely significant effects of the Proposed Development. This Consolidated ES supersedes the 2009 ES and Addenda.

1.3.4 Planning Applications

13. This Consolidated ES outlines the assessment of the Proposed Development, which has been formally submitted to DOE as two planning applications:

- **O/2009/0792/F** – the original planning application for the Proposed Development including the substation, towers, overhead line and associated development; and,
- **O/2013/0214/F** – a second application relating specifically to the works associated with the construction of the proposed overhead line and towers.

14. The EIA, as outlined in this Consolidated ES, assesses the Proposed Development as a whole, i.e. the contents of both planning applications. This Consolidated ES has formally been submitted in support of both applications.

1.3.5 Relationship with Associated Development in the Republic of Ireland

15. The Proposed Development has been developed by NIE and its consultants and has been closely coordinated with parallel activity undertaken by EirGrid and its consultants within the Republic of Ireland.

16. For the avoidance of doubt, the term 'interconnector' is used in this ES to mean a circuit linking the transmission networks of two EU Member States. The circuits described as the Northern Ireland (UK) to Republic of Ireland (Ireland) interconnectors (existing or new) are treated as simple transmission links within the Single Electricity Market in Ireland, but are still considered as interconnectors in the EU sense. In this ES the term "interconnector" is used to describe the circuits linking the Northern Ireland and the Republic of Ireland networks.

17. The Tyrone - Cavan Interconnector project forms part of a major cross-border transmission infrastructure development extending for a total distance of approximately 140km from the proposed substation at Turleenan to an existing substation at Woodland, County Meath ("the overall interconnection development"). This comprises a complete new transmission link between the existing 275kV transmission system in Northern Ireland and the existing 400kV transmission system in the Republic of Ireland. The development within the Republic of Ireland is the subject of an ongoing re-evaluation and consultation exercise being undertaken by EirGrid in the Republic of Ireland and will be progressed by way of a future planning application to the competent planning authority in that jurisdiction (see further – Chapter 19 Cumulative Impacts).

1.4 Structure and Content of Consolidated ES

18. This Consolidated ES is produced in four volumes as set out below.

Consolidated ES Volume 1

19. Volume 1 is the Non Technical Summary of this Consolidated ES.

Consolidated ES Volume 2

20. Volume 2 of the Consolidated ES comprises this document, provided in two parts. The other Chapters in this volume of this Consolidated ES are as follows:

- Chapter 2 sets out the need for the proposed Interconnector.
- Chapter 3 explains the planning and development context for the Proposed Development.
- Chapter 4 sets out the alternatives considered.
- Chapter 5 sets out the Proposed Development in detail, including construction and operational aspects.
- Chapters 6 – 18 present the environmental scoping process, consultations and the technical environmental assessments. These are as follows:
    - Chapter 6 – Scoping and Consultation;
    - Chapter 7 – Electric and Magnetic Fields;
    - Chapter 8 – Water Environment;
    - Chapter 9 – Geology, Soils and Groundwater;
    - Chapter 10 – Ecology;
    - Chapter 11 – Noise;
    - Chapter 12 – Cultural Heritage;
    - Chapter 13 – Landscape and Visual;
    - Chapter 14 – Community Amenity and Land Use;
    - Chapter 15 – Socio- Economics;
    - Chapter 16 – Telecommunications and Aviation Assets;
    - Chapter 17 – Flood Risk Assessment; and,
    - Chapter 18 – Transport.
    - Chapter 19 summarises the cumulative and interrelationship of impacts;
    - Chapter 20 summarises transboundary impacts; and,
    - Chapter 21 summarises the mitigation measures proposed and provides a conclusion.

21. A list of terms and abbreviations are provided following Chapter 21.

Consolidated ES Volume 3

22. Volume 3 contains the appendices which support the assessments contained in Volume 2.

Consolidated ES Volume 4

23. Volume 4 contains the drawings, maps, figures and photomontages relating to this Consolidated ES. It is presented separately in A3 size.

1.5 Copies and Comments

24. Requests for information on the planning process and comments on this Consolidated ES may be made to:

Planning Service Headquarters

Millennium House, 17-25 Great Victoria Street, Belfast, BT2 7BN

Tel: 028 9041 6700 Fax: 028 9041 6802

Email: planning.service.hq@doeni.gov.uk

25. The Consolidated ES is available to download at www.nie.co.uk. An electronic copy (DVD) and a hard copy of the Non-Technical Summary are also available free of charge, and may be obtained by contacting NIE at:

NIE Major Projects

120 Malone Road, Belfast, BT9 5HT

Tel: 08457 643 643

Website: www.nie.co.uk

26. A printed and bound copy of the Consolidated ES can be purchased for a fee of £80.00.

27. Should you wish to purchase a copy you can either:

(a) Write to NIE at the address above enclosing a cheque, made payable to NIE, for the appropriate amount. On receipt of this payment, the documents will be immediately dispatched, or,

(b) Purchase the document directly at the Post Office in Armagh City, County Armagh, at the address given below. Payment at the Post Office can be made by either cash or cheque.

Armagh Post Office

Armagh Shopping Centre, Thomas Street, Armagh, Co. Armagh, BT61 7AE

28. The Consolidated ES and planning applications can be viewed at the Planning Service Headquarters (address given above) or at any of the locations listed below:

Armagh City & District Council

Council Offices, The Palace Demesne, Armagh, County Armagh BT60 4EL. Tel: 028 3752 9600

Dungannon & South Tyrone Borough Council

Council Offices, Circular Rd, Dungannon, County Tyrone BT71 6DT, Tel: 028 8772 0300

Dungannon Library

Market Square, Dungannon, County Tyrone BT70 1JB. Tel: 028 8772 2952

Armagh Branch Library

Market St, Armagh, County Armagh BT61 7BU. Tel: 028 3752 4072

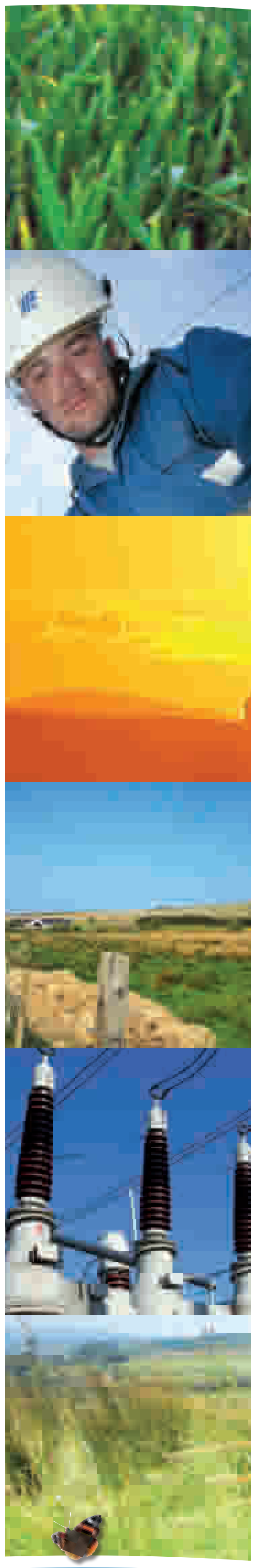
Portadown Library

Church Street, Portadown, County Armagh BT63 3LQ. Tel: 028 3833 6122

Tyrone - Cavan Interconnector

Chapter 2

Need



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2 Need

2.1 Introduction

1. This Chapter sets out the rationale behind, and the need for, the proposed Tyrone–Cavan Interconnector. The proposed Interconnector will form a second major transmission link between Northern Ireland and the Republic of Ireland.

2. The Chapter refers to relevant European, national and regional energy policies to demonstrate compatibility with those policies and the need for the proposed Interconnector at international, national and regional levels.

3. The Chapter then highlights the salient constraints inherent in the existing electricity infrastructure in Northern Ireland which require to be addressed, as well as setting out the principal benefits which will be derived from the proposed Interconnector – namely:

   - <u>Improving competition</u> – by reducing transmission system constraints (and resulting operational costs) that are currently restricting the efficient performance of the all-island Single Electricity Market (SEM);
   - <u>Supporting the development of renewable power generation</u> – by strengthening the flexible exchange of power flows over a large area of the island of Ireland. This will enable the connection and operation of larger volumes of renewable power generation (especially wind-powered generation) throughout the island and in turn help to facilitate meeting targets for renewable generation; and,
   - <u>Improving security of supply</u> – by providing dependable high capacity interconnection, geographically separate from the existing interconnector, between the transmission systems of Northern Ireland and the Republic of Ireland.

4. Finally, the chapter concludes by examining the requirements of the key relevant planning policies, PSU2 and PSU8 of the Planning Strategy for Rural Northern Ireland, and more specifically the extent to which the Proposed Development satisfies the requirements thereof. Chapter 3 (Policy) of this ES deals with policy compliance in full.

2.2 Why a Second Interconnector is Urgently Required

5. The transmission systems of Northern Ireland and Republic of Ireland were established independently. However, in 1969 they were joined together (or interconnected) by the 275kV Tandragee – Louth interconnector. After a period during which this interconnector was out of service it was restored in the mid 1990s. Two westerly 110kV lower capacity interconnectors were also established. Both systems now operate effectively as one synchronised all-island power system.

6. At present, however, in order to ensure system stability across the island of Ireland, power flows on the existing interconnector must be limited to a value well below the maximum capacity of the circuit. The main reason for this limitation is to avoid the catastrophic circumstances that might result if a single event caused failure of the interconnection circuit at a point in time when it was carrying a very high level of power flow. If this were to happen, the sudden shock to the power system might result in major disruption to the all-island power network.

7. The proposed Interconnector will form a second interconnection circuit between the two jurisdictions, and because it will provide an alternative fully independent circuit for power transfer it will enable full utilisation of the existing interconnection and will provide significantly increased power transfer capacity

able to assist delivery of the three key benefits listed above. The need for a second Interconnector has become more urgent in all three of the driving areas noted above; electricity prices are of increasing significance in the current economic circumstances, the connection and operation of wind-powered generation is being increasingly limited by transmission constraints, and the imminent closure of older power generation units in Northern Ireland will increase the requirement for enhanced access to power sources in the Republic of Ireland. Further detail is provided in Section 2.5.6 (Energy Security) of this chapter.

2.3 European Policy

2.3.1 Overview

8. The European Union (EU) has over the last number of years introduced several Directives aimed at addressing energy issues within Europe. Article 194 of the Lisbon Treaty[4] sets out Europe's overarching position on energy, and provides as follows:

> *"1. In the context of the establishment and functioning of the internal market and with regard for the need to preserve and improve the environment, Union policy on energy shall aim, in a spirit of solidarity between Member States, to:*
>
> *a) ensure the functioning of the energy market;*
>
> *b) ensure security of energy supply in the Union;*
>
> *c) promote energy efficiency and energy saving and the development of new and renewable forms of energy; and*
>
> *d) promote the interconnection of energy networks."*

9. Directive 96/92/EC imposed obligations to introduce and facilitate competition – both within and between Member States (Internal Market in Electricity).The Renewables Directive (2001/77/EC) required the active promotion and maximisation of renewable energy sources. In addition, the Emissions Trading Directive (2003/87/EC) introduced mechanisms to incentivise reductions in greenhouse gas emissions.

10. The need to promote electricity produced from renewable energy sources within the internal electricity market of the EU was referred to in September 2001 within Directive 2001/77/EC. Article 3 of this Directive required Member States to:

> *"take appropriate steps to encourage greater consumption of electricity produced from renewable energy sources in conformity with…national indicative targets…".*

11. The proposed Interconnector will facilitate the transmission of electricity produced from renewable energy sources – in particular wind power (see Section 2.5.5 (Renewable Energy) of this chapter for further details).

12. In 2003, the Single Electricity Market Directive (2003/54/EC) was introduced. Article 3, paragraph 7 obliged Member States to:

> *"…implement appropriate measures to achieve the objectives of social and economic cohesion, environmental protection, which may include energy efficiency/demand–side management measures and means to combat climate change, and security of supply. Such measures may include, in particular, the provision of adequate economic incentives,*

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[4] The Lisbon Treaty entered into force on 1st December 2009.

using, where appropriate, all existing national and Community tools, for the maintenance and construction of the necessary network infrastructure, including interconnection capacity".

13. This Directive was followed by a Communication from the European Commission to the European Parliament and the Council on Energy Infrastructure and Security of Supply on 10 December 2003. The Communication stated that: *"…without more interconnection between Member States ... better use of the existing infrastructure, the functioning of competition in the internal market will be constrained".*

14. It continued (at page 5) to state that:

"…a greater level of interconnection between Member States is instrumental to the development of a competitive internal market, which is a priority for the European Union."

15. Under the heading "Adequate Transmission Infrastructure" the Communication further noted that:

"In the context of the single market, interconnector investments are crucial to secure both the commercial capacity and the security of the network. Of particular importance are measures to reinforce transmission networks to respond to the changing pattern of flows in the network that result from the introduction of the internal market; as well as the growth in renewable energy and other distributed generation".

16. As indicated at the start of this Chapter, the benefits which the proposed Interconnector will deliver in terms of security of supply and facilitating the growth of electricity from renewable sources are central to the case that there is a need for the Proposed Development.

17. Under the heading "Reaping the full benefits of the internal market", the Communication (at page 10) noted that:

"…for electricity in particular, the lack of cross-border capacity is a particular problem for the functioning of the single market. It is therefore regrettable that the target set following the first Communication on Energy Infrastructure, that the level of interconnection should be equivalent to 10% of installed generation capacity, has not yet been met in all Member States".

18. The Communication then referred to an "unsatisfactory position" in a number of Member States before singling out eight "striking examples" of which the Republic of Ireland is one. The Communication states:

"…..there is insufficient interconnection with Northern Ireland and the wider EU market".

19. Whilst EirGrid have since constructed a 500MW East West Interconnector (EWIC) with Great Britain there is still insufficient interconnection with Northern Ireland as described earlier.

20. The benefits of interconnection in terms of the continued development of the internal electricity market within the EU were recognised by Directive 2005/89/EC concerning measures to safeguard security of electricity supply and infrastructure investment. Article 1(1) provides as follows:

"This Directive establishes measures aimed at safeguarding security of electricity supply so as to ensure the proper functioning of the internal market for electricity and to ensure:

a) an adequate level of generation capacity;

b) an adequate balance between supply and demand; and

c) an appropriate level of interconnection between Member States for the development of the internal market."

21. The role of interconnectors in increasing security of electricity supply is also referred to in the European Commission's Communication of 10 January 2007. Paragraph 3.1 notes that:

> *"A real Internal Energy Market is essential to meet all three of Europe's energy challenges:…*
>
> *…Security of supply: an effectively functioning and competitive Internal Energy Market can provide major advantages in terms of security of supply and high standards of public service. The effective separation of networks from the competitive parts of the electricity and gas business results in real incentives for companies to invest in new infrastructure, inter-connection capacity and new generation capacity, thereby avoiding black-outs and unnecessary price surges. A true single market promotes diversity."*

2.3.2 Decision 1364/2006 Laying Down Guidelines for Trans-European Energy Networks

22. In addition, a clear statement of European Union support for electricity interconnection can be seen in Decision 1364/2006/EC of the European Parliament and of the Council dated 6 September 2006 (see further below). The Decision lays down guidelines for trans-European energy networks and states at Article 3 under the heading of "Objectives":

> *"The Community shall promote the interconnection, interoperability and development of trans-European energy networks and access to such networks in accordance with Community law in force, with the aim of:*
>
> *a) encouraging the effective operation and development of the internal market in general and of the internal energy market in particular, while encouraging the rational production, transportation, distribution and use of energy resources and the development and connection of renewable energy resources, so as to reduce the cost of energy to the consumer and contribute to the diversification of energy sources;*
>
> *b) facilitating the development and reducing the isolation of the less-favoured and island regions of the Community, thereby helping to strengthen economic and social cohesion;*
>
> *c) reinforcing the security of energy supplies…; and*
>
> *d) contributing to sustainable development and protection of the environment, inter alia by involving renewable energies and reducing the environmental risks associated with the transportation and transmission of energy."*

23. The purpose of the foregoing Directives was also confirmed by the decision of the European Commission in June 2009, to establish a template for National Renewable Energy Action Plans under Directive 2009/28/EC.

24. The Directive requires Member States to adopt national renewable energy action plans setting out the Member State's target, on a national level, for the share of energy from renewable sources which will be consumed in transport, electricity, heating and cooling in 2020. The proposed Interconnector, if permitted, will contribute to the UK Renewable Energy Action Plan (see Section 2.4.3.2 of this chapter for further detail). The EU has listed the proposed Interconnector as a "priority project" (EU Decision 1364/2006/EC laying down guidelines for trans-European energy networks).

2.3.3 The 'RES Directive'

25. Directive 2009/28/EC on the promotion of the use of energy from renewable sources (commonly referred to as the 'RES Directive') states that:

> *"There is a need to support the integration of energy from renewable sources into the transmission and distribution grid and the use of energy storage systems for integrated intermittent production of energy from renewable sources.*
>
> *Interconnection among countries facilitates integration of electricity from renewable energy sources. Besides smoothing out variability, interconnection can reduce balancing costs, encourage true competition bringing about lower prices, and support the development of networks.* *Also, the sharing and optimal use of transmission capacity could help avoid excessive need for newly built capacity.*
>
> *…Member States should take appropriate measures in order to allow a higher penetration of electricity from renewable energy sources, inter alia, by taking into account the specificities of variable resources and resources which are not yet storable. To the extent required by the objectives set out in this Directive, the connection of new renewable energy installations should be allowed as soon as possible…"*[5] (emphasis added).

26. Article 3(1) of the Directive requires Member States to ensure that the share of energy from renewable sources in gross final consumption of energy in 2020 is at least its national overall target for the share of energy from renewable sources in that year.

27. There is a legally binding target to achieve 20% of energy consumption produced from renewable resources by 2020[6]. The UK as a whole is committed to a 15% target by 2020[7], while Northern Ireland is committed to reaching a target of 40% by 2020 (see further below). The mandatory national overall targets are consistent with a target of at least a 20% share of energy from renewable sources in the Community's gross final consumption of energy in 2020.

28. Article 16(1) of the Directive requires that:

> *"Member States shall take the appropriate steps to develop transmission and distribution grid infrastructure, intelligent networks, storage facilities and the electricity system, in order to allow the secure operation of the electricity system as it accommodates the further development of electricity production from renewable energy sources, including interconnection between Member States and between Member States and third countries".*

29. Article 16(2) provides as follows:

> *"Subject to requirements relating to the maintenance of the reliability and safety of the grid, based on transparent and non-discriminatory criteria defined by the competent national authorities:*
>
> *a) Member States shall ensure that transmission system operators and distribution system operators in their territory guarantee the transmission and distribution of electricity produced from renewable energy sources;*
>
> *b) Member States shall also provide for either priority access or guaranteed access to the grid-system of electricity produced from renewable energy sources;"*

---

[5] Recital 57, 59 and extracts from Recital 61 to Directive 2009/28/EC.

[6] Article 3(1) of Directive 2009/28/EC

[7] DECC (2011) UK Renewable Energy Roadmap, p9.

> *c) Member States shall ensure that when dispatching electricity generating installations, transmission system operators shall give priority to generating installations using renewable energy sources in so far as the secure operation of the national electricity system permits and based on transparent and non-discriminatory criteria…"*

30. On 13th July 2009 Directive 2009/72/EC concerning common rules for the internal market in electricity and Regulation 714/2009 on conditions for access to the network for cross-border exchanges in electricity were adopted, which support greater cross-border electricity interconnection.

2.3.4 Energy 2020 – A Strategy For Competitive, Sustainable and Secure Energy

31. On 10th November 2010 the European Commission published its communication 'Energy 2020 – A strategy for competitive, sustainable and secure energy'[8]. The Energy 2020 document states (at page 2) that:

> *"A common EU energy policy has evolved around the common objective to ensure the uninterrupted physical availability of energy products and services on the market, at a price which is affordable for all consumers (private and industrial), while contributing to the EU's wider social and climate goals. The central goals for energy policy (security of supply, competitiveness, and sustainability) are now laid down in the Lisbon Treaty. This spells out clearly what is expected from Europe in the energy area. While some progress has been made towards these goals, Europe's energy systems are adapting too slowly, while the scale of the challenges grows".*

32. The paper notes (at page 9) that:

> *"Europe's energy markets have been opened up to enable citizens to benefit from more reliable, competitive prices as well as more sustainable energy" but warns that: "This potential will not be fully realised unless robust efforts are made to create a more integrated, interconnected and competitive market…Electricity and gas markets are not yet working as a single market. The market is still largely fragmented into national markets with numerous barriers to open and fair competition".*

33. The document advises (at page 10) that:

> *"Most important, Europe is still lacking the grid infrastructure which will enable renewables to develop and compete on an equal footing with traditional sources…*
>
> *The Commission will adopt a new strategy on energy infrastructure development to encourage adequate grid investments in electricity, gas, oil and other energy sectors."*

[8] COM (2010) 639 final.

2.3.5 Priorities for 2020 and beyond – A blueprint for an integrated European energy network

34. The European Commission's 'Priorities for 2020 and beyond – A blueprint for an integrated European energy network'[9] explains that The Energy Policy for Europe establishes the Union's core energy policy objectives of competitiveness, sustainability and security of supply. At page 4, it is noted that:

> *"The internal energy market has to be completed in the coming years and by 2020 renewable sources have to contribute 20% to our final energy consumption, greenhouse gas emissions have to fall by 20% and energy efficiency gains have to deliver 20% savings in energy consumption".*

35. The paper explains that a fully interconnected European market will also improve security of supply and help stabilise consumer prices by ensuring that electricity and gas goes to where it is needed. The Commission warns that permitting and cross-border cooperation must become more efficient and transparent to increase public acceptance and speed up delivery. The report makes, *inter alia*, the following observations:

> *"Electricity grids must be upgraded and modernised to meet increasing demand…The grids must also be urgently extended and upgraded to foster market integration and maintain the existing levels of system's security, but especially to transport and balance electricity generated from renewable sources, which is expected to more than double in the period 2007 – 2020" (at page 6).*

> *"Long and uncertain permitting procedures were indicated by industry as well as TSOs and regulators, as one of the main reasons for delays in the implementation of infrastructure projects, notably in electricity. The time between the start of planning and final commissioning of a power line is frequently more than 10 years. Cross-border projects often face additional opposition, as they are frequently perceived as mere "transit lines" without local benefits. In electricity, the resulting delays are assumed to prevent about 50% of commercially viable projects from being realised by 2020. This would seriously hamper the EU's transformation into a resource efficient and low carbon economy and threaten its competitiveness" (at page 8).*

36. The paper also sets out the basic principles of a new trans-European energy infrastructure regime (see Section 2.3.8 of this chapter for further details) which involves identifying 'Projects of European Interest' within Priority corridors which would confer political priority from their respective Member States.

2.3.6 Energy Efficiency Plan 2011

37. On 8th March 2011 the European Commission published its 'Energy Efficiency Plan 2011' communication[10] which affirms energy efficiency at the heart of the EU's Europe 2020 Strategy for smart, sustainable and inclusive growth. The paper notes that energy efficiency is one of the most cost-effective ways to enhance security of energy supply, and to reduce emissions of greenhouse gases and other pollutants. As part of the plan the Commission warns that:

> *"New generation capacity and infrastructure need to be built to replace ageing equipment and meet demand".*

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[9] COM (2010) 677 final – 17th November 2010.

[10] COM (2011) 109 final.

2.3.7 Roadmap to a Competitive Low Carbon Economy

38. On the same day it published the "Energy Efficiency Plan 2011", the European Commission produced its communication: A roadmap for moving to a competitive low carbon economy in 2050[11]. The Communication presents a roadmap for possible action up to 2050 which could enable the EU to deliver greenhouse gas reductions in line with its targets.

39. The Communication notes that electricity will play a central role in the low carbon economy and comments as follows:

> *"Given that the central role of electricity in the low carbon economy requires significant use of renewables, many of which have variable output, considerable investments in networks are required to ensure continuity of supply at all times. Investment in smart grids is a key enabler for a low carbon electricity system, notably facilitating demand-side efficiency, larger shares of renewables and distributed generation and enabling electrification of transport. For grid investments, benefits do not always accrue to the grid operator, but to society at large (with co-benefits for consumers, producers, and society at large: a more reliable network, energy security and reduced emissions). In this context, future work should consider how the policy framework can foster these investments at EU, national and local level and incentivise demand-side management."*

2.3.8 Regulation on Guidelines for Trans-European Energy Infrastructure (Regulation (EU) No 347/2013)

40. In October 2011, the European Commission proposed a regulation on guidelines for trans-European energy infrastructure and repealing Decision 1364/2006/EC[12]. Regulation No. 347/2013 of the European Parliament and of the Council on guidelines for trans-European energy infrastructure was published in the Official Journal of the European Union on 25th April 2013 and will enter into force on the twentieth day following its Official Journal publication. The majority of the Regulation's provisions will apply from 1st June 2013.

41. The Regulation notes that the Commission has identified 12 strategic trans-European energy infrastructure priority corridors, the implementation of which by 2020 is essential for the achievement of the Union's energy and climate change policies. Under the Regulation, projects of common interest will be recognised in a Union List and such projects will be given priority status at a national level to ensure rapid administrative treatment. The Regulation directs that these Projects of Common Interest should be considered by competent authorities as being in the public interest. It also directs that Member States will need to establish 'one-stop shops' which will be responsible for facilitating and coordinating the permit-granting process for such projects. This would also help to meet the target of decisions on such proposals being made typically within 3 years and 6 months of the initial pre-application stage.

42. In the Regulation, North-South electricity interconnections in Western Europe ("NSI West Electricity") are one of the Priority Electricity Corridors. Ireland and the United Kingdom are identified as two of the Member States concerned. The Union List is to be adopted by 30th September 2013 by the European Commission following the Commission's review of the regional lists of projects of common interest which are to be compiled by the 12 regional groups which fall within the priority corridors. The proposed Interconnector currently sits on the latest draft of its regional list, and the expectation therefore is that it will be on the Union List.

[11] COM (2011) 112 final.

[12] COM (2011) 658 final – 2011/0300(COD).

2.3.9 Energy Roadmap 2050

43. On 15th December 2011 the European Commission published its communication on the 'Energy Roadmap 2050'[13]. In the Foreword, the European Commissioner for Energy (Günther H. Oettinger) warns that:

> *"The EU goal to cut greenhouse gas emissions by 80-95% by 2050 has serious implications for our energy system. We need to be far more energy efficient. About two thirds of our energy should come from renewable sources. Electricity production needs to be almost emission-free, despite higher demand".*

44. In particular, with regard to electricity, the roadmap notes (at page 14):

> *"With electricity trade and renewables' penetration growing under almost any scenario up to 2050, and particularly in the high renewables scenario, adequate infrastructure at distribution, interconnection and long-distance transmission becomes a matter of urgency. By 2020 interconnection capacity needs to expand at least in line with current development plans. An overall increase of interconnection capacity by 40% up to 2020 will be needed, with further integration after this point. For the successful further integration after 2020, the EU needs to fully eliminate energy islands in the EU by 2015; in addition, networks have to be expanded and come over time to synchronised links between continental Europe and the Baltic region…"*

45. In the context of engaging the public, the roadmap observes (at page 17) that:

> *"…more pylons and more transmission lines are needed. Especially for infrastructure, efficient permitting procedures are crucial since it is the precondition for changing supply systems and move towards decarbonisation in time. The current trend, in which nearly every energy technology is disputed and its use or deployment delayed, raises serious problems for investors and puts energy system changes at risk. Energy cannot be supplied without technology and infrastructure. In addition, cleaner energy has a cost."*

2.3.10 Connecting Europe – The Energy Infrastructure For Tomorrow

46. The European Commission's 'Connecting Europe – the energy infrastructure for tomorrow' paper makes it clear (at page 3):

> *"The EU's energy infrastructure is ageing and, in its current state, not suited to match future demand for energy, to ensure security of supply or to support large-scale deployment of energy from renewable sources".*

47. It is stated in particular (also at page 3):

> *"…lack of interconnections will reduce opportunities for system optimisation, increase the risk of disruption and trigger additional, much costlier back-up and balancing generation investments. Supplying energy and balancing supply and demand will become more expensive, with the corresponding effects on the competitiveness of European industries, consumers and growth".*

48. The paper provides an overview of the proposed regulation on trans-European energy infrastructure (see above) and identifies (at page 10) an *"<u>AC land link</u> between Northern and Southern Ireland"* as one of a list of 5 projects in the Northern Seas offshore grid category to be considered as a potential Project of Common Interest.

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[13] COM (2011) 885 final.

2.3.11 Renewable Energy: A Major Player in European Energy Market

49. In June 2012 the European Commission published this Communication[14]. The Communication explains how renewable energy is being integrated into the single market. Under "Transforming our infrastructure" the Communication warns (at page 8) that:

> *"The challenge of meeting future infrastructure needs will very much depend on our capacity to develop renewables, grid infrastructure and better operational solutions together in a single market."*

50. The Communication continues:

> *"The increase in distributed (renewable) generation and demand response will require further investment in distribution grids, which have been designed to transmit electricity to final consumers, but not to absorb generation from small producers…."*
>
> *"Infrastructure development is urgent and critical for the success of the single market and for the integration of renewable energy. Early adoption of the legislative proposals of the energy infrastructure package is crucial in that respect, in particular for speeding up the construction of new infrastructure with a cross-border impact. The Commission will continue to work with distribution and transmission system operators, regulators, Member States and industry to ensure the development of energy infrastructure is accelerated to complete the process of integrating Europe's networks and markets."*

2.3.12 Making The Internal Energy Market Work

51. On 15th November 2012 the European Commission published a communication on 'Making the internal energy market work'[15].The Commission notes (at page 2) that:

> *"…achieving the full integration of Europe's energy networks and systems and opening up energy markets further are essential in making the transition to a low-carbon economy and maintaining secure supplies at the lowest possible cost".*

52. The communication notes (at page 11) that*:*

> *"our energy systems are in the early phase of a major transition. Significant investments are needed to replace the EU's ageing systems, decarbonize them and make them energy-efficient and increase security of supply".*

53. With reference to the proposal for a Regulation on "Guidelines for trans-European energy infrastructure", the Commission warns (at page 16) that:

> *"The swift adoption and implementation of the Energy Infrastructure Package is crucial as acknowledged by the European Council on 9 December 2011".*

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[14] COM (2012) 271 final.

[15] COM (2012) 6634663 final.

2.3.13 State of the Single Market Integration 2013

54. On 28th November 2012 the European Commission published a report on the 'State of the Single Market Integration 2013'[16]. The report noted that the internal energy market was slowly starting to bear fruit and that wholesale electricity prices in the EU had increased less than global primary energy prices and less than inflation. However, the report noted that there is still a lack of integration in the energy market, one cause of which is the limited cross-border interconnection. The report calls for the swift adoption and implementation of the Energy Infrastructure Package and adoption of the first Union-wide list of Projects of Common Interest in energy infrastructure which are of central importance for a future secure and affordable energy supply.

55. In summary, it is clear that the encouragement through interconnection of the effective operation of the European internal market, the facilitation of development, the reinforcement of the security of energy supplies, and, contribution to sustainable development through the improved connection of renewable energy sources are enshrined within EU Directives and are at the very core of European energy policy - the proposed Interconnector is a key enabler to achieving these goals.

56. The proposed Interconnector complies fully with and advances the aforementioned EU Directives and the objectives enunciated therein. As further evidence of this, NIE (and EirGrid in the Republic of Ireland) have received part funding from the EU under the Trans-European Network (TEN-E) programme towards the costs associated with the pre-construction development and design of the proposed Interconnector.

2.3.14 European Commission Green Paper

57. On 27th March 2013, the European Commission published a Green Paper entitled: 'A 2030 framework for climate and energy policies'[17]. The paper notes that while the EU is making good progress towards meeting 2020 targets, creating the internal market for energy and meeting other objectives of energy policy, there is a need now to reflect on a new 2030 framework for climate and energy policies. It notes (at page 5) that:

> *"There are key challenges associated with large scale deployment such as the full integration of renewables into the EU's electricity system…However massive investments in transmission and distribution grids, including through cross-border infrastructure, to complete the internal energy market will also be needed to accommodate renewable energy."*

58. In the context of security of supply and affordability of energy in the internal energy market, the paper notes (at page 6):

> *"As none of the energy policy objectives can be reached without adequate grid connections, the Commission has also proposed a Regulation on Trans-European Energy Infrastructure Guidelines on which political agreement has been reached by the European Parliament and by Council. It addresses infrastructure challenges to ensure true interconnection in the internal market, integration of energy from variable renewable sources and enhanced security of supply."* See Section 2.3.8 above.

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[16] COM (2012) 752 final.

[17] COM (2013) 169 final.

2.3.15 Renewable Energy Progress Report

59. On the same day the Green Paper was published, the European Commission produced its Renewable Energy Progress Report[18]. The Report notes (at page 2) that:

> *"…an impression is gained of a generally solid initial start at EU level but with slower than expected removal of key barriers to renewable energy growth, with additional efforts by particular member states being necessary… At EU and Member States level, further efforts are needed in terms of administrative simplification and clarity of planning and permitting procedures and for infrastructure development and operation."*

60. In respect of the electricity grid, the report warns as follows:

> *"Renewable energy for generating electricity must be integrated into the market. However some of the major future renewable energy sources – mainly wind and solar power – have inherently different characteristics from conventional sources in terms of cost structure, dispatch ability and size, and cannot simply "fit" into existing market structures without any adaptation. Infrastructure investments are clearly and urgently needed and electricity grid operations also need to be updated."*

> *"The current failure to modernise the grid as the energy mix is changing is causing problems for the development of the internal market, technical problems related to loop flows, grid stability and growing power curtailment, and investment bottlenecks resulting from delayed connection of new power producers."*

> *"Together with rapid progress in implementing the Member States' Ten Year Network Development Plan and in determining and starting the Projects of Common Interest established under the regulation on guidelines for trans-European energy infrastructure, such improvements are necessary for the equal treatment of renewable energy and the proper integration of renewable energy producers into the electricity market.".*

2.4 National and Regional Policy and Development Context

2.4.1 Overview

61. The UK Government's 2007 Energy White Paper "Meeting the Energy Challenge" [19] set out four key energy policy goals:

- to put the UK on a path to cutting CO_2 emissions by 60% by about 2050, with real progress by 2020;
- to maintain the reliability of energy supplies;
- to promote competitive markets in the UK and beyond; and,
- to ensure that every home is adequately and affordably heated.

62. Specific reference was made to two key challenges in the area of security of supply:

- reducing reliance on imports of oil and gas in a world where energy demand is rising and in which energy is becoming more politicised; and,
- the need for substantial and timely investment in infrastructure, such as electricity networks.

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[18] COM (2013) 175 final.

[19] Department of Trade and Industry (DTI) (UK), 2007.

63. An absence of indigenous energy resources means that Northern Ireland is reliant on imported energy and upon interconnections with Great Britain and the Republic of Ireland. The proposed Interconnector is therefore of major importance in the context of enhanced electricity supply security for Northern Ireland.

64. In a Northern Ireland energy policy context, there has been support for greater North-South interconnection since 1999 via the Strategy 2010 Report by the Economic Development Strategy Review Steering Group and the Vision 2010 Action Plan paper. These papers contributed to the decision to develop additional interconnection.

2.4.2 Development Framework for an All-Island Energy Market

65. In 2004, the Department of Enterprise, Trade and Investment in Northern Ireland (DETI) together with the Department of Communications, Energy and Natural Resources in the Republic of Ireland (DCENR) agreed a Development Framework ("the Framework") for an All-Island Energy Market[20] in conjunction with the regulatory authorities in each jurisdiction – the Northern Ireland Authority for Utility Regulation (the Utility Regulator) and the Commission for Energy Regulation (CER) respectively.

66. The Framework represented a commitment by both governments to the furthering of regional integration between Northern Ireland and the Republic of Ireland within the wider context of an EU-wide internal market for electricity.

67. The joint Ministerial foreword to the Framework by Barry Gardiner MP and Noel Dempsey TD underscored this by stating:

> *"We, as Ministers, are charged with ensuring that our respective communities and economies have access to safe, secure and sustainable energy supplies, obtained through competitive energy markets. Both Governments agree that this challenge can be met more effectively and to our mutual benefit if we work together. This is especially appropriate when set in the context of the regional approach to development of energy markets being pursued as part of the European Union's drive to create an EU-wide Internal Market in electricity and natural gas.*
>
> *This Development Framework sets out the commitment of our Governments to meeting that challenge through the creation of an All-Island Energy Market. This involves collaboration on issues ranging from improved interconnection, competitive markets and harmonised trading arrangements, through to generation adequacy, security of supply and sustainable energy and energy efficiency measures".*

68. The Framework's work programme identified the decision on additional North-South interconnection as an infrastructure priority in the short to medium term. At page 5 of the Framework it is stated that:

> *"A key enabler for an All-Island Energy Market is the removal of existing gaps and bottlenecks in electricity or gas infrastructure that adversely affect cross-border trade. Key elements will be the construction of a second electricity interconnector and network reinforcements as recommended by the regulatory authorities and announced by the Ministers in November 2004…"*

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[20] All-Island Energy Market: A Development Framework, 2004.

69. Speaking at the launch of the Framework, Enterprise, Trade and Investment Minister, Barry Gardiner MP said:

> *"We also welcome the Regulatory Authorities' recommendation that a second electricity interconnector should be built between Northern Ireland and the Republic. They have made a sound strategic and economic case for this project. We have therefore endorsed their plans to work with the industry to identify the route, size and cost of the proposed interconnector".*

70. Both Minister Gardiner and his counterpart in the Republic of Ireland, Noel Dempsey TD, are recorded as emphasising the importance they attached to "*the early construction of the second interconnector and asked the Regulators to provide them with regular reports on progress*". (DETI press release 22nd November 2004).

71. On 30 May 2006, the Proposed Development received further Ministerial endorsement from the Enterprise Minister, Maria Eagle MP, who stated in response to an announcement by the transmission operators of plans to invest £120 million in the proposed Interconnector:

> *"This is a significant development in the excellent progress which is being made on building the all-island energy market. Additional interconnector capacity will facilitate open and transparent competition in electricity markets in Ireland and Northern Ireland. Interconnection also enables the sharing of generator operating reserve between the two systems. It results in financial savings on both sides of the border as both utilities can support each other in the event of a major fault".*

72. On 20 January 2009, DETI Minister Arlene Foster, when addressing an international climate change and energy seminar in Belgium, made further reference to the review of energy policy and stated:

> *"We must ensure that energy, the life blood of modern economies, continues to flow. I have put in place a full review of Northern Ireland's energy policy to ensure that Government is equipped to respond to a rapidly changing landscape. Northern Ireland is also working with its UK partners and regional neighbours to enhance its security of supply."*

73. The Minister also referred to the objective of realising significant increases in wind generation and the benefits of the Single Electricity Market:

> *"In order for Northern Ireland to benefit from a substantial increase in wind-powered generation, our electricity grid will need a major overhaul. This will require significant investment...Northern Ireland is testimony to how a small region of the United Kingdom can play its part in Europe. By working with our counterparts in the Republic of Ireland, we established the Single Electricity Market in record time. This is the first successful regional wholesale market of its kind within the European Union's Internal Market. We are already seeing evidence of growing competition, with nearly 40 companies seeking to participate in the new market. More are expected to enter the market in the future. This can only mean good news for customers."*

2.4.3 Sustainable Development Strategy

2.4.3.1 Overview

74. In May 2010 the Northern Ireland Executive published its Sustainable Development Strategy. One of the Priority Areas for Action is ensuring reliable, affordable and sustainable energy provision are reducing Northern Ireland's carbon footprint. The Strategy warns (at page 14) that: *"We must promote renewable energy, protecting ourselves from the volatility of international markets and the implications*

for security of supply". As such, strategic objectives include increasing the proportion of energy derived from renewable sources and increasing energy security.

2.4.3.2 UK Renewable Energy Action Plan

75. The UK's National Renewable Energy Action Plan (as required pursuant to Article 4 of the Renewable Energy Directive – see above) was published in July 2010. The plan notes (at page 4) that *"The UK needs to radically increase its use of renewable energy"*. The plan confirms that the UK's target of reaching 15% renewable energy by 2020 is feasible but notes that the Devolved Administrations have a key part to play in meeting the overall target:

> *"The UK Government is working closely with the Devolved Administrations in Wales, Scotland and Northern Ireland who have a key part to play in meeting our overall target".*

76. The plan notes (at page 87) that:

> *"Northern Ireland is the only country in the United Kingdom with land borders to another Member State. A new North-South interconnector between Northern Ireland and the Republic of Ireland is planned to be constructed and commissioned by 2013/14".*

2.4.3.3 The Strategic Energy Framework

77. In September 2010 DETI published the Strategic Energy Framework (SEF). In this document DETI Minister Arlene Foster MLA set a target of 40% consumption of electricity to be from renewable sources by 2020. In doing so, the Minister signalled that Northern Ireland is seeking to play a particularly strong role in contributing to the UK wide target. In the Foreword to the document the Minister comments that:

> *"While onshore wind currently offers the most cost-effective means of renewable electricity generation, I believe that, as with fossil fuels, a diverse mix of renewables is our overall objective as we look to the composition of Northern Ireland's energy portfolio in 2020".*

78. The document also states:

> *"…the key to growing the market is a robust and stable electricity transmission system. This is critical to a modern economy and investment in electricity grid infrastructure is increasing across the world. The second North-South electricity interconnector will be <u>crucial</u> for increasing opportunities for trading wholesale electricity within the Single Electricity Market, as well as transmission of wind generation. It is <u>very important for Northern Ireland</u> that this new infrastructure is delivered" (page 6) (emphasis added).*
>
> *"It is imperative that any policy decisions made now are assessed for their impact on energy cost" (page 7).*
>
> *"Promoting competition to reduce energy costs continues to be a major energy market policy driver" (page 9).*
>
> *"DETI is committed to the ongoing development of the Single Electricity Market and further regional market integration" (page 9).*
>
> *"Enhancing North-South interconnector capacity is part of a package of measures to improve the robustness of the transmission and distribution grid networks on an all-island basis<u>. The second North-South electricity interconnector that is currently seeking planning approval will bring greater security and resilience of electricity supply, will increase transmission capacity and encourage competitiveness in the </u>Single Electricity Market<u> for the benefit of all consumers. Importantly, it will also facilitate growth in renewable energy generation</u>. This new transmission line is only the first part of the strategic overhaul of the NI electricity grid network – a system that has been in place since its last major development in the 1960's and which needs significant new investment if it is to be fit for*

purpose to support economic growth over the coming decades. <u>This cannot be delivered without visual impact</u>" (page 21) (emphasis added).

"DETI will support construction and commissioning of the new North-South electricity interconnector …" (page 23).

79. In summary, 'Key Actions' of the SEF include:

- SEF 36 – Ensure that electricity grid development plans are future proofed to facilitate a more decarbonised energy mix beyond 2020.
- SEF 37 – Ensure co-operation between the Utility Regulator, NIE and SONI to deliver new electricity grid infrastructure.
- SEF 39 – Support construction and commissioning of the new North-South electricity interconnector by 2013-14.

80. It is clear that the 2013 -14 delivery date will now not be met and this underlines the urgent need for the Proposed Development.

81. The DETI Minister has made it clear that her department considers the proposed Interconnector a necessary project to help meet the SEF objectives. In answers to questions on 5th October 2010, the Minister responded as follows[21]:

"As highlighted in the recently published strategic energy framework, investment in and strengthening of the electricity network is <u>absolutely essential</u>. The new North/South interconnector is <u>a key element</u> of that." (emphasis added).

"As energy Minister, my duty is to ensure that the consumers have access to a reliable electricity supply and that the line will burden electricity customers in Northern Ireland only with the costs that are strictly necessary. I am sure that the whole House wants me to ensure that consumers do not receive increased bills because of unnecessary burdens….I will burden consumers here only with what is strictly necessary."

82. The DETI Minister has made other public affirmations of the need for the Proposed Development including:

"The Single Electricity Market (SEM) is an all island market and the arrangements for generators and their access to the market are harmonised. These harmonised arrangements include provision for renewables generators to have priority dispatch in accordance with Article 16(2) of the Renewable Energy Directive 2009/28/EC allowing the system operator to run them ahead of other generation so long as the system can take them".[22]

"Ongoing developments such as a second North-South interconnector and the new East-West interconnector will enhance efficient functioning of the market, along with a programme to align the market with the Great Britain market under the European target model for 2014/16. This will bring further benefits to consumers, with a long term downwards competitive pressure on wholesale prices and greater security of supply".[23]

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[21] Official Report (Hansard) Tuesday 5th October 2010, Volume 56, No. 2.

[22] In response to NI Assembly question AQW 14193/11.15 on 13th September 2012 (AIMS Portal).

[23] In response to NI Assembly question AQW 11977/11.15 on 21st May 2012 (AIMS Portal).

"Transmission capacity constraints are estimated to cost consumers in Northern Ireland and the Republic of Ireland some £18million to £25million per annum. A second interconnector will remove these costs and is expected to save Northern Ireland electricity consumers £7million per annum".[24]

"In its 2011 Report "Inquiry into Barriers to the Development of Renewable Energy Production and its Associated Contribution to the Northern Ireland Economy" the Committee for Enterprise Trade and Investment concluded that the interconnector was a vitally important element of infrastructure both from an energy and economic perspective. I agree with that finding. The extra transmission capacity of the proposed Interconnector is important for large scale development of renewable power, allowing the transmission grid and Single Electricity Market to work more efficiently. In order to meet the 2020 target it is vital that the Interconnector proceeds at the earliest opportunity".[25] *(emphasis added).*

"A new interconnector will remove transmission capacity constraints that are costing consumers in Northern Ireland and the Republic of Ireland some £18 - £25million a year. Currently, more expensive plant must be run than would otherwise be the case due to lack of capacity. To promote competition effectively it is important that suppliers can access electricity from the most efficient power plants. This will help drive down the cost of electricity for consumers and support economic growth; increase system resilience, support the growth of renewable electricity and help meet the target of 40% of electricity from renewable generation".[26]

"It is important to have our interconnector in place. As the Member probably realises, huge costs are passed on to consumers in Northern Ireland by [dint] of the fact that the interconnector is not up and running at present….All I know as energy Minister is that we need that second interconnector, and we need it very soon."[27] *(emphasis added).*

2.4.3.4 Committee for Enterprise, Trade and Investment inquiry into Barriers to the Development of Renewable Energy Production and its Associated Contribution to the Northern Ireland Economy

83. The Northern Ireland Assembly Committee for Enterprise, Trade and Investment has also made it clear that in its view, the proposed Interconnector is essential for Northern Ireland. In a Committee Report of January 2011[28], the report's Executive Summary observes (at paragraph 7) as follows:

"The Committee believes that the vision for renewable energy should extend well beyond the SEF timescale of 2020 and that Government should now be looking much further forward in order to secure our long-term energy future. Any vision for our energy future must not only ensure an integrated approach within Northern Ireland, it must also be integrated with the visions of other devolved administrations, with the Republic of Ireland and possibly even further afield. This is especially the case in relation to the Single Electricity Market (SEM) and in relation to the SEF target of 40% electricity consumed coming from renewable sources by 2020. Both are highly dependent on our ability to export and import electricity through interconnection".

[24] In response to NI Assembly question AQW 8572/11.15 on 21st February 2012 (AIMS Portal).

[25] In response to NI Assembly question AQW 8467/11.15 on 17th February 2012 (AIMS Portal).

[26] In response to NI Assembly question AQW 8355/11.15 on 16th February 2012 (AIMS Portal).

[27] In response to questions about the proposal - Official Report (Hansard) Monday 6th February 2012 Volume 72, No. 1.

[28] Report on the Committee's Inquiry into Barriers to the Development of Renewable Energy Production and its Associated Contribution to the Northern Ireland Economy – Volume 1: NIA 14/10/11R – 27th January 2011.

84. The report summarises the evidence relating to grid infrastructure (at paragraph 29) as follows:

> *"The Department considers the proposed North-South Interconnector to be <u>an essential requirement to meet its 40% target for renewable electricity as well as being important for the Single Electricity Market (SEM).</u> The Utility Regulator informed the Committee that not having the North-South Interconnector is costing the Northern Ireland economy approximately £20million per year….Evidence to the Committee has demonstrated that the North-South Interconnector is a <u>vitally important element of infrastructure both from an energy perspective and from an economic perspective. It is essential that a decision on the Interconnector is made with the utmost urgency.</u> Therefore, the Department of the Environment and the Planning Appeals Commission should prioritise the Public Inquiry process so as to ensure that high priority, key infrastructure projects such as the North-South Interconnector are dealt with as a top priority (Recommendation 19)". (emphasis added).*

85. The report notes (at paragraph 193) that DETI officials advised the Committee that:

> *"The SEM will need to be integrated with the bigger market in the British Isles over the next number of years, and the market in the British Isles will have to be better integrated with Europe. That is the way that market integration is going at European level, and if we do not have the quality of grid in place and the quality of interconnection on the island, we are going to be stuck out on the corner of Europe and very exposed".*

2.4.3.5 UK Renewable Energy Roadmap

86. In July 2011 the UK Government published its UK Renewable Energy Roadmap. The Roadmap is endorsed by the DETI Minister.

87. The Roadmap sets out the shared approach to unlocking the UK's renewable energy potential to set the UK on a path to achieve its renewable energy target over the next decade. The Roadmap sets out key actions for 8 types of renewables technology including offshore wind, marine energy, biomass electricity and biomass heat.[29]

2.4.3.6 Electricity Market Reform White Paper

88. DECC's White Paper 'Planning our electric future: a White Paper for secure, affordance and low-carbon electricity' was published alongside the Renewable Energy Roadmap. The White Paper identifies 4 main areas of challenge in the coming decades:

- Security of supply is threatened as existing plant closes;
- Electricity generation must be decarbonised;
- Demand for electricity is likely to rise; and,
- Electricity prices are expected to rise.

[29] An update to the Renewable Energy Roadmap was published 27th December 2012.

89. The White Paper confirms that the EU and the UK share common energy policy objectives:

> *"We support full integration of the UK energy market with the broader EU electricity market and consider that, in principle, the challenges the UK energy market faces are best addressed through European efforts"* (at section 9.2)[30].

2.4.3.7 Sustainable Development Implementation Plan 2011.14

90. In April 2011 the Northern Ireland Executive published its Sustainable Development Implementation Plan 2011–14. The Plan identifies objectives pursuant to the Priority Areas for Action set out in the Sustainable Development Strategy (see above). Objective 5.2 is to increase the proportion of energy derived from renewable sources. As part of the objective, the Plan states (at page 58) that:

> *"DETI will ensure that electricity grid development plans are future proofed to facilitate a more decarbonised energy mix beyond 2020."*
>
> *"DETI will ensure co-operation between the Utility Regulator, NIE and SONI to deliver new electricity grid infrastructure."*

91. Objective 5.4 of the Plan is to increase energy security. As part of that objective, the Plan states (at page 59) that:

> *"DETI will embed the single wholesale electricity market to contribute to:*
>
> *- further opening of energy markets; and*
>
> *- secure a diverse, viable and environmentally sustainable long term energy supply for NI…"*
>
> *"DETI will work with other Northern Ireland Departments, and partners in DECC and the Scottish and Irish Governments to achieve an efficient and co-ordinated regional approach to planning for electricity, gas and oil emergencies."*

92. Further, under Objective 6.3 (at page 60), the Plan states that:

> *"DETI will ensure the Single Electricity Market continues to encourage investment and is flexible enough to meet changing generation and demand patterns, with the aim of securing the lowest possible wholesale electricity price."*

2.4.3.8 Draft Onshore Renewable Electricity Action Plan 2011 – 2020

93. DETI's draft Onshore Renewable Electricity Action Plan 2011 – 2020 sets out the difficult task that Northern Ireland must grapple with to reach the ambitious targets in the SEF. It notes under 'Integration of renewables onto the grid' at section 3.2 that:

> *"The Department recognises that achievement of 40% of electricity consumption from renewable sources will require an unprecedented level of grid strengthening, particularly in the west of the province to maximise the connection of the plentiful onshore wind resource there. It is estimated that the achievement of the 40% target could involve in the region of £1billion of network expenditure spread between now and 2020…Considerable challenges in relation to securing planning permission for overhead tower lines adds a level of uncertainty to the timing of the investment and ultimately build out of this level of grid reinforcement."*

[30] In December 2011 DECC published a technical update to its Electricity Market Reform White Paper (see above).

94. The draft plan reiterates (at section 3.4) the benefits of interconnection:

> *"to improve security of supply, support the integration of renewable power generation and improve competition. Additional interconnection between the island of Ireland, the UK and France is required to meet EU Directives in relation to pan-European energy networks and has the potential to deliver significant benefits to the island of Ireland".*

> *"Both Government and regulatory policy is supportive of the proposed second North-South Tie Line[31] between NI and ROI which is critical to supporting the development of the renewable power generation, allowing the Single Electricity Market to work more efficiently by removing market constraints, as well as improving security of supply on the island of Ireland. <u>The Tie Line is essentially the first step of any grid development programme and in order to meet the 2020 target it is vital that this project proceeds at the earliest opportunity</u>". [emphasis added]*

2.4.3.9 Joint Statement by Prime Minister and Taoiseach

95. In a 2012 Joint Statement by the Prime Minister and the Taoiseach[32], the two premiers confirmed their support for UK-Ireland interconnection proposals. The statement notes that:

> *"We share common long term challenges to our prosperity, including the need for secure, competitive and sustainable sources of energy.*

> *We welcome the progress achieved on the all-Ireland Single Electricity Market and on the new East-West interconnector which is due to be commissioned later this year. Our two administrations will work to develop further interconnectivity North-South and East-West, to facilitate security of supply and enhanced competition.*

> *We recognise the significant untapped potential in renewable energy and will seek to promote mutually beneficial investment and deployment in this area. We will also seek to collaborate in the development and commercialisation of related technologies."*

2.4.3.10 Economic Strategy

96. In March 2012 the Northern Ireland Executive published its Economic Strategy: 'Priorities for sustainable growth and prosperity' document. The overarching goal of the strategy is to improve the economic competitiveness of the Northern Ireland economy. The strategy confirms (at section 5.48) that the Executive will *"encourage and develop the green economy and develop the sustainable energy sector"*.

97. The document confirms (at section 5.70) that:

> *"the creation of the Single Electricity Market (SEM), which began cross-border trading in wholesale electricity in November 2007 is already promoting greater competition, enhancing security and diversity of supply and bringing efficiencies through economies of scale".*

98. Notwithstanding this positive message, the strategy warns that challenges still remain, one of which is that Northern Ireland has low levels of electricity generated from renewable sources with gas, coal and oil accounting for 90% of power generation: *"This leaves the region vulnerable to fluctuations in both supply and pricing, and it also presents important environmental considerations"* (at section 5.74). In working to rebalance the Northern Ireland economy, the paper states that the Executive is committed to

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[31] A Tie-line is an alternative technical term for the Proposed Interconnector.

[32] Monday 12th March 2012.

delivering the objectives of the Strategic Energy Framework (see above). A 'Key Action' on delivering economic infrastructure is to:

> *"Overhaul our energy infrastructure to ensure it will be fit for purpose through to 2050. This will include long term investment in the electricity grid, exploring prospects for further development of the natural gas network, encouraging proposals aimed at increasing the security of our energy supply and underscoring our commitment to further integration of EU gas and electricity markets" (section 5.8.8).*

2.4.3.11 Programme for Government

99. The Northern Ireland Executive's Programme for Government 2011.15 ("PfG") was also published in March 2012. Priority 1 under the PfG is growing a sustainable economy and investing in the future. As part of this, one of the 82 commitments is to (at page 9) *"encourage achievement of 20% of electricity consumption from renewable sources and 4% renewable heat by 2015"*. However, the PfG recognises that all milestones / outputs are *"subject to adequate grid reinforcement being approved by NIAUR"*.

2.4.3.12 Regional Development Strategy

100. Policy RG 5 of the current Regional Development Strategy[33] is to deliver a sustainable and secure energy supply. It advises that:

> *"Northern Ireland needs a robust and sustainable energy infrastructure. This should deliver reliable and secure sources of energy to communities and businesses across the Region. New generation or distribution infrastructure must be carefully planned and assessed to avoid adverse environmental effects, particularly on or near protected sites. At the plan <u>or</u> project level, this will require a Strategic Environmental Assessment <u>or</u> Environmental Impact Assessment and potentially a Habitats Regulation Assessment to identify likely effects and appropriate mitigation. Decision makers will have to balance impacts against the benefits from a secure renewable energy stream, and the potential for cleaner air and energy for industry and transportation" (emphasis added).*

101. The strategy provides (at section 3.8) the following objectives:

> *"Increase the contribution that renewable energy can make to the overall energy mix. There will need to be a significant increase in all types of renewable electricity installations and renewable heat installations, including a wide range of renewable resources for electricity generation both onshore and offshore to meet the Region's needs.*
>
> *Strengthen the grid. With an increasing number of renewable electricity installations as well as increasing numbers of renewable heat installations we will need to strengthen the grid. It will be necessary to integrate heat and electricity infrastructure (e.g. district heating networks and new electricity grid) alongside new road infrastructure development at the planning stage. If electric transport becomes more widespread, there will need to be a reliable recharging network. It also means increasing electricity interconnection capacity to strengthen the linkages between transmission and distribution networks.*
>
> *Work with neighbours. This will ensure a secure energy supply from competitive regional electricity and gas markets in the EU's Internal Market."*

[33] The Department for Regional Development's RDS 2035 'Building a Better Future' – 15th March 2012.

102. Section 3.23 of the Strategy notes that:

> *"Fossil fuels represent over 90% of the Northern Ireland's power generation and over 70% of households still use oil for home heating. Increasing the contribution that renewable energy can make to the energy mix will reduce reliance on fossil fuels and improve security of supply".*

103. Policy RG9 of the Strategy is to 'reduce our carbon footprint and facilitate mitigation and adaption to climate change whilst improving air quality'. Mitigation includes (at section 3.26):

> *"Increase the use of renewable energies. Energy production from fossil fuels is a major source of greenhouse gas emissions and other pollutants. Northern Ireland is largely dependent on fossil fuel combustion for electricity generation. Energy efficiency along with decarbonisation of the power sector is the key to achieving emissions reduction targets. The Strategic Energy Framework for Northern Ireland 2010 sets a target of 40% of electricity consumption from renewable sources by 2020 as well as achieving 10% penetration of renewable heat. This will require increasing numbers of renewable electricity installations and the grid infrastructure to support them. These must be appropriately sited to minimise their environmental impact."*

104. Under Part 4, 'Regionally Significant Economic Infrastructure', the strategy provides as follows:

> *"4.15 Development of Northern Ireland's renewable energy sources is vital to increase its energy security, help combat climate change and achieve the renewable energy targets. The Strategic Energy Framework sets a target of 40% electricity consumption from renewable sources and a 10% renewable heat target by 2020, in line with mandatory EU renewable targets. This is likely to mean an increase in the number of wind farms both on and off shore and the need to diversify renewables to include electricity from other sources such as tidal stream and bio-energy sources. A renewable heat strategy is likely to require new renewable heat infrastructure to support it.*
>
> *4.16 <u>To facilitate the provision of additional renewable power generation, primarily from on-shore wind energy, and a need to address current areas of weakness in the grid, it will be necessary to strengthen the electricity grid in many parts of Northern Ireland.</u> <u>Grid upgrading will also be needed to ensure that proposed tidal stream and off-shore wind developments are planned for properly.</u> This will involve a significant programme of investment in grid strengthening, in the north and west, of the region.*
>
> *4.17 <u>Increased electricity interconnection capacity, allowing for the export and import of power, will help to ensure security and stability of electricity supply. It will provide increased opportunities for competitive trading in wholesale electricity, encourage new investment in generation and supply and enhance Northern Ireland's security of supply. It is also important to facilitate the growth in power generation from renewable sources, while managing the challenging network management issues that increasing amounts of renewable integration onto the grid brings</u>".* (emphasis added).

105. The strategy recognises (at 5.15) that:

> *"Certain key infrastructure, such as sea and air ports, road and rail, energy and telecommunication connectivity brings mutual benefit to all parts of the island. Co-operation at strategic planning level ensures that the greatest added value is extracted from investment in shared infrastructure". (emphasis added).*

2.4.3.13 Offshore Renewable Energy Strategic Action Plan 2012 - 2020

106. DETI's Offshore Renewable Energy Strategic Action Plan makes it clear that a combination of both offshore and onshore renewable energy will be needed to meet the target of 40% electricity consumption from renewable sources by 2020. The plan notes (at paragraph 4) that:

> *"Electricity consumption from renewable sources currently stands at an average of 12% during 2011, with some months achieving as high as 18%. DETI expects that the 2012 target for 12% of electricity consumption from renewable sources will be achieved, albeit primarily from on shore wind, which is currently the most readily available and affordable renewable energy for power generation. However it is envisaged that while on shore wind may continue to be the principal source of renewable electricity generation in Northern Ireland in the short to medium term, further work on renewable generation scenarios as part of the On Shore Renewable Electricity Action Plan (OREAP) indicate that off shore energy will be needed to achieve a 40% target by 2020."*

2.4.3.14 European Priorities for 2012-13

107. The Northern Ireland Executive set out its European Priorities for 2012-13 on 28th May 2012. The Executive notes (at page 12) that:

> *"We also have low levels of electricity generated from renewable sources, with gas, coal and oil accounting for 90% of power generation. This leaves the region vulnerable to fluctuations in supply and pricing, and it also presents important environmental considerations. We are committed to increase the amount of electricity consumption and heat from renewable sources to 40% and 10% respectively by 2020. In addition to addressing energy diversity and security of supply, higher levels of renewable energy, including bio-energy, will play a very positive role in climate change mitigation.*
>
> *Our economy faces a major energy challenge over the next decade. We need to build competitive markets, ensure security of supply, enhance sustainability and develop our energy infrastructure. Meeting carbon budgets and emission targets can create job opportunities, for instance with the growth of the renewable energy market. We need to take advantage of the opportunities which are available."*

108. Two of the Executive's 'key aims' on climate change and energy are to develop energy infrastructure to support both EU and Strategic Energy Framework objectives, and increase the amount of energy and heat obtained from alternative and renewable sources. Objective CC8 of the Executive's 'European Priorities 2012-13 Implementation Plan' (at page 13) is to *"Identify key infrastructure projects which align with EU energy policy and funding opportunities and support the delivery of the Strategic Energy Framework"*. The Interconnector is such a project.

2.4.3.15 Investment Strategy for Northern Ireland

109. The Investment Strategy for Northern Ireland[34] warns (at page 6) that:

> *"Good transport and telecoms links, reliable and affordable energy and a schools/college system producing a well educated workforce are essential 'must haves' to encourage investment and to help local businesses to grow and compete in an increasingly global marketplace".*

[34] 'Building a better future' – 8th October 2012.

110. To that end, the Investment Strategy confirms that:

> *"In energy generation, we will work with the utility companies to migrate from a reliance on imported fossil fuels to clean renewable generation in the future. If we act decisively, we can create new jobs and develop local expertise in this growing sector, building on our natural resources for wind and wave power and also on the engineering prowess of local companies and our universities and FE colleges" (at page 13).*

> *"High quality transport, communication and energy networks are the vital arteries of today's most successful economies…Investing in efficient reliable competitive and sustainable networks is critical if we are to deliver our top priority of growing a dynamic and innovative economy" (at page 18).*

> *"Security of supply, increasing use of renewable energy sources and cost of energy remain vital issues for the future. We will work with the economic regulator (NIAUR) and private sector energy players to address the challenges ahead" (at page 18).*

> *"We will support significant investment in the Electricity Grid and Interconnection to ensure that consumers benefit from the Single Electricity Market, there is improved security of supply and that wind energy as a valuable energy source is not curtailed" (at page 21).*

2.4.3.16 Sustainable Energy Action Plan 2012-2015 and beyond

111. In May 2012 DETI published its 'Sustainable Energy Action Plan 2012-2015 and beyond' ("SEAP"). SEAP reiterates the Executive's commitment to create the relevant conditions for an increase to 40% electricity consumption from renewable sources by 2020. It notes that:

> *"Additional interim targets have been included in the Programme for Government, subject to adequate grid reinforcement being approved by NIAUR: encourage industry to achieve 12% electricity consumption from renewable sources by 2013, 15% by 2014 and 20% by 2015".*

112. The plan notes that:

> *"Northern Ireland has already led the way in Europe through integration of the wholesale electricity market (Single Electricity Market) with the Republic of Ireland, and we know that we will need to integrate into the France-UK-Ireland regional market. So any vision for the future will need to encompass how we relate to other regions in terms of energy and energy infrastructure".*

113. The plan advises that in respect of infrastructure, significant electricity grid strengthening is planned throughout the UK and ROI to carry out modernisation work and manage increasingly higher levels of renewables, particularly onshore wind, and in Northern Ireland, major grid strengthening and ongoing interconnection with neighbouring networks are being planned. However, SEAP warns that:

> *"Northern Ireland faces a major energy challenge over the next decade as the integration of more renewable energy will result in significant reinforcement of the electricity transmission and distribution system to ensure it will be fit for purpose to manage a more decarbonised energy supply through to 2050 and beyond. Energy infrastructure features strongly in the new Regional Development Strategy and is seen as an integral component of wider regional economic planning and development across Northern Ireland. Increasingly, decisions about energy policy matters are being made by a range of Northern Ireland Departments and these need to be prioritised and appropriately co-ordinated".*

2.4.3.17 UK Energy Bill

114. The energy bill was introduced to Parliament on 29th November 2012. As of the time of writing, its report stage and third reading in the House of Commons are pending. The Bill's major aim is to implement electricity market reform ("EMR") and as such, further decarbonise electricity generation. The plan is to move from centralised, large fossil fuel fired power stations to a more geographically diverse generation mix encompassing more renewable sources.

2.4.3.18 Recent Northern Ireland Ministerial comments

115. The need for the project was again recently emphasised by the DETI Minister in answers to Northern Ireland Assembly questions (on 4th February 2013)[35]. Minister Foster stated that:

> *"The North/South Interconnector is a necessity. We have a single electricity market in the Republic of Ireland and Northern Ireland, and if we are to benefit from that we need good interconnection between both parts of this island….*
>
> *…Therefore, it is not just a luxury; it is an absolute necessity and it is costing consumers in Northern Ireland a large amount of money. Therefore, it is imperative that it is progressed very soon." (emphasis added)*

116. The DETI Minister has confirmed that: "Improved interconnection has a vital role to play in relation to long-term security of supply for Northern Ireland"[36].

117. Further, the Minister for the Environment (Mr. Alex Attwood MLA) has recently made the following remarks in the NI Assembly in relation to renewable energy[37]:

> *"…we are in a situation in the North in which, to borrow a phrase, we could reach a perfect storm. The Utility Regulator spoke about that at a recent conference in Belfast. There could be a perfect storm in that we might not have sufficient interconnection on the island of Ireland to keep the lights on in Northern Ireland. That is only one of the factors that could lead to a perfect storm. The issues of energy security, energy cost and, as the Member said, the cost of connection of renewables are ones on which we need to more collectively gather our thoughts." (emphasis added).*

118. And the SEM committee in its letter of 30th April 2013 to NIE accepted:

> *"the relevance of the second North South interconnector to the successful implementation of the policy objectives of competitiveness, sustainability and security of supply in both Ireland and Northern Ireland and the necessity to advance and deliver this project, and to not only deliver it but deliver it as a matter of urgency".* (emphasis added).

[35] Official Report (Hansard) Monday 4th February 2013, Volume 81, No 5.

[36] In response to Assembly Question AQW 19572/ 11.15 on 18th February 2013.

[37] Official Report (Hansard) Monday 4th March 2013, Volume 82, No. 7.

2.5 The Need for the Interconnector

2.5.1 Overview

119. The proposed Interconnector is a development of long term importance for Northern Ireland. If approved, it will deliver specific benefits in all three of the key development areas noted previously:

- Improving competition;
- Supporting the development of renewable power generation; and,
- Improving security of supply.

120. The proposed Interconnector is required to be capable of transferring up to 1,500MW of electricity in either direction between Northern Ireland and the Republic of Ireland (see below in Section 2.5.7 of this chapter for further details). It needs to be physically separate from the existing interconnector and must be capable of maintaining synchronism between the North and South parts of the all island transmission system.

121. These and other issues are addressed below under the following headings:

- Legal and regulatory context;
- Power transmission and infrastructure challenges for Northern Ireland;
- Electricity prices;
- Renewable energy;
- Energy security; and,
- Performance requirements for enhanced interconnection.

2.5.2 Legal and Regulatory Context

122. DETI is the Government department responsible for energy affairs in Northern Ireland. It also has a role in ensuring the provision of the infrastructure that is needed for Northern Ireland’s economy.

123. The Electricity (Northern Ireland) Order 1992 sets out the basic licensing regime for carrying out electricity related business activities in Northern Ireland. Article 12 of the order places a statutory duty on NIE as a licence holder to develop and maintain an efficient, co-ordinated and economical system of electricity transmission which has the long-term ability to meet reasonable demands for the transmission of electricity.

124. NIE’s licence requires it to develop a mechanism for the transmission of electricity in Northern Ireland that takes account of the benefits of efficient, co-ordinated and economical systems for the transmission of electricity on the island of Ireland as a whole. It also requires NIE to contribute to security of supply through adequate transmission capacity and system reliability, and to facilitate competition in the supply and generation of electricity.

125. The Utility Regulator is responsible to Government for regulating the ongoing operation of NIE and for protecting the long term interests of customers. The Utility Regulator is, amongst other things, specifically required to promote effective competition between persons engaged in the sale or purchase of electricity through the SEM.

126. The proposed Interconnector is consistent with the legal and regulatory obligations required of NIE by DETI and by the Utility Regulator.

127. The Governments of both Northern Ireland and the Republic of Ireland, and their respective energy regulators, have recognised and confirmed the need to develop and build a new electricity interconnector between the two jurisdictions (see Section 2.5.4.1 for further detail).

128. On the basis of this direction, the Utility Regulator directed NIE to develop and deliver, jointly with EirGrid, a new electricity interconnector that is capable of meeting the identified needs.

2.5.3 Power Transmission and Infrastructure Challenges for Northern Ireland

2.5.3.1 Technical Limitations of the Current Interconnector

129. Electricity generation and demand must always be balanced since it is not at present economically viable for electrical energy to be stored in sufficient quantities to act as an alternative to the Proposed Development. This means that an electricity transmission system must be capable of dealing with significant changes in operating conditions, whilst needing to provide a continuously stable and high quality supply of electricity throughout a wide geographic area. Transmission systems were originally designed to cater for the receipt of power from a relatively small number of large reliable sources of power generation with long term contracts and the distribution of that power to a widely dispersed population of demand. This is changing in two ways. First, due to formation of larger competitive markets and unbundling of vertically integrated utilities, transmission system capacity needs to be capable of transferring large amounts of electricity between a range of power stations and load centres to enable use of the cheapest energy sources. Secondly, more small scale generation and renewable energy-sourced generation is seeking connection to or use of transmission systems. Much of this is wind-powered generation, which has variable and intermittent output. Transmission System Operators therefore need to exchange large amounts of power to efficiently manage the variability.

130. The high voltage transmission system on the island of Ireland acts as a strategic “backbone” for the electricity system – providing a substantial, reliable and proven corridor for balancing bulk power flows and ensuring stable performance across the entire island. It operates at high voltages, to enable power to be transferred most efficiently, and is designed and constructed to provide a high standard of reliability and dependability.

131. The transmission system in Northern Ireland (Figure 4.1) operates at 275,000 volts (275kV) and 110,000 volts (110kV). The 275kV system is constructed using overhead conductors, supported by steel lattice towers, to connect the major switching and voltage reduction points (substations), which then interface to the more widespread and lower voltage, distribution system.

132. A double circuit 275kV interconnector connects the Northern Ireland transmission system to the transmission system in the Republic of Ireland[38]. This existing interconnector was built in 1969 and after a period out of outage was returned to service in the mid 1990s. This existing interconnector provides benefits to both jurisdictions in terms of security of supply and was crucial in enabling the formation of the Single Electricity Market in 2007 on the island of Ireland. Whilst the existing interconnector does provide clear benefits these cannot be maximised due to the risk that a sudden loss of the circuit would cause the electrical separation of both parts of the all island system. If the interconnector was carrying high power flows just before this event then this would cause instability in both parts of the system. This risk is managed by the Transmission System Operators by constraining the power allowed to flow on the existing interconnector. This constraint however at times leads to generators not being dispatched in the most efficient manner. It also leads to a minimum number of generation units having to be dispatched in Northern Ireland. Under the SEM rules, this means that in addition to the constraints payments made to generators who cannot make full use of the transmission system to trade their output, generators in each jurisdiction are also paid to provide extra levels of stand-by support (reserve) generation.

[38] The existing 275kV Interconnector runs between NIE’s Tandragee substation in Northern Ireland, to ESB’s Louth substation in the Republic of Ireland.

133. Significant increases in the use of wind-powered generation are planned in both Northern Ireland and the Republic of Ireland. A further shortcoming of the existing interconnector is that it will present significant limitations on the connection and operation of additional wind-powered generation as further explained below (see Section 2.5.5 of this chapter for further details).

2.5.3.2 Technical Description of the Existing NIE Transmission System

134. NIE's transmission system includes a 275kV network based on double circuit overhead lines supported on steel lattice towers some of which are designed to operate at 400kV. These 275kV overhead lines mainly form a double circuit loop from the power stations on the east coast of Northern Ireland around the perimeter of Lough Neagh. There is a spur out to Coolkeeragh Power Station in the north-west. The transmission system includes an interconnector from Tandragee to Louth in the Republic of Ireland.

135. Accompanying these 275kV circuits is an 110kV system connected to strategic transmission nodes and providing bulk electricity supplies to load centres such as towns and industrial complexes throughout Northern Ireland.

2.5.3.3 Operational Characteristics and Limitations of Existing Interconnection

136. In normal operation, the existing 275kV interconnector to the Republic of Ireland is operated together with smaller 110kV interconnectors linking the west of Northern Ireland to the Republic of Ireland. These 110kV interconnectors are useful for the power transfers needed for managing circuit outages in the specific areas they serve, but they are not capable of larger power transfers. In the event of a failure (or removal from service) of the 275kV interconnector, both the smaller circuits are automatically disconnected to protect them against overload. Therefore, the existing 275kV interconnector forms the only effective large scale interconnection between the two transmission systems.

137. The existing 275kV interconnector is a double circuit line, which means that two separate circuits are carried on a single series of towers. In theory, each circuit can be loaded to half its total capacity whilst ensuring that the overall power transfer capability is preserved in the event of a sudden and unexpected failure of the other circuit.[39] However, in the event of a double circuit failure (arising for example from lightning, a failure of the circuit protection to detect which circuit is subject to a fault, the loss of a tower carrying both circuits, or a fire at one of the termination points) the interconnection would be lost entirely. If this happened, then the combined transmission system throughout the island of Ireland would immediately become two separate transmission systems ("system separation"). Energy balance would immediately need to be achieved in each jurisdiction irrespective of what was happening in the other. If loss of the interconnector arose at a time when the power flow immediately prior to the event was substantial, then the consequences would be a significant shortfall of power in one jurisdiction and an oversupply in the other. Whilst automatic controls would attempt to address the imbalance (through immediate supply disconnections and changes in power generation levels) there would be large, damaging swings in both the voltage and frequency on both transmission systems, which would be likely to lead to widespread power black-outs together with the failure of critical equipment.

138. As a result of the possibility noted above and the severity of the consequences, each of the two transmission system operators[40] is obliged (under their respective licence obligations) to design and operate their respective transmission system to be robust against the sudden loss of interconnection. This leads each of them to ensure that they do not depend upon the existing interconnector to an extent that could require very high levels of emergency power transfer. This restriction results in generation not always being dispatched as efficiently as possible and hence higher costs which are passed on to the users.

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[39] The design approach is often referred to as the "N-1 Criterion", and is used to ensure the security of transmission systems.

[40] The Transmission System Operators (TSO'sTSOs) are SONI in Northern Ireland and EirGrid in the Republic of Ireland.

139. For this reason, whilst each of the existing 275kV interconnector circuits could in theory carry power flows up to 750MW, it is currently not possible to load the circuits to this theoretical level. At present, the maximum power total transfer capacity of the existing interconnector (incorporating an element for contingency reserve) is 450MW. This constraint leads to the inefficiencies and additional costs noted above.

140. Enhanced interconnection would reduce these constraints and would improve the overall integrity and security of the transmission system.

2.5.4 Electricity Prices

2.5.4.1 Overview

141. For Northern Ireland to remain competitive and to generate growth, it will be important for energy prices, including electricity prices, to be competitive. The primary mechanism for achieving this objective is to facilitate and encourage competition through market forces. Market liberalisation and competition are therefore important factors driving change across the electricity sector. Competition was the major driver behind the development and implementation of the SEM on the island of Ireland.

2.5.4.2 Single Electricity Market

142. In November 2007 the SEM came into effect with the trading of wholesale electricity on an all-island basis. The market structure is now well established and all electricity generated, consumed, imported or exported is being traded through the single wholesale market. The rules of the market are set out in the SEM Trading and Settlement Code[41]. This provides a mechanism for the lowest priced source of generation to be dispatched in order to meet the demand for electricity which varies throughout the day.

143. The SEM operates within the context of two separately developed transmission systems that are currently joined by a single electricity interconnector, which was built in 1969. Market reliance on a single interconnector is a significant constraint on the most efficient operation of the SEM. The constraint results from the physical limitations of the existing interconnector as described earlier in Section 2.5.3.3. As a result of this constraint, the market system can sometimes be prevented from selecting the most competitively priced source of power generation available for production at a particular point in time. This results in costs under the SEM being higher than they would be if a second interconnector were available. These additional costs are ultimately borne by electricity customers.

144. The Framework document[42], within which the energy regulators and government departments in both Northern Ireland and the Republic of Ireland initially made commitments to the development of the SEM, explicitly identified the need for improved electricity infrastructure, and specifically a second North-South interconnector, as a “key enabler” for the future effectiveness of the SEM.

145. The Utility Regulator, in his letter of support to the Planning Appeals Commission dated 6th January 2012 (see Appendix 2A), stated that it is forecast that this will reduce the electricity generation costs across the island by £18-25m per year. The letter also states that the investment is very much in the interests of Northern Ireland electricity customers. The letter further states that further delays in the approval process will result in increasing challenges to maintaining our security of supply.

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[41] (Single Electricity Market Trading and Settlement Code, April 2009).

[42] (DETI, DCMNR, NIAUR, CER, November 2004).

146. In the Utility Regulator's Energy Retail Report 2012[43] the Regulator notes that:

> *"Increasing and expanding cross-border interconnection through the building of the second North-South tie-line will help facilitate a more stable, secure and efficient all-island system. In the absence of the second tie-line consumers are facing higher costs due to a less than optimal dispatch of generators resulting in higher production costs and the requirement for a larger overall amount of installed generation capacity to meet the security of supply standards in both jurisdictions. EirGrid and SONI have estimated the benefits currently being lost by the absence of a second North-South line to be in the order of €20m per annum. Any delays to the implementation of the additional tie-line will increase security of supply risks in NI."*

147. In March 2012 Lord Whitty prepared an independent report for the Consumer Council entitled 'Energising Northern Ireland'. The report considers energy strategy from the point of view of both current and future domestic energy consumers and looks at a sustainable strategy in terms of costs but also social and environmental impacts. In the context of Infrastructure Priorities, Lord Whitty advises that:

> *"The most rational strategy in terms of economic cost-effectiveness and environmental and social return would be to prioritise:*
>
> *…Substantial modernisation of the ageing electricity network, it needs to be upgraded and adapted to renewable sources…*
>
> *Clearing the financing and planning issues to speed up the North South Interconnector and planning new interconnectors with Great Britain and ROI – with a view to moving to an eventual north-west European Supergrid…"*

148. The most recent constraints analysis carried out by EirGrid has indicated that at 2020 the cost saving to the all-island electricity market will be €20m per annum rising to €40m by the end of the next decade[44]. It is estimated that as part of the all island market the Northern Ireland customer funds approximately one quarter of this.

149. The proposed Interconnector will help to reduce constraint payments which contribute to electricity prices.

2.5.5 Renewable Energy

150. The geography and topography of Northern Ireland and the Republic of Ireland are both particularly well suited to the development of further substantial wind energy resources. The development and exploitation of these resources could bring significant benefits to both economies, whilst improving the overall diversity of supply and reducing dependence on imported energy.

151. In January 2008, DETI and DCMNR published the results of a comprehensive assessment of the ability of the projected all-island electrical transmission system to accommodate large amounts of electricity produced from renewable sources.

152. This "All-Island Grid Study"[45] indicated that up to 6,000MW of wind-powered generation, representing 42% of the all-island maximum electricity demand, might be installed across the island by 2020.

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[43] Published 1st October 2012.

[44] EirGrid. North-South 400kV Interconnection Final Re-evaluation Report April 2013.

[45] (DETI, DCEMNR, January 2008)

153. Approximately 30% of this wind-powered generation might be installed in Northern Ireland and adjacent County Donegal, in the Republic of Ireland, with the result that NIE's transmission system would need to accommodate some 2,000MW of additional wind-powered generation.

154. As of March 2013, in Northern Ireland there was 472MW of large scale wind generation connected to the network, with a further 582MW of large scale renewable generation with planning permission. In addition a 600MW offshore wind farm is planned for the east coast and two 100MW tidal installations off the County Antrim coast. Finally, based on analysis of Planning Service information on relevant planning applications within Northern Ireland there is a further approximately 540MW of onshore wind generation still seeking planning permission[46]

155. Wind-powered generation on this scale will, through the avoidance of emissions and related costs otherwise arising from the combustion of fossil fuels, as well as the growth of the industry itself, deliver a significant benefit to the Northern Ireland economy. In the letter of support, dated 6th January 2012, from Viridian Power and Energy (VP&E) a report from the European Wind Energy Association ("Wind at Work", 2009) is quoted as estimating that 0.4 ongoing direct jobs are created for every MW of installed wind capacity. VP&E estimate that there is a potential for up to 600 full time jobs by 2020 in Northern Ireland. The letter further states that in the 18 months prior to the date of the letter £150m was spent on developing wind farms in Northern Ireland, of which approximately £45m was spent directly in Northern Ireland.

156. A key constraint to the full development of wind-powered generation is the ability of the existing transmission systems to absorb and manage this form of power generation (see Section 2.5.3.1 of this chapter for further details). Whilst the potential for wind power is evident, the costs and complexities associated with expanding and modifying the transmission systems will present significant infrastructural challenges in the years ahead. The All-Island Grid Study report[47] observed that "timely development of the transmission system" is a precondition for implementation of the available potential generation from wind resources.

157. It will not be possible to deliver the full potential of wind power generation in both Northern Ireland and the Republic of Ireland without significant additional transmission system interconnection (see Section 2.5.2 of this chapter for further details). The proposed Interconnector will be a significant step towards addressing this issue by allowing power sourced from renewable generation to access demand and other interconnectors on both parts of the all island network.

2.5.6 Energy Security

2.5.6.1 Overview

158. As noted above, the UK Government Energy White Paper of 2007 incorporates specific references to two key challenges in the area of security of supply:

- reducing reliance on imports of oil and gas in a world where energy demands are rising and in which energy is becoming more politicised, and,
- the need for substantial, and timely, investment in infrastructure such as electricity systems.

159. An absence of indigenous energy resources means that Northern Ireland is almost entirely reliant on imported energy and on interconnections with Great Britain and the Republic of Ireland. The development and use of local energy resources, such as wind-powered generation, can reduce the amount of energy that is required to be imported.

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[46] As outlined on www.planningni.gov.uk.

[47] (DETI, DCEMNR, January 2008)

160. A further consideration is that Northern Ireland has a relatively small transmission system with only three major power stations. It is therefore exposed to a greater risk of loss of supply than would be the case in a large and highly interconnected system with a large number of major power stations.

161. As a result of recent legislation in Northern Ireland transposing the Industrial Emissions Directive[48], the operation of two of Northern Ireland's three power stations will be affected. The Ballylumford Phase 2 sets are due to retire by 2016 as a result of the Large Combustion Plant Directive. The Kilroot Units 1 and 2 may have to be restricted to reduced running hours[49] (see Section 2.5.6.2 for further details).

162. It is also worth considering the series of cable faults on the Moyle Interconnector and the ongoing restriction on its operating capacity. The failures highlight the vulnerability of any electricity system and the general need for improved interconnection with other power systems.

2.5.6.2 All Island Generation Capacity Statement 2013-22

163. The SONI and EirGrid All Island Generation Capacity Statement 2013-2022 explains that Northern Ireland has a Generation Security Standard of 4.9 hours Loss of Load Expectation (LOLE[50]). The document shows that whilst there is a considerable surplus of generation in the Republic of Ireland, the circumstances in Northern Ireland are very different. Currently, and in the continuing absence of the proposed Interconnector, Northern Ireland can comply with this standard, but with only a small and diminishing margin[51]. In the event of a further generation loss, a failure of the Moyle interconnector or significant additional demand, for example for the sort of large data centres being promoted by DETI, there may well be inadequate generation surplus to meet this standard (4.9 hours LOLE).

164. The statement notes (at page 10):

> *"Following the closure of plant at Ballylumford at the end of 2015 and the introduction of emissions restrictions on plant at Kilroot at the start of 2016, the Northern Ireland adequacy position is tight with surpluses reduced to modest levels of circa 200 MW. This means Northern Ireland is at risk in the event of a prolonged outage of a large generation plant or the Moyle Interconnector, even with a 200 MW reliance on Ireland being available to Northern Ireland.*
>
> *From 2021, further emissions restrictions on plant at Kilroot have a large effect on system adequacy, and push the jurisdiction into deficit. This deficit could be alleviated if the additional North-South tie line was in place…*
>
> *This highlights the importance of the additional North-South tie line project to maintain generation security standards in Northern Ireland."*

165. The analysis indicates that whilst the Republic of Ireland has a surplus of generation, existing interconnection constraints prevent Northern Ireland from benefiting from that that surplus. This underlines the need for the proposed Interconnector.

166. The risk of loss of supply is highly relevant in the context of inward investment decisions, and a secure energy environment will ensure the best possible advantage for Northern Ireland. Invest NI recently published its Digital Northern Ireland 2020 report. This discusses opportunities for inward investment in large scale data centres. The Project Kelvin, as referenced in the 2020 report, is a new communications connection that links Northern Ireland with North America and Europe. This project

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[48] The Pollution Prevention and Control (Industrial Emissions) Regulations (Northern Ireland) 2012 which came into operation on 6th January 2013.

[49] Source: All Island Generation capacity Statement 2013 — 2022.

[50] Average period of time that a customer will lose electricity supply in a given year, when the daily peak demand exceeds the available generating capacity.

[51] Source: All Island Generation capacity Statement 2013 — 2022.

makes Northern Ireland of particular interest to data centre developers. Data centres however have a high demand for energy and security of supply is vital. The proposed Interconnector is essential to ensuring that Northern Ireland can attract this type of development and their associated economic benefits in terms of job creation.

167. The proposed Interconnector is a direct response to the requirement for energy security.

2.5.7 Performance Requirements for Enhanced Interconnection

2.5.7.1 Overview

168. This section sets out the key technical requirements associated with the design of an additional high voltage transmission system interconnector between Northern Ireland and the Republic of Ireland.

2.5.7.2 Requirements for Enhanced Interconnection – Capacity and Design

169. As described in Section 2.5.5 above, the All-Island Grid Study[52] shows that NIE's transmission system might need to accommodate up to 2,000MW of wind-powered generation located in Northern Ireland and County Donegal. A consequence of sourcing energy from wind-powered generation is that the level of power generation varies with wind speeds. Over the relatively small landmass of the northern part of the island, wind speed fluctuations can cause significant variations in wind-powered generation output levels over short periods of time. These variations mean that the amount of wind-powered generation in a particular region may well need to be constrained. However, over the larger landmass of the whole island the degree of fluctuation will be less extreme. If the overall network is able to disperse power variations by means of power transfers between regions, then these short term fluctuations are likely to have less overall effect on the network, and the network can therefore accommodate more wind-powered generation.

170. As also described above, the significantly increased north – south power transfer requirements arising from the increased use of wind-powered generation cannot be transported by the existing interconnector. This means that connecting the levels of wind-powered generation anticipated by the "All-Island Grid Study" and confirmed by the quantity of renewable generation wishing to connect, would represent a significant risk to system security unless there is additional interconnection.

171. In order to provide sufficient capacity for renewable targets to be met, to achieve security of supply and to enable a competitive market, the proposed Interconnector must be capable of delivering the same maximum power transfer capacity as the existing interconnector.

172. NIE and EirGrid are proposing a rating of 1,500MW for the proposed Interconnector, matching the capacity of the existing interconnector. If a lower capacity were to be proposed, then the capacity of the proposed Interconnector would become the limiting factor for the future overall interconnection capability of the all-island transmission system. The addition of an equivalent interconnector will optimise the future capability of the transmission system in relation to power transfer capacity.

173. The proposed Interconnector also 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 the additional power flow so that there is no resulting instability in system behaviour, or loss of supply to customers.

174. In February 2006, NIE and EirGrid presented a paper entitled "Additional Interconnection between Northern Ireland and the Republic of Ireland[53] " to their respective Regulatory Authorities. This paper recommended the selection of a development option describing a 400kV interconnector with an ultimate capacity of 1,500MW. The recommendation was accepted by both Regulatory Authorities.

[52] (DETI, DCEMNR, January 2008)

[53] (NIE and ESB National Gird, February 2006)

175. Since the acceptance of this recommendation there have been a number of significant developments with relevance to transmission system planning. These include the commencement of the Single Electricity Market, the establishment of challenging Government targets for renewable power generation, and the increasing pace of wind power development across the island of Ireland. Short and medium term economic cycles are not expected to have any material impact on the long term trend toward increased power flows arising from the growth of wind-powered generation, since these trends are largely driven by Government initiatives to respond to long term climate change.

2.5.8 Requirements for Enhanced Interconnection – Performance Characteristics

176. A further consideration is to ensure that the proposed Interconnector is capable of performing properly within the context of the overall transmission system.

177. The proposed Interconnector is required to form part of a transmission system that, although formed from two separately owned transmission systems within two separate jurisdictions, are operated as a single integrated transmission system. In order to avoid constraints, the proposed Interconnector must operate in exactly the same way as any other transmission line within the transmission system as a whole.

178. This means that the proposed Interconnector, like the existing interconnector, must have the performance characteristics of a transmission line that is required to form part of a synchronised alternating current (AC) all-island transmission system (see also Chapter 4 Alternatives of this ES for further details).

2.6 Conclusions

179. The proposed Interconnector is an infrastructure development of long term importance for Northern Ireland, and will deliver specific benefits for electricity customers in all three of the following key areas:

- Improving competition;
- Supporting the development of renewable power generation; and
- Improving security of supply.

180. The proposed Interconnector complies with EU Directives that require enhanced electricity interconnection between EU member states and improved conditions for energy competition throughout Europe. The development of the Tyrone – Cavan Interconnector has been part funded by the EU Trans European Networks (TEN-E) programme, in which it has been listed as a “priority project”.

181. The proposed Interconnector is jointly supported by the Governments of both the UK and the Republic of Ireland and is fully compliant with Northern Ireland energy policy, having received specific support from the Department of Enterprise, Trade and Investment (DETI). The project is also supported by the Northern Ireland Authority for Utilities Regulation (the Utility Regulator).

182. The high voltage transmission system acts as a strategic “backbone” for the electricity system and is designed and constructed to provide a very high level of reliability and dependability. The transmission system currently incorporates an interconnector linking Tandragee in Northern Ireland to Louth in the Republic of Ireland, but the design and characteristics of this existing interconnector are insufficient to meet the challenges presented by the future requirements of the all-island electricity market and the introduction of a large amount of renewable power generation.

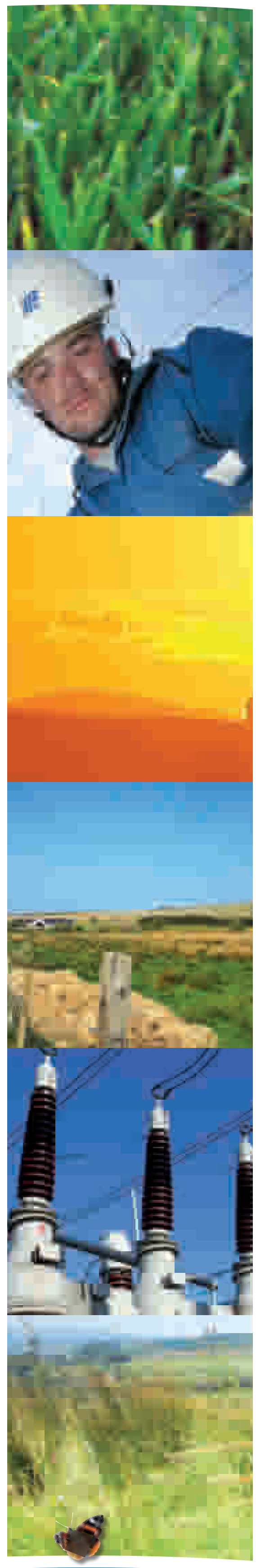
183. Additional interconnection capacity must be designed and constructed to integrate with the existing transmission system, and should be capable of providing an additional transfer capacity of 1,500MW.

184. Policies PSU 2 and PSU 8 of the Planning Strategy for Rural Northern Ireland require the applicant to demonstrate a need for the Proposed Development. This Chapter has addressed that requirement.

Tyrone - Cavan Interconnector

Chapter 3

Planning and Development Context



Consolidated Environmental Statement

Volume 2

Part funded by
EU TEN-E Initiative

Northern Ireland Electricity

3 Planning and Development Context

3.1 Planning Legislation

1. The Planning (Northern Ireland) Order 1991 (as amended) sets out the Department of the Department or DOE") functions in planning. The Department is responsible for developing, implementing and administering government planning policies and development plans in Northern Ireland. The Department for Regional Development (DRD) has functions in respect of regional planning under The Strategic Planning (Northern Ireland) Order 1999.

2. The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 1999 and the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2012 ("the EIA Regulations") set out requirements in respect of the assessment of the effects of certain public and private developments. Under Regulation 4, the Department cannot grant planning permission for EIA development unless they have first taken environmental information into consideration.

3. The Proposed Development (including the Associated Works) is EIA development under Regulation 5, Schedule 1 Category 20 development under the EIA Regulations in that it involves "*Construction of overhead electrical power lines with a voltage of 220 kV or more and a length of more than 15 kilometres*." Accordingly, this ES has been prepared having regard to Schedule 4 of the EIA Regulations and Development Control Advice Note 10 (Revised) (DCAN 10) – Environmental Impact Assessment[54] which provides advice on the operation of the EIA Regulations. This ES relates to the Proposed Development in its entirety.

4. Section 20 in DCAN 10 sets out the DoE's responsibility in terms of notifying or consulting key authorities likely to be concerned by the Proposed Development by virtue of their specific environmental responsibilities. There have been extensive consultations with both the public and statutory bodies with respect to this EIA development and details of those consulted are set out in Chapter 6 (Scoping and Consultation) and Appendix 6A.

5. This ES has been produced to conform to the EIA Regulations and DCAN 10, as well as best practice.

3.2 Planning Policy Documents Reviewed

3.2.1 Overview

6. Key relevant planning policy documents reviewed in respect of the Proposed Development are the Area Plans for Dungannon and Armagh, The Regional Development Strategy, the Planning Strategy for Rural Northern Ireland Planning Policy Statements (PPSs), Development Control Advice Notes (DCANs) and other publications listed below:

- Regional Development Strategy 2035 "Building a Better Future" (DRD, March 2012);
- Dungannon and South Tyrone Area Plan 2010 (DOE, 2005);
- Armagh Area Plan 2004 (DOE, 1995);
- Armagh Area Plan 2004 Alterations No 1 : Armagh Countryside Proposals (DOE, 2001);
- Armagh Area Plan 2018 Issues Paper (DOE, 2004);
- A Planning Strategy for Rural Northern Ireland (DOE, 1993);

[54] (DOE, 2012)

- PPS 1 - General Principles (DOE, March 1998);
- PPS 2 - Planning and Nature Conservation (DOE, June 1997);
- PPS 2 - (Draft) Revised Natural Heritage (DOE, March 2011)
- PPS 3 – Access, Movement and Parking (DOE, February 2005);
- PPS 6 - Planning, Archaeology and Built Heritage (DOE, March 1999);
- PPS 10 – Telecommunications (DOE, April 2002)
- PPS 13 – Transportation and Land Use (DRD, February 2005);
- PPS 15- Planning Policy and Flood Risk (DOE, June 2006);
- PPS 16 – (Draft) Tourism (DOE, November 2010);
- PPS 18– Renewable Energy (DOE, August 2009);
- PPS 18 Renewable Energy Best Practice Guidance (August 2009);
- Supplementary Planning Guidance Wind Energy Development in Northern Ireland's Landscaped (DOE, August 2010);
- PPS 21- Sustainable Development in the Countryside (DOE, June 2010);
- DCAN 10 – Environmental Impact Assessment (DOE, 2012);
- DCAN 15 - Vehicular Access Standards (DOE, 1999);
- Parking Standards (DOE, 2005); and,
- Power Lines: Demonstrating compliance with EMF public exposure guidelines. A Voluntary Code of Practice (Department of Energy & Climate Change, March 2012)

7. It can be noted that Draft PPS 16 and Draft PPS 2 while included for completeness carries limited and no weight. Draft PPS 16 stipulates in the preamble (page 1) that when issued in final form its policies will supersede the tourism policies of the PSRNI and PPS 21. The Draft policy was issued in November 2010 but has not yet been adopted. Draft PPS 2 stipulates in the preamble (page 1) that "*no weight will be given to draft PPS 2 in the determination of individual planning applications until such times as it is published in final form*".

3.2.2 Other Policies of Material Relevance

8. The development of the proposed Interconnector brings with it many considerations relating to competition, security of supply and the need to facilitate renewables. The policies that introduce these are set out in Chapter 2 "Need" and Chapter 4 "Alternatives". This chapter cross refers to those policies, but does not replicate them here.

9. The relevant policies and guidance in each of the relevant planning policy documents are set out below, together with an analysis of how the Proposed Development complies with these policies and guidance.

3.3 Regional Development Strategy 2035[55]

10. The case for interconnection is supported by the RDS 2035. It was published in March 2012 and is the most recent expression of Government policy in the context of the Proposed Development. It is important to set out the full extent of support the RDS gives for the Proposed Development.

11. It can also be noted that the previous RDS was not intended to provide detailed operational policy statements and that further work was needed to amend operational policies to give effect to the Strategic Guidelines. The new RDS 2035 changes this approach. It states (at paragraph 5.6):

> *"New plans and policy introduced subsequent to the publication of the RDS must fulfil the statutory requirement to take account of, or be in general conformity with, the strategy. <u>The RDS is material to the processing of planning applications and it may take precedence over existing development plans and policies particularly where the new guidance is materially different and of significance to a development proposal</u>" [emphasis added].*

12. The eight aims of the revised RDS include:

> *"strengthen links between north and south, east and west, with Europe and the rest of the world. <u>There is already collaboration on a north/south basis promoting the development of gateways and cross-border connections</u>. Opportunities exist to further develop this along with improved East/West linkages. <u>In a rapidly expanding and interdependent global marketplace opportunities exist to compete and trade with Europe</u> and the rest of the world. In order to achieve this accessibility, communications, education and employability within the population need to improve.[emphasis added]*

13. A key issue which has influenced the Spatial framework within the RDS includes the:

> *"Importance in all aspects of forward planning to address the consequences of climate change; this means an even greater focus on where people live and work and how transport and <u>energy needs are planned"</u>. [emphasis added]*

14. The RDS states:

> *"Northern Ireland needs modern and sustainable economic infrastructure. Guidance in this section is aimed at ensuring people can connect with a range of facilities and services and how they get to places of work. Businesses depend on efficient connections for goods and services <u>including the necessary infrastructure to service economic growth, such as robust electricity</u> and telecoms connections. Wealth and value-added employment created by export driven economic growth will help achieve balanced regional growth and sustainable development and enhance equality. <u>Decision makers will have to balance economic growth and the environmental impacts on air quality and energy supply for industry</u> and transportation". [emphasis added]*

15. RDS policy RG5 seeks to:

> *"deliver a sustainable and secure energy supply"*

16. and states:

> *"Northern Ireland needs a robust and sustainable energy infrastructure. This should deliver reliable and secure sources of energy to communities and businesses across the Region.*

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[55] (DRD 2012)

New generation or distribution infrastructure must be carefully planned and assessed to avoid adverse environmental effects, particularly on or near protected sites. At the plan __*or*__ *project level, this will require a Strategic Environmental Assessment or Environmental Impact Assessment and potentially a Habitats Regulation Assessment to identify likely effects and appropriate mitigation. Decision makers will have to balance impacts against the benefits from a secure renewable energy stream, and the potential for cleaner air and energy for industry and transportation" [emphasis added].*

17. It also states, (inter alia):

"Increase the contribution that renewable energy can make to the overall energy mix. There will need to be a significant increase in all types of renewable electricity installations and renewable heat installations, including a wide range of renewable resources for electricity generation both onshore and offshore to meet the Regions needs.

__*Strengthen the grid. With an increasing number of renewable electricity installations as well as increasing numbers of renewable heat installations we will need to strengthen the grid*__*. It will be necessary to integrate heat and electricity infrastructure (e.g. district heating networks and new electricity grid) alongside new road infrastructure development at the planning stage. If electric transport becomes more widespread, there will need to be a reliable recharging network.* __*It also means increasing electricity interconnection capacity to strengthen the linkages between transmission and distribution networks*__*.*

__*Work with neighbours. This will ensure a secure energy supply from competitive regional electricity and gas markets in the EU's Internal Market.*__

Develop "Smart Grid" Initiatives. This will improve the responsiveness of the electricity grid to facilitate new forms of renewable generation, to improve reliability, productivity, and energy efficiency and empower customers to make a more informed choice in relation to their energy usage". [emphasis added]

18. RDS Policy RG9 seeks to:

"Reduce our carbon footprint and facilitate mitigation and adaptation to climate change whilst improving air quality".

19. It states:

*"Climate change is increasingly seen as one of the most serious problems facing the world. Air pollution from particulate matter is currently estimated to reduce the life expectancy of every person in the UK by an average of 7-8 months. The young and infirm are often particularly affected, as well as people living in deprived areas. In addition, emissions of sulphur (SO_2), nitrogen (NO_X) and ammonia (NH_3) can be deposited on land and water causing either acidification, or nutrient enrichment (*eutrophication__*). Whilst action is required internationally, it is important that Northern Ireland plays its part by reducing air pollution and greenhouse gas emissions and preparing for the impacts of climate change*__*. These include the effects on species and habitats and on health as a result of warmer temperatures, storms, floods and coastal erosion".* It continues *"Consideration needs to be given on how to reduce energy consumption and the move to more sustainable methods of energy production. The use of fossil fuels and greenhouse gas emissions can be reduced by recycling waste and recovering energy from it" [emphasis added].*

20. In terms of facilitating "Mitigation" to reduce our carbon footprint it states the need to:

"Increase the use of renewable energies. Energy production from fossil fuels is a major source of greenhouse gas emissions and other pollutants. Northern Ireland is largely dependent on fossil fuel combustion for electricity generation. Energy efficiency along with

decarbonisation of the power sector is the key to achieving emissions reduction targets. The Strategic Energy Framework for Northern Ireland 2010 sets a target of 40% of electricity consumption from renewable sources by 2020 as well as achieving 10% penetration of renewable heat. This will require increasing numbers of renewable electricity installations and the grid infrastructure to support them. These must be appropriately sited to minimise their environmental impact" [emphasis added].

21. RDS Policy RG11 aims to conserve, protect, and where possible, enhance our built and our natural environment. This policy requires the protection, enhancement and encourages the restoration of inland water bodies. Rivers and lakes support habitats and species of national and international importance. This policy is consistent with PPS 2 and compliance with PPS 2, which the Proposed Development achieves, satisfies this policy.

22. Under Regionally Significant Infrastructure, the RDS states:

"Strategic Projects which will contribute to economic infrastructure development are considered to be those that:

- deliver strategic improvements in external and internal communications including transport and telecoms;

- contribute to the achievement of renewable energy targets;

- contribute to the achievement of waste management and climate change targets; or

- raise issues of regional or more than regional importance" [emphasis added].

23. Under strategic improvements in external and internal communications the RDS states under renewable energy:

"Para 4.15 Development of Northern Ireland's renewable energy sources is vital to increase its energy security, help combat climate change and achieve the renewable energy targets. The Strategic Energy Framework sets a target of 40% electricity consumption from renewable sources and a 10% renewable heat target by 2020, in line with mandatory EU renewable targets. This is likely to mean an increase in the number of wind farms both on and off shore and the need to diversify renewables to include electricity from other sources such as tidal stream and bio-energy sources. A renewable heat strategy is likely to require new renewable heat infrastructure to support it".

4.16 To facilitate the provision of additional renewable power generation, primarily from on-shore wind energy, and a need to address current areas of weakness in the grid, it will be necessary to strengthen the electricity grid in many parts of Northern Ireland. Grid upgrading will also be needed to ensure that proposed tidal stream and off-shore wind developments are planned for properly. This will involve a significant programme of investment in grid strengthening, in the north and west, of the region.

4.17 Increased electricity interconnection capacity, allowing for the export and import of power, will help to ensure security and stability of electricity supply. It will provide increased opportunities for competitive trading in wholesale electricity, encourage new investment in generation and supply and enhance Northern Ireland's security of supply. It is also important to facilitate the growth in power generation from renewable sources, while managing the challenging network management issues that increasing amounts of renewable integration onto the grid brings"[emphasis added].

24. Finally, in the context of "working with neighbours" it states that:

> *"5.13 The region can benefit from collaboration with its neighbours on both a North/South and East/West basis.*
>
> *North/South*
>
> *5.14 The area around the border can gain significantly from a joined-up approach to spatial planning. Cross-border co-operation and collaboration provide opportunities to boost the economic performance and competitiveness across the island.*
>
> *5.15 Certain key infrastructure, such as sea and air ports, road and rail, energy and telecommunication connectivity brings mutual benefit to all parts of the island. Co-operation at strategic planning level ensures that the greatest added value is extracted from investment in shared infrastructure".[emphasis added]*

25. While in themselves these are not operational policies, they are material to the applications now before the Department. The guidance herein does not differ materially from the current policies; however, the increased emphasis is important and of course, the RDS states that it may take precedence over pre-existing operational planning policy where there is a conflict.

3.4 A Planning Strategy for Rural Northern Ireland (PSRNI)[56]

3.4.1 Overview

26. The PSRNI sets out a series of planning policies on a topic by topic basis and identifies the factors that the DOE takes into account when considering development proposals outside urban areas. The DOE has begun progressively to replace the PSRNI with a series of Planning Policy Statements (PPSs). The PSRNI remains in force with respect to those topics not covered by PPSs and of these the main topics of relevance to the Proposed Development are:

- Public Services and Utilities;
- New Infrastructure;
- Overhead Lines;
- Tourism; and,
- Landscaping.

3.4.2 Public Services and Utilities

27. Policies PSU 2, PSU 8 and PSU 11 are key policies in the consideration of the Proposed Development. A common feature of all these policies is the requirement that new infrastructure proposals have to be assessed in terms of their environmental impact and in many cases an EIA has to be carried out involving submission of an ES.

[56] (DOE, 1993)

3.4.3 Policy PSU 2 Major Projects PSRNI, pages 101-102

28. The policy applied in PSU 2 requires that a rigorous examination of the Proposed Development's environmental impacts be conducted. The Proposed Development complies with the terms of the policy in that NIE have prepared a full Environmental Statement in line with the legislative requirements and best practice.

29. The test of the policy is whether there is an overriding national or regional reason for the development. This is clearly met by the Proposed Development as explained in Chapter 2 Need. This establishes that a further interconnector with the Republic of Ireland is a clear component of UK Government policy consistent with EU policy on development of a robust and reliable infrastructure between member states. This need, based on compliance with regional, national and EU policies, is a matter of overriding public interest to be balanced against any identified potential negative environmental impacts of the Proposed Development. In this connection, the precedent of the Moyle Electricity Interconnector between Northern Ireland and Scotland is most relevant. In its report on a Public Inquiry (Reference C3/194) the Planning Appeals Commission (PAC), based on the conclusions of the Presiding Commissioner, accepted that:

> *"on the basis of the Government's energy strategy for Northern Ireland, an overriding national and regional need has been established for this proposal. This is a very significant factor as far as the general principle of the acceptability in land use terms of interconnection with Great Britain is concerned"* (PAC Report, page 2).

30. The DOE accepted this finding of the PAC and, given the similar context in this case of current energy policy for a further interconnector with the Republic of Ireland, a demonstrable overriding European, national and regional need or reason for the Proposed Development in the public interest has been established.

31. That need identified by Government Ministers cannot be over emphasised and the use of such words as "imperative", "vital" "essential" and "crucial" all make the case for the Proposed Development to be brought forward as quickly as possible. There are overriding national and regional reasons for the proposed Interconnector.

32. Furthermore, it can be noted that PSU 2 states that *"Department will consider not only the immediate needs and benefits but the wider long term environmental effects of the proposal".* In this context, the Proposed Development will facilitate the development of renewable energy in Northern Ireland, which is a wider long term environmental benefit.

33. The policy text recognises that some proposals may be required for imperative reasons but that is not a test, and while the Interconnector can be considered to be imperative it is not a policy requirement to demonstrate this.

34. The imperative nature of the Proposed Development is confirmed most recently by the statement by DETI Minister Arlene Foster on 4th February 2013 where the Minister stated:

> *"the North South interconnector is a necessity. We have a single electricity market in the Republic of Ireland and Northern Ireland and if we are to benefit from that we need good interconnection between both parts of this island. We also need it, of course, to move ahead into the future, when we are looking at regulation right across the British Isles in Scotland, Wales and England as well as ourselves. Therefore, it is not just a luxury; it is an absolute necessity and it is costing consumers in Northern Ireland a large amount of money. Therefore it is <u>imperative</u> that it is progressed very soon". [emphasis added]*

35. The policy also requires that *"a developer will need to demonstrate …where appropriate … that a thorough exploration of alternatives has been made and that the alternatives are unsuitable."* In the energy policy context of provision of a further interconnector between Northern Ireland and the Republic of Ireland, the only relevant alternatives are alternative technological methods of interconnection or alternative locations and routes. In Chapter 4 the alternatives are thoroughly explored and the ES demonstrates that the Proposed Development has least potential environmental impact, while meeting technical requirements, compared to the alternative routes, technologies and locations.

36. The requirement for a rigorous examination of potential environmental impacts is context driven, and in the context of the Interconnector, what has been carried out in this application is sufficient to meet the policy test of PSU 2. Moreover, the balancing of the overriding public interest of the Proposed Development with negative environmental consequences is considered at Section 3.5.3 through 3.5.10 where environmental policies are assessed. The overall balance that has to be made is whether the need for this proposal outweighs the environmental impacts it has and whether there are suitable alternatives. It is considered that the need for this proposal decisively outweighs the environmental impacts it has.

3.4.4 New Infrastructure

3.4.4.1 Policy PSU 8 New Infrastructure PSRNI, pages 110-111

37. Policy PSU 8 ("*The need for new infrastructure including extensions to existing facilities will be balanced against the objective to conserve the environment and protect 'amenity'*") in common with Policy PSU 2 indicates that an ES will normally be required and highlights that *"the need for the facility will be balanced against the objective of conserving the environment and protecting amenity"*. In the context of the Proposed Development the supporting text advises that *"Developments such as … electricity generation can all be of vital importance not only to industry and commerce but to the quality of life of society as a whole"* (page 110). While the Proposed Development does not generate electricity itself, it is supported by this aspect of the policy as (by analogy) without electricity infrastructure such as the proposed Interconnector, electricity generation will not be supplied to society.

38. Again the key test on need and alternatives is that:

> *"the Department will wish to be satisfied that there is an overriding regional or local requirement for the development and that a thorough exploration of alternative sites has been carried out. Normally the Department will wish to see the development sited so as to minimise the environmental effects, for example, the alignment and landscaping of a new road should be designed to achieve the maximum possible integration into the landscape" (page 110).*

39. The important criteria to be considered are identified in the policy as comprising:

> *"need for the facility; impact on the environment - in particular the visual and ecological impacts; impact on existing communities; impact on the natural or man-made heritage; existence of alternative sites or routes; and provision to mitigate adverse effects" (page 110).*

40. Paragraphs 26-33 above are applicable to Policy PSU 8 as well as to Policy PSU2 and it is clear that the Proposed Development satisfies this policy.

3.4.5 Overhead Lines

3.4.5.1 Policy PSU 11 Overhead Cables PSRNI, pages 114-11

41. Policy PSU 11 ('The siting of electricity power lines and other overhead cables will be controlled in terms of the visual impact on the environment with particular reference being given to designated areas of landscape or townscape value') is a broadly permissive policy which acknowledges that "*One aspect of modern life is the presence of pylons and poles carrying overhead wires for … electricity supply*". Furthermore, the Proposed Development does not impact on any areas of landscape or townscape value and avoids areas such as Areas of Outstanding Natural Beauty.

42. As in Policies PSU 2 and PSU 8 this policy refers to the possible need for an ES. The potential for "wirescape" to be visually obtrusive where it appears above the skyline is noted in the policy which requires that in the siting of transmission lines consideration should be planned to:

> *"avoid areas of landscape sensitivity; avoid sites and areas of nature conservation or archaeological interest; minimise their visual intrusion; make sure that they follow the natural features of the environment; and ensure that wirescape in urban areas is kept to a minimum with preference being given to undergrounding services where appropriate" (page 114).*

43. Policy PSU 11 has no requirement that new power lines should be undergrounded - the only reference to this being "*a preference… where appropriate*" in urban areas (page 114). New overhead lines in rural areas are acceptable provided they are designed appropriately. The only preference for undergrounding is where appropriate in urban areas (Conservation Areas) and in AONBs. The relevant consideration for the Proposed Development is to "minimise" the Proposed Development's visual intrusion.

44. In choosing the overhead line route described in the Proposed Development, the criteria in the Holford Rules (see Chapter 4 Alternatives of this ES) and the "Guidelines for NIE Networks and the Environment[57]" were followed. AECOM and NIE undertook a routeing exercise that involved mapping the key constraints and selecting the optimum corridor and then refining the route within that. The exercise was undertaken by a landscape architect and environmental consultants. The landscape and visual impacts were among the key drivers for the selection of the route, in addition to a range of other aspects (i.e. engineering, economics and environmental).

45. It is significant that the Proposed Development does not pass through any landscape with a statutory or development plan designation due to its visual importance or the quality of its landscape character. The choice of route and form of towers to be employed seeks to minimise the landscape and visual impact of the proposed overhead line, with particular care having been given to the location of towers in relation to views and proximity to properties. Full analysis of the visual impact of the overhead lines is set out in Chapter 13 Landscape and Visual. It is acknowledged that by their nature overhead lines will have a landscape and visual impact. It is notable that the Department of Enterprise, Trade and Investment accept that "*the North South Interconnector cannot be delivered without visual impact*"[58]. However, the assessment states that, with the adoption of the line routeing process described in Chapter 4 Alternatives, visual and landscape impacts have been minimised. The Proposed Development meets the requirements of PSU 11 in that the overhead line route avoids designated areas of landscape importance or quality, sites of nature conservation /archaeological interest and minimises as far as reasonably practicable the degree of visual intrusion. Furthermore, the level of adverse landscape and visual impact is more than outweighed by the balancing factor of overriding and imperative reasons of public interest.

3.4.6 Tourism

3.4.6.1 Policy TOU 2 Protection of Tourist Assets PSRNI, page 85

46. Policy TOU2 of PSRNI sets out the policy for assessing the Proposed Development and protection of key environmental assets. It seeks to prevent their damage or destruction for short-term gain and exploitation. The Proposed Development does not physically impact on any tourism assets and avoids areas designated for their tourist value, and indeed for their landscape, recreational or ecological value. However, the Proposed Development will have some direct environmental impacts such as visual impacts (as discussed in Chapter 13 Landscape and Visual) and potential disruption to the road network (as discussed in Chapter 18 Transport). This is dealt with in Chapter 15 Socio Economics. The Proposed Development is consistent with TOU2 in that while it may have impacts, the overriding need for it is based on (inter alia) facilitating renewable energy. It will not damage specific tourist assets and overall will support them in the long term.

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[57] (NIE, J63413 10/98 C 10 CN9261)

[58] Strategic Energy Framework (DETI, 2010))), page 21.)

3.4.7 Landscaping

3.4.7.1 Policy DES 10 Landscaping PSRNI, pages 133-144

47. Policy DES 10 ("*A landscape scheme will normally be required for all development proposals involving new building*") recognises the importance of existing trees and planting of new trees to integrate new buildings into the landscape. A landscape scheme is required to include "*a full survey of existing landscape features such as trees, hedgerows and other vegetation, and archaeological and historic features; details of the protection proposed, throughout the construction period, for all existing features which are to be retained; appropriate provision for the planting and initial maintenance of new trees and vegetation; as well as details of all hard and soft landscaping*" (page 134)

48. A landscaping scheme for the substation site is proposed, albeit the entire proposal includes landscaping works to mitigate its environmental impact.

49. The building in policy terms in this case is the substation. The proposals for the Turleenan substation include a detailed planting scheme, in compliance with policy DES 10. This is described in Chapter 5, section 5.3.6.

50. An assessment of the degree of visual integration of the substation, including the access roadway to it, is provided in Chapter 13 Landscape and Visual.

51. The substation area will change from agricultural land to the site of an electricity substation. However, the loss of agricultural land is not considered to be significant at a local or regional level.

52. The topography is such that views into the site will be screened by the intervening hillside which makes up the western and southern slopes of the proposed site. Views may be available of the tops of buildings and tall structures within the substation site.

53. The proposed planting will include blocks of woodland and selected tree planting at the site entrance, along the approach road, and surrounding the substation that will in time effectively screen views for receptors and travellers and integrate the site into the local landscape character. This is illustrated in Viewpoints 1-5 contained in Volume 4. A range of plant sizes will be used to give a degree of maturity to the planting. Areas of open space will become meadow areas, created with grassland cut on a low maintenance regime to encourage species diversity. These proposals have been designed in response to predicted landscape and visual impacts to assist in their amelioration.

54. In regard to the towers, while landscaping is not a policy requirement, landscaping has been dealt with in Chapter 5 (Proposed Development) which advises that where vegetation is affected by the construction phase of the development it will be reinstated. The temporary working areas have been designed to avoid hedgerows and trees as far as possible. However there will be an impact with the removal of 826m of hedgerows (in the context of a 34,000m overhead line route) and treelines and 9 individual trees which will be largely reinstated post construction. At the tower bases the permanently affected area of the towers is smaller than the required construction area. Of the area affected by construction, roughly 66% can be reinstated post construction. It is possible for vegetation (including hedgerows) to grow under each of the proposed towers; however as a worst case it has been assumed that 296m of hedgerows and treelines and 3 trees will be permanently lost.

3.5 Planning Policy Statements (PPS)

3.5.1 Overview

55. PPSs set out the policies of the DOE on particular aspects of land use planning and apply to the whole of Northern Ireland. They replace many of the earlier planning policies contained within the PSRNI.

3.5.2 PPS 1 General Principles[59]

56. PPS 1 sets out the general principles the DOE will follow in exercising its development management functions. The underlying or guiding principle is set out in paragraphs 3 (page 4) and 59 (page 23). Paragraph 3 states that "*The town and country planning system exists to regulate the development of land in the public interest. The public interest requires that all development is carried out in a way that would not cause demonstrable harm to interests of acknowledged importance*." Paragraph 59 puts it as follows – "*The Department's guiding principle in determining planning applications is that development should be permitted, having regard to the development plan and all other material considerations, unless the Proposed Development will cause demonstrable harm to interests of acknowledged importance*." This guiding principle is considered below under section 3.8, Conclusions.

3.5.3 PPS 2 Planning and Nature Conservation[60] and Draft PPS 2 Natural Heritage (Revised) (and Supplementary Guidance to Draft PPS 2)[61]

57. PPS 2 contains various policies relating to designated Sites of International Nature Conservation Importance, Sites of National Nature Conservation Importance, Sites of Local Nature Conservation Importance and Sites of Local Nature Conservation Importance Identified in Development Plans (paragraphs 39-60, pages 12-18). Policy on protecting and conserving peatlands is also covered (paragraphs 68-70, page 21). As the Proposed Development affects no such designated sites or peatlands, these policies do not apply. Moreover a Test of Likely Significance/Habitats Directive Assessment screening report is at Appendix 10H which assess the potential impacts to SACs, SPAs and Ramsar sites within 30km of the Proposed Development The conclusion of that report is that there are no likely significant effects on those sites, and hence no need for Stage 2 Appropriate Assessment.

58. PPS 2 also sets out policy on Development Affecting Other Sites of Local Nature Conservation Importance (paragraphs 61-63, page 19), Trees and Woodlands (paragraphs 64-67, (pages 20) and Protection of Species (paragraph 68, page 21).

59. The Proposed Development does not threaten any Other Sites of Local Nature Conservation Importance (paragraphs 61-63) in that no protected species of flora or fauna of significance has been identified along the proposed route of the overhead lines or within the site of the proposed substation which would be unacceptably affected by the Proposed Development. Accordingly, following the "*the wise management of the total land resource*" approach of paragraph 61 of PPS 2 as demonstrated by the assessment in Chapter 10 Ecology, care has been taken to provide appropriate mitigation in compliance with the statement in paragraph 63 of the PPS that "*Wildlife habitats and physical features can sometimes be protected by the careful siting and treatment of developments. In some cases, conditions will be attached to planning permissions to minimise or compensate for the impact on wildlife or physical features. Informatives may also be attached informing the developer of his obligations under the Wildlife Order*." This ES proposes mitigation measures including, for example, installation of deflectors on the overhead line where it poses the greatest risk to flying whooper swans (Chapter 10 Ecology.)

60. The Proposed Development does not have an impact on any trees protected by a Tree Preservation Order or any designated woodland area. In accordance with policy on Trees and Woodlands close consideration has been "*given to the potential impact of Proposed Development upon trees*" (paragraph 65, page 20). Some individual trees will have to be removed to facilitate location of the substation and proposed towers; however, consistent with the advice in paragraph 65 that "*Landowners and developers will be encouraged to retain existing trees, where practicable, and to plant additional trees. Wherever possible, existing trees, woodlands and important hedgerows will be protected by the*

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[59] (DOE, 1998)

[60] (DOE, 1997)

[61] (DOE, 2011)

imposition of conditions on the grant of planning permission. Opportunities will also be taken to secure new tree planting in development schemes. Where development involves the loss of trees, permission will normally be conditional on a replanting scheme with trees of appropriate numbers, species and size," where possible trees have been avoided and a landscaping plan is proposed for Turleenan substation that includes the provision of native tree planting. Full assessment of the impact on nature conservation interests, including mitigation measures, is set out in Chapter 10 Ecology and Chapter 13 Landscape and Visual; in summary the Proposed Development does not conflict with the approach, policy and guidance laid out in PPS 2.

61. In respect of Draft PPS 2 and the accompanying Supplementary Guidance, this states, *"No weight will be given to draft PPS2 in the determination of individual planning applications until such times as it is published in final form. However, all statutory requirements for designated nature conservation sites and protected species must be met"*. As evidenced in Chapter 10 Ecology the statutory requirements for designated nature conservation sites and protected species have been met.

3.5.4 PPS 3 Access, Movement and Parking and PPS 13 Transportation and Land Use[62]

62. As the Proposed Development will only generate relatively low levels of construction traffic and on-going maintenance traffic at points along the length of the route corridor, it does not raise any issues under PPS 13, albeit Chapter 18 (Transport) has had regard to it in assessing the Proposed Development.

63. The key objective of PPS 3 relevant to the Proposed Development is to "*promote road safety, in particular, for pedestrians, cyclists and other vulnerable road users*" (paragraph 3.1, page 10). It sets out policy on Access to Public Roads (Policy AMP 2, pages 20-24), Access to Protected Routes (Policy AMP 3, pages 25-27) and Car Parking and Service Arrangements (Policy AMP 7, pages 31-32). Detailed advice on access standards and car parking standards are set out respectively in the documents DCAN 15 Vehicular Access Standards and Parking Standards.

64. Policy AMP 3 does not apply to the Proposed Development as there are no proposed accesses on to a protected route. Access to the proposed Turleenan substation site is onto the B106 road between Moy and Tamnamore and the location of the access and design standards meet the requirements of Policy AMP 2 and DCAN 15 and "*will not prejudice road safety or significantly inconvenience the flow of traffic*" (Policy AMP 2, page 20). NIE has assessed all accesses for construction purposes. Details of these are set out in Chapter 18. During construction existing accesses will be used as much as possible.

65. It is proposed that the contractor will use temporary traffic measures to minimise disruption to the road network and environmental impact as the preferred access option. If it is determined by the Department that temporary traffic measures are not to be used, existing accesses could be temporarily enlarged to accommodate the larger types of construction vehicles. The area required for temporarily enlarging the existing accesses has been identified and included within the planning application boundary. Whilst it is not the preferred option the selection and design of all accesses has been based on the need to comply with PPS 3 Policy AMP 2 and DCAN 15. Car parking and service arrangements related to the proposed substation comply with Policy AMP 7 and the associated Parking Standards. Full details of access compliance are contained in Chapter 5 (Proposed Development) and Chapter 18 (Transport) of this ES. The Proposed Development fully accords with all relevant policy on access, movement and parking.

66. In addition the Proposed Development raises the issue of competing policies in that there is a need (set out in PPS 21 Aims and Objectives) "*to protect the countryside from unnecessary development"* and *"to conserve the landscape and natural resources of the rural area and to protect it from excessive, inappropriate or obtrusive development*" and the requirement to comply with PPS 3 policy AMP 2 and

[62] (DOE, DRD, 2005)

DCAN 15 Access Standards. The PAC's approach in these circumstances where policies pull in different directions can be noted in appeal 1998/A025 where in an appeal for apartment development in an Area of Townscape Character (Knockdene), the Commission judged that greater weight should be accorded to environmental considerations than to road safety and traffic considerations and that a proposed traffic solution would facilitate retention of existing boundary and internal hedges; widening of existing entrances should be minimal; and the layout of car parking areas should take account of environmental characteristics of the area. The Commission endorsed the approach by Roads Service which withdrew the need for a footpath in order to take proper account of the necessity to protect the area's environmental characteristics. The Commission advised that existing vegetation within the site should be retained and the landscape plan should indicate strengthening particularly along the boundaries. The PAC's approach has similarities with the approach being adopted in this application where the traffic measures are the preferred option in order to maintain the environment.

3.5.5 PPS 6 Planning, Archaeology and the Built Heritage[63]

67. PPS 6 provides the policy context for assessing proposals which affect the archaeological or built environment and seeks to achieve sustainable development and environmental stewardship of the region's archaeological and built heritage by cherishing and protecting monuments, buildings and other heritage resources. The relevant policies are Policy BH 1 The Preservation of Archaeological Remains of Regional Importance and their Settings (pages14-15), Policy BH 2 The Protection of Archaeological Remains of Local Importance and their Settings (pages 15), Policy BH 3 Archaeological Assessment and Evaluation (pages 16), Policy BH 4 Archaeological Mitigation (page 17-18) and Policy BH11 Development affecting the Setting of a Listed Building (pages 29-30). Chapter 12 Cultural Heritage assesses fully the impact of the Proposed Development on archaeological remains and the built environment and only critical elements are referred to below in analysing how the Proposed Development relates to PPS 6 policies.

68. Policy BH 1 states that *"The Department will operate a presumption in favour of the physical preservation in situ of archaeological remains of regional importance and their settings. These comprise monuments in State Care, scheduled monuments and other important sites and monuments which would merit scheduling. Development which would adversely affect such sites of regional importance or the integrity of their settings will not be permitted unless there are exceptional circumstances"* (page 14). Paragraph 3.5 indicates that *"exceptions to this policy are likely only to apply to proposals of overriding importance in the Northern Ireland context"* (page 14). The Proposed Development has adverse impacts on a number of scheduled monuments, some of these impacts are moderate adverse impacts. The overhead line also lies some 2.5 kilometres from Navan Fort and the impact on its setting is assessed in Chapter 12 Cultural Heritage as neutral. This is illustrated in Viewpoint 19. In the balancing exercise, the overriding need for the Proposed Development outweighs the moderate adverse impacts of the Proposed Development.

69. The Policy BH 2 head note indicates that *"Development proposals which would adversely affect archaeological sites or monuments which are of local importance or their settings will only be permitted where the Department considers the importance of the* Proposed Development *or other material considerations outweigh the value of the remains in question"* (page 15). The Proposed Development will have some moderate adverse impacts on the setting of archaeological remains of local importance, in particular two raths and Mullan Fort (see Chapter 12 – Cultural Heritage). However, these impacts have been assessed in Chapter 12 as being insufficient to jeopardise the Proposed Development and, in any event, the Proposed Development is "of overriding importance in the Northern Ireland context" (PPS 6, page 14). Indeed, the project is required for overriding reasons of public interest in PSU 2 policy terms

70. Policy BH3 and BH 4 deal with archaeological assessment, evaluation and mitigation in circumstances where either the impact of a proposal is unclear or where sites are known to have remains. The policies state respectively that "*Where the impact of a development proposal on important archaeological*

[63] (DOE, 1999)

remains is unclear, or the relative importance of such remains is uncertain, the Department will normally require developers to provide further information in the form of an archaeological assessment or an archaeological evaluation. Where such information is requested but not made available the Department will normally refuse planning permission" and "*Where it is decided to grant planning permission for development which will affect sites known to contain archaeological remains, the Department will impose conditions to ensure that appropriate measures are taken for the identification and mitigation of the archaeological impacts of the development, including where appropriate the completion of a licensed excavation and recording of remains before development commences*." The Consolidated ES provides the required information on archaeological remains in accordance with Policy BH 3. As far as Policy BH4 is concerned any appropriate conditions will be accepted, and complied with, by NIE.

71. In overall terms the impact of the Proposed Development on archaeological remains is not so adverse as to justify rejection of the Proposed Development, which is of overriding importance to Northern Ireland.

72. Policy BH11 Development affecting the Setting of a Listed Building states:

> *"The Department will not <u>normally</u> permit development which would adversely affect the setting of a listed building. Development proposals will normally only be considered appropriate where all the following criteria are met:*
>
> *a) the detailed design respects the listed building in terms of scale, height, massing and alignment;*
>
> *b) the works proposed make use of traditional or sympathetic building materials and techniques which respect those found on the building; and*
>
> *c) the nature of the use proposed respects the character of the setting of the building".[emphasis added]*

73. Policy BH11 is again considered in Chapter 12 Cultural Heritage where the impact of the Proposed Development on all listed buildings in the area is assessed. The impact on the former back gate lodge to Tullydowey House (No 39 Tullydowey Road, a grade B1 listed building) is the only building identified as having a moderate adverse impact, which is on its setting only. Notably it is also the only remaining consideration raised by NIEA Protecting Historic Buildings in respect of the Proposed Development. The Proposed Development's impact is addressed in Chapter 12. This advises that the Proposed Development does not have an adverse effect on the primary (or 'immediate') setting of No 39 Tullydowey Road, but that it has an adverse impact on the secondary (or 'extended') setting of the house. In terms of policy BH 11 the Proposed Development would have an adverse effect however the Proposed Development would be a permissible exception. The word 'normally' (as explained in page 5 of PPS 6) is included in policy because the Department consider it "*necessary …to ensure that there is no public misunderstanding of its planning policies. It is generally recognised that on occasion there will be circumstances where other material considerations outweigh these policies*".

74. The impacts of the Proposed Development upon the setting of No.39 Tullydowey Road and other sites of archaeological interest are therefore matters that must be balanced by the decision maker but in terms of Policies BH 1, BH 2 and BH 11 the overriding national/regional need for the Proposed Development clearly outweighs these adverse impacts.

3.5.6 PPS 10 – Telecommunications[64]

75. PPS 10 sets out the DOE Planning Service policies in relation to telecommunications development. Paragraph C26 of Annex C advises that "*The construction of new buildings or other structures, such as*

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[64] (DOE, 2002)

wind turbines, can interfere with broadcast and other telecommunications services, and the possibility of such interference can be a material planning consideration (see Policy TEL 2)". Policy TEL 2 Development and Interference with Television Broadcasting Services states "*The Department may refuse planning permission for development proposals which would result in undue interference with terrestrial television broadcasting services*". As the Proposed Development will not cause interference it complies with this policy.

3.5.7 PPS 15 Planning and Flood Risk[65]

76. PPS 15 sets out the policies of the DOE Planning Service in relation to development within flood plains and adopts a precautionary approach (Section 5.0, page 10).

77. The extent of the Blackwater River and River Rhone flood plains has been determined as part of this EIA, as the flood plain is in proximity to the Turleenan substation site. The proposed application boundary of the substation site includes land that is identified as being within the Q100 floodplain. This is more appropriately referred to as the 1% Annual Exceedance Probability (AEP) event, i.e. there is a 1% probability that this level will be exceeded in any given year. However, the substation has been designed to ensure that the area of permanent development, incorporating the compound and access road, is above the 1% AEP floodplain and the area within the 1% AEP floodplain will only be used for additional drainage, landscaping and planting.

78. The permanent development area of the substation is located above the modelled Q 200 or 0.5% AEP floodplain and ancillary development, with the exception of the new 275kV tower and drainage, landscaping and planting which will be located above the Q100 or 1% AEP floodplain. Additionally nine 400kV towers and five access track are located within the predicted Q100 flood plain. Under Policy FLD 1 (Development in Flood Plains) of PPS 15 criterion (c) acknowledges the acceptability of "*development where location within a flood plain is essential for operational reasons, for example ...utilities infrastructure which has to be there*." This policy provision is elaborated on at paragraph 8.11 of the Justification and Amplification under Policy FLD 1 where it is stated that "*Built development will therefore only be permitted in undefended areas in exceptional cases. This may include infrastructure works where it is demonstrated that a specific flood plain location is essential for operational reasons and that an alternative lower risk location is not available*." As the route for the overhead line and the site of the substation has been chosen to ensure minimum impact on environmental assets, and the towers are an essential component of the Proposed Development, their location within the 1% AEP floodplain complies with Policy FLD 1 as any relocation of the substation or towers and consequential change to the overhead line route would result in greater impact on environmental assets. In any event, the location of towers within the flood plain is de minimis development in the overall context of the flood plain area. The open nature of the tower structures would not impede the flow of flood water, the tower proposals (singularly or cumulatively) would have a de minimis effect on flooding within the floodplain and, accordingly, Policy FLD 1 would not be breached.

79. Moreover, the Proposed Development complies with Policy FLD 1 as the established overriding national and regional need for the Proposed Development demonstrates that it is of "overriding regional importance" as provided for in the policy.

3.5.8 PPS 16 Draft Tourism[66]

80. Draft Planning Policy Statement 16 Tourism policy TSM1 deals with safeguarding tourism assets. A tourism asset must be of '*intrinsic interest to tourists'*. It is a draft policy and thus limited weight can be given to it when PSRNI policy TOU2 remains the policy of weight. In any event the route of the

[65] (DOE, 2006)

[66] (DOE, 2010)

Proposed Development and the location of the substation are such that impacts on tourism are not expected to be significant and these impacts are outweighed by the need for the Proposed Development.

3.5.9 PPS 18 Renewable Energy[67]

81. PPS 18 states that "*Northern Ireland will play its full part in helping the UK to meet its EU targets for renewable energy*." (Section 2.1, page 3). While the Proposed Development is not an electricity generation proposal, its benefits as set out in Chapter 2 Need are clearly strongly supported by the policy context of PPS 18.

82. PPS 18 also reiterates the UK Renewable Energy Strategy in recognising that achievement of the targets for renewable energy *"will only be possible with strong, co-ordinated efforts from a dynamic combination of central, regional and local Government and the Devolved Administrations, including Northern Ireland, as well as other public groups, the private sector and dedicated communities"* (paragraph 2.8). The Proposed Development is critical to achieving the full benefits of renewable energy as it is necessary to enable the network to accommodate additional wind-powered energy, to make it actually useable. It is an infrastructural delivery mechanism critical to achieving the strategic aim of PPS18.

83. The Best Practice Guidance is not directly relevant as it relates to energy generation not transmission, and likewise the Supplementary Guidance on PPS 18 is not directly relevant to the Proposed Development as it relates solely to wind energy development.

3.5.10 PPS 21 Sustainable Development in the Countryside[68]

84. PPS 21 contains a suite of policies for development in the countryside. It will "*take precedence over the policy provisions for the following designations contained in existing development plans: green belts and Countryside Policy Areas*" (preamble, page 2).

85. The aim of the PPS is to *"manage development in the countryside in a manner consistent with achieving the strategic objectives of the Regional Development Strategy 2025*". The RDS 2025 has been replaced by the RDS 2035, albeit the Proposed Development is consistent with PPS 21 insofar as it is delivering a key aspect of our electricity grid infrastructure. The objectives of the PPS include the need to *"conserve the landscape and natural resources of the rural and to protect it from excessive, inappropriate or obtrusive development and from the actual or potential effects of pollution*" and to "*Promote high standards in the design, siting and landscaping of development in the countryside*". As demonstrated below the Proposed Development is a type of development that can be acceptable in principle in the countryside.

86. The policies to be considered in respect of the Proposed Development are Policy CTY 1 Development in the Countryside (pages 11.13) and Policy CTY 13 Integration and Design of Buildings in the Countryside (pages 33-36), Policy CTY 14 Rural Character (pages 37-38) and CTY 16 Development Relying on Non-Mains Sewerage.

87. Policy CTY 1 acknowledges the countryside as a unique resource which, among other roles, is the home of the region's agriculture industry. In setting out the general policy for development in the countryside it states that "*There are a range of other types of non-residential development that may be acceptable in principle in the countryside, e.g. certain utilities or telecommunications development. Proposals for such development will continue to be considered in accordance with existing published planning policies*" (page 12). At paragraph 5.11 it is stated that "*Appropriate industrial and commercial*

[67] (DOE, 2009)

[68] (DOE, 2010)

enterprises, including minerals development and necessary infrastructure will be facilitated" (page 13). The Proposed Development seeks to minimise loss of agriculture land and any severance of land holdings in recognition of the role of agriculture in the countryside. The agricultural impact assessment, reported in Chapter 14 of this ES, determined that overall significance of construction phase impacts on agriculture along the Proposed Development is slight adverse. The loss of agricultural land has been determined to range from imperceptible to slight adverse. Of the 181 affected land parcels within the study area, one parcel experiences a major residual adverse impact. This is due to the high level of land loss due to construction of the substation, over which NIE has an option to purchase the land. The remaining parcels are affected to an imperceptible, slight adverse or moderate adverse degree – with a high percentage as imperceptible

88. Furthermore the Proposed Development is "*necessary infrastructure*" in line with Government energy policy as set out in Chapter 2 Need above, which is relevant when considering the relevant PSU policies of the PSRNI which are the "existing published planning policies" referred to in Policy CTY 1. In the light of this analysis the Proposed Development meets the general principles of Policy CTY 1.

89. Policy CTY 13 seeks to achieve visual integration of buildings into the countryside and Policy CTY 14 seeks to avoid new development from being unduly prominent, leading to a build up of suburban development, conflicting with the traditional pattern of settlement, creating ribbon development or damaging rural character through the impact of ancillary works. While both of these policies apply to the proposed substation at Turleenan it should be noted that PPS 21 (paragraph 5.2 and 5.3) was published (in part) as a response to the "*significant concern has been expressed by many about development trends and the enhanced pressures being exerted on the countryside*" and that "*In recent years there has been an accelerating pressure for development throughout the countryside, in particular single dwellings*". The policies for design of buildings and rural character must be seen in this context, that they are generally aimed at controlling the acceleration of planning applications for, and development of, single dwellings in the countryside.

90. In this respect it can be noted that Policy CTY 13 indicates that buildings which are prominent in the landscape or are on sites where there are no established boundaries or a suitable degree of enclosure or where the design is inappropriate will be unacceptable. This is clearly a policy targeting rural dwellings. In any event, Chapter 13 Landscape and Visual assesses the landscape and visual impact of the substation. A landscaping proposal is included to mitigate the landscape and visual impact of the substation thereby securing integration into the landscape when new planting matures and it will not be unduly prominent or fail to meet the other criteria of Policy CTY 14.

91. Policy CTY 16 states that "*planning permission will only be granted for development relying on non-mains sewerage, where the applicant can demonstrate that this will not create or add to a pollution problem*". The ES Chapter 8 Water Environment and Chapter 9 Soils, Geology and Groundwater demonstrate that the septic tank required for the substation will not create or add to pollution.

92. PSRNI policy 11 is the relevant policy for the towers and overhead line. The Proposed Development will not erode the rural character of the area under CTY 14 and is acceptable when assessed against CTY 13 and 14 particularly in the context of the overriding national and regional need for the development.

3.6 Power Lines: Demonstrating Compliance with EMF Public Exposure Guidelines

93. Public exposure to Electro Magnetic Fields (EMFs) is a material consideration. The relevant policy is the Power Lines: Demonstrating Compliance With EMF Public Exposure Guidelines. In March 2012, the Guidelines published by the UK Department of Energy and Climate Change were agreed by the Northern Ireland Executive and the Health and Safety Executive[69].

94. As explained in Chapter 7 there are no statutory regulations in the UK that limit the exposure of people to power-frequency electric or magnetic fields. However, responsibility for implementing appropriate measures for the control of EMFs lies with Government, and Government has put in place a set of policies to this end, based on quantitative exposure guidelines.

95. The Proposed Development must comply with Government policy on EMFs and in particular within the Government's EMF exposure guidelines. Compliance with Government policy on EMF exposure levels ensures the appropriate level of protection for the public from these fields.

96. The policies that exist in the UK for the control of EMFs are described in detail in Chapter 7. But in summary, in 2004, the National Radiological Protection Board (NRPB), which had statutory responsibility for advising Government on non-ionising radiation protection, including power-frequency fields, recommended to Government (NRPB 2004a) the adoption in the UK of guidelines published in 1998 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) (ICNIRP 1998). Government accepted this recommendation, stating in 2004 (DH 2004) that public exposures should be limited by the 1998 ICNIRP Guidelines in the terms of a 1999 EU Recommendation (EU 1999). This policy was restated and made more explicit in a 2009 Written Ministerial Statement (DH 2009), and the necessary details for the practical implementation of this policy were set out in a Code of Practice (DECC 2012a) first issued in 2011. The Northern Ireland Executive explicitly adopted this Code of Practice in 2012 at which point a revised version was issued to include Northern Ireland.

97. On 1 April 2005 the NRPB became part of the Health Protection Agency (HPA), forming the Radiation Protection Division (HPA-RPD). This Environmental Statement continues to refer to NRPB for statements made prior to that date.

98. NIE has designed the proposed new 400kV overhead line to comply fully with the 1999 EU Recommendation, and also with the only other relevant Government policy, which relates to a concept called "phasing" which can only be applied to double circuit overhead lines. The single-circuit 400kV design was chosen because it has a lower visual impact and lower cost. To construct the overhead line as a double-circuit line instead of a single-circuit line, solely in order to be able to construct it with optimum phasing, would require every support structure to be significantly higher than currently proposed with increased visual impact and at a greater cost. The Proposed Development line is therefore compliant with that policy. This approach complies with Government policy and with the specific advice of the HPA, who acts as the Government's independent scientific adviser in relation to EMFs.

99. As Chapter 7 explains, the overhead line and the substation are compliant with UK policy, and that there is (with minor exceptions i.e. an effect of the electric fields on the structure of beehives, which is readily eliminated by simple mitigation methods) no effect on farming, flora and fauna. In addition devices such as pacemakers, other active implanted medical devices and hearing aids are almost entirely immune from any interference at the levels of EMFs produced by the overhead line (see Chapter 7 EMF for further details). There can therefore be no proper policy objection to the Proposed Development on an EMF basis.

[69] Power Lines: Demonstrating compliance with EKF public exposure guidelines A voluntary Code of Practice (DECC, March 2012)

3.7 Development Plans

3.7.1 Overview

100. Development Plans within Northern Ireland which are relevant to the Proposed Development are:

- The Armagh Area Plan 2004;
- Armagh Area Plan 2004 Alterations No 1 : Armagh Countryside Proposals;
- The Armagh Issues Paper 2018; and
- Dungannon and South Tyrone Area Plan 2010.

101. Development plans are prepared by the DOE, in consultation with local councils, under the provision of Part III of the Planning (NI) Order 1991. They apply the regional policies, outlined in the aforementioned documents, in a local context, frequently with specific geographical content.

3.7.2 Armagh Area Plan 2004 (AAP) and Armagh Area Plan Alteration No 1 (AAP Alt 1)[70]

102. The AAP sets out a range of proposals, policies such as HP 1 as set out in Chapter 12 (Cultural Heritage) of this ES, and zonings the most relevant being in respect of nature conservation (Section 6.0, page 15), Archaeological Sites and Historic Monuments (Section 7.0, page 16). There are no specific policies relating to infrastructure such as the Proposed Development. In combination these Plans designate or define boundaries for a Green Belt; a Countryside Policy Area; Sites of Local Nature Conservation Importance; Parks, Gardens and Demesnes of Special Historic Interest; Parks, Gardens and Demesnes Supplementary Sites; Areas of Significant Archaeological Interest; and Local Landscape Policy Areas. They also show the boundaries of Areas of Scientific Interest and Areas of Special Scientific Interest. As already noted the proposed route of the overhead line and proposed substation site avoid any of these defined/designated areas. In any event, the Green Belt and Countryside Policy Area designations have been overtaken by PPS 21. These Plans do not include any additional policies on these issues and all relevant considerations have already been assessed under PPS 2 and PPS 6. The Proposed Development does not therefore conflict with any aspect of the AAP or AAP Alt 1.

3.7.3 Armagh Area Plan 2018 Issues Paper[71]

103. The issues paper for this forthcoming area plan was published in March 2004. There is no reference within this paper to electricity or associated infrastructure.

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[70] (DOE, 1995), (DOE, 2001)

[71] (DOE, 2004)

3.7.4 The Dungannon and South Tyrone Area Plan 2010 (DSTAP)[72]

104. The DSTAP plan sets out both geographic planning designations and policy/proposal framework statements. There are no geographic planning designations relevant to the Proposed Development. Planning designations near to the Proposed Development are shown in Figure 1.2.

105. The relevant policy frameworks include Utilities (pages 43-47) and Conservation (pages 72-7). Under Utilities there is no reference to electricity infrastructure. The Conservation proposals and policies CON3, CON4 and CON6 as identified in Chapter 12 (Cultural Heritage) of this ES do not add to the regional policy (PPS 6) framework already considered. As illustrated in Chapter 12 (Cultural Heritage) and 15 (Socio-economics) of this ES, the Proposed Development does not conflict with any DSTAP zoning, designation, policy or proposal.

3.8 Conclusions

106. The Proposed Development is EIA development under the terms of the EIA Regulations, and accordingly this ES has been prepared having regard to Schedule 4 of the EIA Regulations and DCAN 10, which provides advice on the operation of the EIA Regulations.

107. This ES demonstrates that the Proposed Development has been designed with due regard to the Regional Development Strategy for Northern Ireland, and has been closely assessed in the context of all relevant Strategic Planning Guidelines, Planning Policy Statements and the policies set out within the Planning Strategy for Rural Northern Ireland.

108. In terms of the underlying or guiding principle as set out in PPS 1 General Principles, paragraph 3 page 4 (also expressed in broadly similar terms in paragraph 59, page 23) the Proposed Development would, as required by the "*public interest....*" be "*carried out in a way that would not cause demonstrable harm to interests of acknowledged importance*." In summary, the Proposed Development complies with the overall thrust of current planning policy. In any event, if there were shown to be harm, policy requires that harm to be balanced against the overriding and imperative need for the Proposed Development.

109. The environmental impacts of the Proposed Development have been rigorously examined through the EIA process as documented in this ES. The environmental information gathered in this process has demonstrated, in relation to the planning policies set out in the above paragraphs, that there will be adverse impacts of varying degrees on some facets of the environment. However, in the overall balancing exercise involved in considering a wide range of often competing planning policy, guidance and standards, these adverse environmental impacts are more than outweighed by the strategic need for the Proposed Development as set out in Chapter 2 (Need), which demonstrates a clear overriding national and regional and indeed imperative need for the development in accordance with relevant planning policy on major projects and new infrastructure and the unsuitability of alternatives as set out in Chapter 4 (Alternatives).

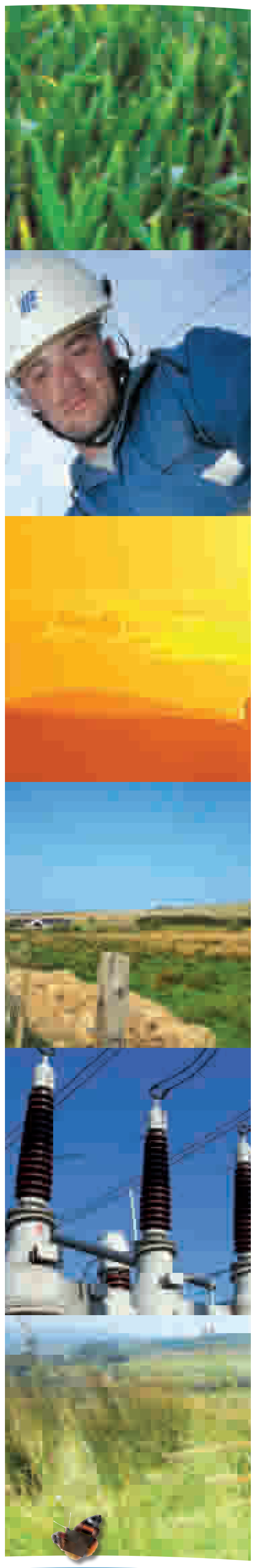
110. The economic benefits of the proposed Interconnector are strongly in the public interest and have been demonstrated as a key component of the justification of need. As confirmed in a recent statement by the Minister of the Enterprise Trade and Investment, the Interconnector is:

> *"an absolute necessity and* [the lack of the Proposed Interconnector] *is costing consumers in Northern Ireland a large amount of money. Therefore it is imperative that it is progressed very soon".*

[72] DOE, 2005)

Chapter 4

Alternatives



Consolidated Environmental Statement

Volume 2

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EU TEN-E Initiative

Northern Ireland Electricity

4 Alternatives

4.1 Introduction

1. This Chapter describes the process undertaken by NIE to examine alternative means of enhancing the transmission system interconnection between Northern Ireland and the Republic of Ireland whilst also complying with the critical performance requirements set out in Chapter 2 of this ES. The process of examining transmission alternatives has involved a number of separate elements as follows:

<u>Part One: Transmission Alternatives:</u>

- Consideration of a “do-nothing” alternative;
- Examination of alternatives to transmission network solutions;
- Evaluation of alternative transmission circuit technologies;
- Determination of operating voltage and circuit configuration; and,
- Consideration of design alternatives for the preferred transmission option.

<u>Part Two: Substation Site Selection and Overhead Line Routeing:</u>

- Identification of system connection options;
- Technical evaluation of identified connection options;
- Evaluation of preferred study areas, the identification of route corridor options and the selection of a “preferred route corridor”;
- Overhead transmission line route selection within the preferred route corridor;
- Consideration of alternatives for substation technology and design; and,
- Substation site selection.

2. The consideration of transmission alternatives as set out within this Chapter has extended over a considerable period of time, and the overall process has included ongoing review during 2012 and 2013 in order to ensure that the conclusions drawn by NIE (in association with EirGrid) have been fully informed by the latest developments in worldwide power transmission technology and practice.

3. The information in this Chapter is provided in accordance with the applicable EIA Regulations, which require in Schedule 4, part 1, item 2, that an ES should contain *“An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects.”*

4. The information in this Chapter is also provided in the context of PSRNI policies PSU2 and PSU 8, in that NIE have undertaken a thorough exploration of alternatives to the overhead line and route selected as the preferred alternative identified to meet the identified Need set out in Chapter 2.

5. Part One of this Chapter (which follows next) includes the description and evaluation of alternative technologies and methods for delivering the desired transmission interconnection capacity, and summarises the reasons for the selection of an overhead line as opposed to other potential transmission circuit technologies. The material presented herein includes reference to studies and reports produced by internationally recognised consultants, some commissioned by NIE and EirGrid, and others commissioned by Government. The conclusions from these reports have informed NIE and EirGrid’s individual and joint assessments of all the available alternatives for constructing a high voltage transmission interconnection circuit capable of meeting the strategic need as set out in Chapter 2 Need

above, and has confirmed their assessment that the least cost and most technically acceptable option to meet the need for interconnection would be a 400kV single circuit overhead transmission line.

6. Part Two of Chapter 4 describes the process undertaken by NIE to evaluate alternative positions for the connection point to the transmission system in Northern Ireland (NI), and viable route corridors for an overhead transmission line between the selected connection point and the transmission system in the Republic of Ireland (ROI). It describes the process of detailed route selection within NI and the issues and options evaluated as part of a process to determine the finalised route for the proposed overhead line. Part Two also describes the process undergone to evaluate alternatives for location, design and layout of the proposed substation.

4.2 Part One: Transmission Alternatives

4.2.1 Strategic Need

7. Chapter 2 Need sets out the "case of need" for the proposed Interconnector and shows that there are three fundamental drivers for the development:

   (i) Improving all-island electricity market competition;

   (ii) Supporting the development of renewable generation; and,

   (iii) Improving the security of electricity supply.

8. The proposed Interconnector is being developed by NIE and EirGrid in response to all three of these fundamental and inter-related strategic needs. NIE is required to carry out this function in compliance with its Licence and Transmission Interface Arrangements with the Northern Ireland Transmission System Operator. The alternatives for achieving these objectives are outlined below.

4.2.2 Do Nothing Alternative

9. The Do Nothing alternative describes the circumstance where no development occurs. In this case, under a Do Nothing alternative, no changes or alterations would be made to the existing strategic transmission infrastructure. The land upon which such development is proposed to occur – primarily agricultural land - would remain unchanged, unless developed for some separate purpose. As a consequence, the environmental impacts identified in this ES, positive and negative, would not occur.

10. Under the Do Nothing alternative, the interrelated strategic needs for additional interconnection between the two electricity transmission systems on the island of Ireland, as set out in Chapter 2 Need would not be addressed. Doing nothing would fail to address the need to improve the efficiency of the electricity market, as required by existing European Directives, and would impede the realisation of all-island government policies to increase renewable energy generation. Also, it would not deliver the additional electricity transfer capacity needed to deliver improvements in the security of electricity supply within the island of Ireland in general; neither would it ensure that Northern Ireland, in particular, is able to avoid future shortfalls in electricity supply.

11. Given that the extent of the existing electricity interconnection between the transmission systems of Northern Ireland and the Republic of Ireland is insufficient to achieve these key objectives, the Do Nothing alternative is not acceptable, and NIE (along with EirGrid) has rejected it.

4.2.3 Alternatives to Transmission Network Solutions

4.2.3.1 Context

12. The "all-island" Single Electricity Market (SEM) structure has been designed to separate the electricity supply chain into three fundamental parts:

- Power generation (production);
- Electricity transmission and distribution (delivery); and,
- Electricity supply (retail sales).

13. This market structure relies fundamentally upon the transmission and distribution network infrastructure to link the sources of electricity production to the points of electricity demand. The network owner is required, under its Licence, to provide generators and suppliers with effective and efficient, pathways for the delivery and sale of electricity to electricity users, if the cross-border transmission network is not developed, the following considerations become relevant.

4.2.3.2 Transmission System Limitations and Consequences

14. The existing Tandragee – Louth 275kV double circuit overhead line forms the primary existing interconnection pathway between Northern Ireland and the Republic of Ireland, but further and more effective interconnection arrangements are required to meet the three strategic objectives listed in 4.2.1 above.

15. Due to the fact that both of the existing 275kV 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. Such a loss of interconnection would bring about an electrical separation of the transmission networks in Northern Ireland and the Republic of Ireland and, depending upon operating conditions at the time, could lead to an all-island power system collapse and an all-island black-out. The risk of such an event is unacceptable, and for this reason the Transmission System Operators currently impose a transfer capacity restriction on the existing Interconnector. This ensures that if there is a sudden loss of the Interconnector, the shock to the network is limited to a level that can be managed without widespread black-outs.

16. However, the restriction described above creates a "bottleneck" in the network, seriously limiting the scope for commercial exchanges of electricity between generators and suppliers in each part of the all-island electricity market, and leading to inefficiencies and costs that are passed through to final customers as part of their electricity prices.

17. Another issue of increasing concern, as more fully explained in Chapter 2 (Need) above, is that future reductions in generation capacity within Northern Ireland could lead to a shortfall in available electricity supply north of the border in the years beyond 2016. In these circumstances, the "bottleneck" described above, which limits the ability of the network to transfer electricity from available spare power generation capacity in the south, could seriously threaten electricity supply security in Northern Ireland.

4.2.3.3 Potential Alternative : New Conventional Generation in Northern Ireland

18. One measure to reduce the economic effect of the transmission capacity restrictions described above could be to build further generation in NI.

19. It is conceivable that a new conventional generation plant or peaking[73] generation plant constructed in Northern Ireland might reduce the cross-border balancing costs and improve security of supply issues in the medium term, however, it must be recognised that investment in new generation is at the

[73] A "Peaking Generator" is designed to operate for relatively short periods of time in order to provide electricity during either emergency conditions or during the times of peak demand.

discretion of independent commercial ventures, and market forces have not produced any proposal for new conventional or peaking generation to date.

20. Enforcing the construction of a new power station to improve security of supply in Northern Ireland could not be achieved without creating fundamental distortions in the Single Electricity Market. Such distortions would, in their turn, have a consequential adverse impact on other existing generators, further jeopardising future investment in generation.

21. It should also be noted that this solution to electricity security concerns would not address either of the other two primary strategic needs, i.e. improving market competition or enabling the increased use of renewable energy. In fact, it would be detrimental to them both.

22. The addition of further power generation capacity in Northern Ireland, without addressing the need to transfer and exchange power flows across the border, would further exacerbate distortions in the electricity market, and would perpetuate conditions in which all-island electricity prices would remain higher than necessary.

23. Finally, the construction of additional conventional generation in Northern Ireland would jeopardise the achievement of renewable targets. With additional conventional generation output in Northern Ireland, the renewable generation would need to be constrained from operating since the electricity produced could not all be consumed locally, and yet it could not be sold and exported either, due to the lack of transmission capacity. Such a situation would significantly depress economic interest in renewables investment, and would make it highly unlikely that renewable energy targets could be met in Northern Ireland.

4.2.3.4 Potential Alternative : Longer Life for Existing Conventional Generation in Northern Ireland

24. The generation shortfall in NI is exacerbated by European emission restrictions that are precipitating the closure of existing NI generation before its mechanical end-of-life. It is possible that the security of supply shortfalls described in Chapter 2 Need could be deferred for a period by the introduction of time limited derogations such that certain generators may be able to continue to operate for a longer period of time. However such a move would introduce significant market costs and would prolong elevated environmental emissions associated with the use of older plant. At best, it would also be a short term market solution, and would not therefore remove the need for additional interconnection.

25. It should also be noted that this potential solution to electricity security concerns would not address either of the other two primary strategic needs, i.e. improving market competition or enabling the increased use of renewable energy.

26. The life-extension of additional conventional generation in Northern Ireland, without addressing the need to transfer and exchange power flows across the border, would extend conditions in which all-island electricity prices would remain higher than they should be.

27. Additionally, the life-extension of conventional generation in Northern Ireland would jeopardise the achievement of renewable targets. The extension of local conventional generation capacity in continuing circumstances where renewable generation output must frequently be constrained owing to the lack of export capacity would depress the economic interest in renewables investment, and would make it highly unlikely that renewable energy targets could be met in Northern Ireland.

4.2.3.5 Potential Alternative : Increased Dependence on Renewable Energy

28. Whilst there are ambitious plans for onshore and offshore renewable generation to connect in Northern Ireland and Republic of Ireland in future years, the intermittent and unpredictable nature of wind, wave or solar generation precludes it from being relied upon for secure electricity supplies in the way that conventional power stations are. The future connection of renewable sources of electricity generation would therefore not remove the need for access to conventional generation to supply NI electricity needs and to balance power flows at all other times.

29. It is also important to note that investment proposals for renewable energy projects invariably depend upon an expectation that there will be a network pathway to transport the electricity produced to a party that wishes to purchase and use that electricity. If there is no development of increased interconnection capacity and there are therefore continuing restrictions in access to the all-island network, then these restrictions will continue to limit the viability of investment cases for renewable energy, and will therefore limit the number of such developments that can be achieved in reality.

4.2.3.6 NIE Conclusion on Non-Transmission Network Solutions

30. NIE considers that, to achieve the objectives listed in 4.2.1 whilst avoiding the security of supply, economic and environmental risks discussed above, there is no feasible or desirable alternative to the development of a transmission network solution. The only way to meet the strategic needs described in Chapter 2 Need whilst also delivering a downward pressure on electricity prices is to enhance the transmission interconnection capacity to the Republic of Ireland. This is the fundamental premise upon which NIE proposes this transmission development, and it is the reason that NIE has examined the transmission technology alternatives described below.

4.2.4 Evaluation of Transmission Technology Alternatives

4.2.4.1 General Principles

31. Any examination of alternative technologies and solutions for electrical power transmission must first recognise the physical and practical differences between the various available technologies and how they each perform technically, environmentally and economically.

32. A power transmission circuit requires a continuous conducting pathway for electrical current that is suitable for the bulk transmission of high levels of electrical power over relatively long distances. The circuit must include two essential elements: electrical conductors for the current (typically copper or aluminium alloy), and insulators (such as porcelain and atmospheric air, or high-grade plastic) to prevent leakage of the current away from the conductor circuit.

Energy Losses

33. For a given amount of power transfer, less energy is lost to the environment when the electrical voltage (or pressure) is increased. This is because, with higher voltage, less current flows and this creates less heating of the conductor. However, as the voltage level is increased, it is necessary to increase the amount of insulation to stop the current leaking away. In the case of overhead lines the insulation is mostly provided by the air, and so for the high voltages used in transmission the distances between the conductors and the ground can be several metres. In the case of underground cables, however, oiled paper or high-grade plastic just a few centimetres thick insulates the conductors from ground.

System Voltage and Stability

34. For transmission voltages, these two fundamentally different insulation arrangements mean that an underground cable circuit has quite different effects on the transmission network compared to those of an overhead line. Over long distances these differences can create significant electrical effects which the system design must account for.

35. Transmission circuits form part of an interconnected network, and each circuit can run for tens or hundreds of kilometres. Thus, each circuit has a significant influence on the overall performance of that network. Whether a circuit is constructed as a line or cable can therefore have an impact on the performance of the entire network. In general, the greater the length of any given transmission line, the greater will be its impact on the overall voltage control, electrical losses, and stability of the interconnected network. In circumstances where a particular technology leads to technical difficulties for the operation of the network it is important to limit the extent of its use, and to provide technical measures to mitigate the negative effects in circumstances where there is no practical alternative.

Other Key Factors: Environmental Impact, Performance, and Cost

36. For technologies where the technical and safety performance is satisfactory there are of course further considerations when comparing technologies for any particular application. First, environmental issues need to be evaluated. This will always present a challenge in comparing overhead lines and underground cables because cables, and especially those operating at the highest voltages, can cause significant environmental impact arising from physical disruption along a continuous corridor, whereas overhead lines have a generally lower environmental impact, but do create unavoidable visual impact. (See ECOFYS 2009, as discussed in section 4.2.4 and PB Power 2009, as discussed in section 4.2.6).

37. Cost is another consideration. Cable systems, and especially those applicable at the highest voltages, are significantly more expensive to install than overhead lines. In the operational circumstances applicable to transmission lines, cables produce higher electrical losses over their lifetime.

38. Performance issues such as maintenance requirements and circuit availability is a third element to consider. When faults occur, cables take very much longer to repair which means that their overall availability is lower. All of these factors may be treated as technical concerns, but must also be recognised as having an impact on operational costs, and therefore upon electricity market prices.

39. Utility companies throughout the world have gained a significant level of practical experience with the design and application of effective transmission systems for different performance requirements. There is worldwide recognition that in addition to their high costs, high voltage underground transmission cables present a number of technical difficulties within transmission systems. For this reason, worldwide best practice demonstrates an overriding preference for transmission circuits to be built using overhead line technology. In general, the use of cable for high voltage transmission purposes is limited to short lengths or to circumstances where overhead lines are either impractical (e.g. significant water crossings) or cannot be achieved (e.g. in the heart of cities).

40. The process of technology evaluation must therefore continuously balance three principal measures:

- Performance and technical capability;
- Environmental impact; and,
- Cost and customer benefits (on a whole life basis).

41. NIE's "Guidelines for NIE Networks and the Environment"[74],available on the NIE website[75], provides information on NIE's philosophy and policies for managing the environment, for commitment to public consultation, and for delivering sustainable developments that are both essential and acceptable to the society of Northern Ireland. Major portions of this publication are devoted to environmental concerns, because environmental responsibility is a matter of primary concern for NIE.

42. These guidelines are a fundamental point of reference for NIE when considering the approach when delivering any new network infrastructure within Northern Ireland. The guidelines require project managers to "assess the potential environmental effects of any new development" and include a specific requirement to perform "a thorough exploration of alternatives" as part of "a holistic process developed through various stages before the final selection of a preferred design or network solution". The document includes practical guidance for the establishment of high voltage transmission circuits in rural areas, and shows that overhead lines are normally found to deliver an optimum overall balance between environmental, economic and technical objectives and therefore to be the most appropriate solution.

[74] (NIE; J63413 10/98 C 10 CN9261)

[75] http://www.nie.co.uk/documents/NS/T-C-Inter_H-Safety/9-guidelines-for-nie-networks-the-environment.aspx

4.2.4.2 Design Development

43. NIE's starting point for the development of a transmission circuit that must be located in a rural area is therefore to search for an overhead line solution that is technically capable of delivering the required performance over its lifetime, whilst still being environmentally acceptable, and economically viable. This approach does not determine that other potential alternatives are ignored, because all potential alternatives have to be considered before a final decision is made. Instead, it is a responsible and pragmatic approach to the development of an initial design. It takes account of local and international experience that has been gained from extensive evaluation of alternatives for transmission circuits that have been performed on a wide variety of projects and over a number of years.

44. For example, the overriding majority[76] of transmission circuits worldwide are built using overhead line technology, and over 98% of the onshore extra high voltage (EHV) electricity transmission network in Europe utilises alternating current (AC) overhead lines. The interconnector project development process adopted by NIE (and EirGrid) and described in Part Two below, was therefore based on the initial evaluation that an overhead line solution would probably prove to be the least-cost technically and environmentally acceptable solution, and should thus be the design against which other alternatives should be compared.

45. Having established a baseline design, NIE and EirGrid then undertook a full and iterative evaluation of potential transmission technology alternatives, in order to ensure that the evaluation and development process was performed as an integral part of the EIA and therefore fully and properly informed, firstly with respect to the available technological alternatives and their prospective environmental impact; and secondly, to ensure that their initial choice of an overhead line solution remained sound in the context of emerging and evolving technological alternatives worldwide. The information and knowledge base available for this process was periodically updated and re-examined through assessment of technological, environmental and sociological developments worldwide, so that alternative technologies and their relative capabilities and features were correctly depicted within the ES.

4.2.4.3 ES Prevalence

46. The alternative technologies have recently been reviewed, and updates reflected in this Consolidated ES, and NIE therefore considers it to be current, up to the date of publication of this document.

4.2.4.4 The Alternatives

47. Arising from the process described above, two main technological alternatives were identified. These can be categorised into Synchronous Technology Solutions (using AC connection) and Asynchronous Technology Solutions (using DC connections).

48. The existing electricity transmission system in the island of Ireland is, as in every other part of the world, a high voltage alternating current (HVAC or AC) system. In this type of system all the main generators are synchronised to each other. This is known as synchronous technology. There exists, however, another type of electricity transmission technology known as high voltage direct current (HVDC or DC). Although both technologies are used to transmit electricity, the types of electricity transmitted by each are very different and are not compatible. The result is that a DC circuit does not naturally integrate within an AC network, and high cost converter stations are required wherever the AC network meets DC transmission.

49. This is somewhat comparable with the way an electric railway does not naturally integrate with a motorway network. The electric train cannot run on the motorway and motor vehicles cannot run on the electric railway. They are of course both forms of transport, but they do not naturally integrate together. In electricity networks the electricity that exits the power stations is AC electricity, and the electricity required by the end consumer is AC electricity. Inserting a DC circuit between the power stations and the end consumer requires that the AC electricity at the supply end of the circuit is converted into DC

[76] Over 99% of transmission circuits worldwide use overhead line technology.

electricity, carried by DC to the receiving end, where it is converted back from DC to AC electricity, and then transmitted onwards to the end consumer. This is inconvenient and inefficient, but in the case of some very particular applications such as the interconnection of two separate systems, the need to transmit over long submarine links, or very long overland distances (for example some HVDC circuits exceed 2000km) DC may be the only technically feasible option.

50. The alternatives initially considered for power system interconnection between Northern Ireland and the Republic of Ireland are those set out below:

Synchronous Technology Solutions

51. (i.e. those capable of forming an integral part of the existing AC transmission network)

- Alternating Current (AC) Overhead Line;
- AC Underground Cable;
- Hybrid arrangement adopting sections of AC underground cable within an overhead line circuit; and,
- AC Submarine Cable (with required on shore connections to the power system).

Asynchronous Technology Solutions

52. (i.e. those requiring conversion equipment and specialised arrangements in order to connect to the existing transmission network)

- Direct Current (HVDC) Submarine Cable (with required on shore connections to the power system);
- HVDC Overhead Line (with required conversion equipment at each power system connection point);
- HVDC Underground Cable (with required conversion equipment at each power system connection point); and,
- Linkage to the proposed offshore HVDC ISLES project.

4.2.4.5 Evaluation of Transmission Alternatives – Key Objectives

53. All of the above transmission alternatives were considered against a number of key performance objectives which must be achieved regardless of the particular technological alternative that is actually employed. These objectives derive from the overall performance requirements of the proposed Interconnector as described in Chapter 2 Need, and also from the general obligations and respective policy positions of both NIE and EirGrid. These key objectives are listed below.

- Compliance with Safety Standards: it is required that the proposed technology and its application shall comply with all relevant and appropriate health and safety standards.
- Due regard for the environment: it is required that the chosen solution must enable construction, operation and maintenance in an environmentally sustainable manner.
- Dependability and Reliability: it is required that the additional transmission connection shall have a high level of dependability and reliability.[77]
- Enabling Power Transfer: it is required, as set out in Section 2.9 of this ES, that the additional transmission circuit is capable of transporting an ultimate 1,500MVA of power in either direction whilst also forming a secure, stable and integral part of a synchronised AC transmission system throughout the island of Ireland.
- Electrical Strength: it is required that the additional transmission circuit must connect to strong network points, and must operate in parallel (i.e. together) with the existing 275kV interconnector.[78]

[77] ES, Section 2.10

- Independence: it is required that the additional transmission circuit shall be physically separate from and independent of the existing interconnector, so that the risk of concurrent failure will be low. [79]
- Enabling Synchronous Operation: the additional high capacity transmission circuit must enable continued synchronous connection between both parts of the all island transmission system.
- Proven: the imperative nature of the case of need requires the chosen solution to be proven and dependable, and therefore to present a high degree of likelihood that it will be effective in delivering the key benefits to electricity customers as described within the “case of need”.
- Flexibility: a key requirement is that the chosen solution must provide the operational flexibility required to facilitate future transmission system connection and reinforcement.
- Commercially Effective: the chosen solution must provide the means to effect the removal of network constraints that are currently contributing to elevated wholesale electricity prices.[80]
- Increased Electricity Security: the chosen solution must increase system security and minimise the risk of loss of supply to customers.[81]
- Economic: the chosen solution must be cost effective in order to deliver the maximum overall benefit to electricity customers.[82]
- Capable of facilitating Wind-Powered Generation: the chosen solution must facilitate the wider development of wind-powered generation[83], and must enable the increased use of such wind-powered generation (in displacement of fossil fuelled sources of generation) as part of Government initiatives to respond to long term climate change.[84]
- Compliance with good Utility Practice: the term ‘Good Utility Practice’ is similar in meaning to terms such as ‘Best International Practice’ and ‘Good Industry Practice’. These are generic terms in widespread use in the energy utility industry in countries where the industry is subject to Government regulation.

4.2.4.6 Preliminary Analysis of Transmission Alternatives

Consideration of submarine technology and routeing as a potential alternative to effect the transmission interconnection.

54. At an early stage in the development of the Project, NIE and EirGrid performed an initial analysis of the primary alternatives, and came to the conclusion that, where land-based alternatives exist, the undersea alternatives (whether AC or DC) should be rejected for the following principal reasons:

- Undersea technology would impose the high cost, difficult to integrate, HVDC transmission technology;
- Undersea cable systems are significantly more expensive than land-based cables;
- The use of undersea technology introduces a wide range of additional and significant environmental impacts including - impacts on the seabed and the foreshore areas associated with on land connection points, on fish stocks and fishing, on marine archaeology, and upon shipping and navigation.

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[78] ES, Section 2.9.1

[79] ES, Section 2.9.1

[80] ES, Section 2.9.2

[81] ES, Section 2.9.1

[82] Letter from NIAUR, 16th April 2008 : “The Authority considers that the interests of all customers in Northern Ireland are unlikely to be protected if additional unnecessary cost is incurred through placing the line underground”

[83] ES, Section 2.9.1 (NB: Generators are also “customers” for network infrastructure services)

[84] ES Section 2.9.1

- The undersea alternative would require a significantly longer route than the 'on land' option, with attendant increases in environmental impact and cost;
- The route applied for an undersea option would still need to be brought on-shore in two or more places, and then overland across the relatively congested eastern coastal strip of the island to connect into the existing transmission system, with attendant increases in land-based environmental impact and cost;
- All future connections to an undersea cable would require the connections to be brought on shore, and across the land with the same risk to land environment as mentioned in the above bullet point;
- The length of time necessary to repair any failure of, or damage to, an undersea cable would be far greater than that applicable to land-based alternative; and,
- Undersea construction and maintenance is an unnecessary safety risk when other safer alternatives exist.

55. In summary, it was recognised that (a) any undersea route would have to be considerably longer than an overland alternative, with attendant increases in environmental impacts both onshore and offshore, and (b) the application of submarine technology would entail significant additional cost, risk, uncertainty, environmental impact and engineering complexity in comparison with proven alternatives for the application of land based technology options. With the reasonable expectation that a land based alternative would be found, no further consideration was therefore given to an undersea option for delivery of the proposed Interconnector.

Consideration of proposed ISLES Project as a potential alternative to effect transmission interconnection.

56. The Irish-Scottish Links on Energy study (ISLES) was a technical study of a conceptual submarine HVDC network between Scotland, Wales and Ireland. The study was to design a network capable connecting major offshore wind farm arrays, and increasing electricity network interconnection

57. The project studied two conceptual HVDC systems that could connect Scotland, Wales and the island of Ireland. The northern HVDC system explored connecting between Scotland and Northern Ireland and offshore renewable generation. The southern HVDC system proposed links between the network in Ireland and Wales and the connection of a number of offshore wind developments. These two systems were not otherwise interconnected except through the existing AC systems on the Island of Ireland and Great Britain.

58. Due to the project being expected to be a long term development it assumes the presence of the proposed Interconnector as part of an interconnected power network on the island of Ireland. It also assumes the introduction and application of advanced HVDC technology (such as high capacity DC circuit breakers) that have not so far been developed or applied in practice.

59. The ISLES concept may be developed further by the jurisdictions however the timing of such development is uncertain. None of the three jurisdictions involved in the study has confirmed that funding will be available for completion of the project. On the basis of uncertainty and different initial objectives, NIE do not consider that the ISLES concept provides any sort of viable alternative option to the proposed Interconnector.

Consideration of HVDC Overhead Lines

60. A detailed examination of HVDC technology, and whether it represents a viable and appropriate choice for the proposed Interconnector, is set out later in this Chapter in the context of alternative underground solutions.

61. HVDC technology in Europe is most frequently used, in conjunction with submarine cable, to cross long stretches of water. The expense of the HVDC terminals and cable is justified in this case since HVDC is the only viable transmission technology for long sea routes.

62. HVDC overhead lines connections are viable over land, but these have not generally become cost effective until the route exceeds around 800 km.

63. An HVDC overhead line would require the construction of support structures of very similar form and appearance to those generally used for an AC overhead line, and would have an overall environmental impact that is broadly the same. NIE's consideration of this option concluded that an HVDC overhead line would present no significant environmental benefit (when compared against an AC overhead line) whilst presenting a significantly greater level of cost and operational risk because of the associated AC/DC converter stations that would be required at both ends of the circuit.

64. On this basis, NIE did not consider an HVDC overhead line to be an alternative that justified more detailed investigation.

Technology Alternatives Identified for Detailed Investigation and Comparison

65. Following the broad filtering process described above, the potential alternatives remaining for more detailed investigation and consideration were therefore the following:

Synchronous Technology Solutions

66. (i.e. those capable of forming an integral part of the existing AC transmission network)

- Alternating Current (AC) Overhead Line;
- AC Underground Cable; and,
- Hybrid arrangement adopting sections of AC underground cable within an overhead line circuit.

Asynchronous Technology Solutions

67. (i.e. those requiring conversion equipment to connect to the transmission network)

- DC Underground Cable (with required AC/DC conversion equipment at each power system connection point).

68. In relation to these remaining alternatives of AC or DC, overhead or underground, NIE and EirGrid recognised the need to ensure that the alternative technologies were fully and properly evaluated in relation to both up to date technology and the specific need as described in Chapter 2 to increase the interconnection of both transmission systems on the island of Ireland. NIE and EirGrid therefore jointly commissioned detailed and comprehensive studies into the available options.

4.2.4.7 Specific Studies Commissioned by NIE and EirGrid

69. Over the period of analysis, NIE and EirGrid have jointly commissioned five separate studies to further inform both companies about the latest available alternative transmission technologies, and also to assist the ongoing consultative and planning processes relevant to the overall interconnection development as applicable to elements being proposed within each jurisdiction.

70. Four of these studies were informed by specific data on the actual technical characteristics of the transmission systems within each jurisdiction on the island of Ireland and each performed by reference to the geographic locations and prospective routes applicable to the required transmission circuit. The studies were:

- **The Preliminary Briefing Note** (Parsons Brinckerhoff, Power Division [PB Power], 2008). A short report, published at an early stage in the project development process, drawing upon generic information to summarise in general terms the technical and cost issues associated with implementing the proposed transmission circuit.

- **The PB Power Study** (PB Power, 2009). A thorough report describing the conclusions drawn from a detailed study by PB Power following the publication of the Preliminary Briefing Note referenced above. The study was specific to the proposed Interconnector, and compared a high voltage overhead line transmission option with underground cable options utilising either AC or DC technologies.
- **The TEPCO Study** (TEPCO, 2009). A system wide study that considered the implications, for transmission system reliability and stability, of incorporating very long lengths, and large quantities, of High Voltage (HV) underground cable transmission infrastructure on the all-island AC transmission network. The study was performed by Tokyo Electric Power Company of Japan (TEPCO) who, as owner and operator of the world's longest existing underground cable circuit operating at a voltage of 400kV or above, is uniquely placed to bring its specific experience to bear on the subject.
- **The TransGrid Study** (TransGrid, 2009). A system wide study that considered the implications for transmission system reliability and stability of incorporating HVDC circuits into the integrated all-island AC transmission network. This study was performed by TransGrid Solutions (of Winnipeg, Canada), a consultancy with extensive international experience in the evaluation of HVDC technology. The study included specifically an examination of the viability of using an HVDC link as the basis of a second North – South Interconnector.
- **The Technology and Costs Update** (PB Power, 2013 – Appendix 4B of this ES). A report summarising the results of a further study carried out to update the information provided in the "PB Power Study" of 2009. The report includes a review of up to date technology and application developments worldwide. It also draws upon information and conclusions published within a number of recent relevant studies (including the International Expert Commission (IEC) Report (2012)) into the subject of transmission technology alternatives. A key output from the updated study has been to provide up to date comparative costs for the identified alternatives.

71. The objectives of each of these studies, and the conclusions set out in each of the associated reports, are described in further detail below.

4.2.4.8 Preliminary Briefing Note (PB Power 2008)

72. In late 2007 EirGrid and NIE instructed consultants PB Power to prepare a "Preliminary Briefing Note on Overhead and Underground Energy Transmission Options[85]" to identify the general technical and cost issues associated with implementing the overall 400kV transmission line development. The Preliminary Briefing Note was completed by PB Power in February 2008 and was subsequently issued by NIE and EirGrid. The Briefing Note described the key characteristics of both overhead line and underground cable options as alternatives for construction of the overall 400kV transmission line development.

73. PB Power's Preliminary Briefing Note set out a comparative overview of the technical and economic issues arising in respect of overhead line and underground cable transmission infrastructure options, with particular reference to the proposed Interconnector. The document noted that both AC overhead and AC underground technologies are proven in service, but found, in summary, that:

- HVAC overhead lines are used for the overriding majority (over 99 %) of EHV transmission infrastructure worldwide. The predominance of overhead line transmission infrastructure arises from the fact that it has been judged to represent the best balance from an economic, technical and environmental perspective, and also because it provides a well proven and reliable basis for establishing, running and maintaining an electrical transmission system;
- HVAC Underground cable technology had not yet been tried anywhere in the world for a transmission circuit approaching the route length of the proposed Interconnector;

[85] (PB Power, 2007).

- HVAC underground cable technology was significantly more expensive (by a factor of nearly nine, at that time) than HVAC overhead line technology. There could be considerable variation in cost ratios dependent upon site specific factors including the terrain and ground conditions; and,
- Underground cable technology was noted to play an important role in urban and congested areas, or where site specific environmental constraints occur, for example within a visually sensitive area (see Chapter 3 (Policy and Development Context – section 3.4.2, 3.4.3, 3.4.4, 3.4.5) for further discussion of the PSU policies of the PSRNI).

74. The Preliminary Briefing Note focussed primarily on AC technology. The document did not include a review of HVDC technology because, at this early stage in the project, it appeared that the high land-take and high costs of terminal stations would not offer any benefits over the AC solutions.

75. It should be noted that the cost comparison was focussed on the relative costs of the transmission circuit element only. The note did not include the cost of other equipment that would be broadly common to either an AC overhead line or an AC underground cable.

4.2.4.9 Comparison of High Voltage Transmission Options : Alternating Current Overhead and Underground and Direct Current Underground (PB Power 2009)[86]

76. A comprehensive project-specific, and site-specific, study carried out by PB Power, experienced international power consultants, comparing a high voltage overhead line transmission option with underground options utilising either AC or DC technologies.

77. The final report[87] on the comprehensive PB Power Study was completed in 12 February 2009. It was published on both NIE's and EirGrid's websites and circulated as part of the consultation process. The report considered the entirety of the 140km Meath – Tyrone Interconnection Development, but was arranged to present information relevant to each of NIE and EirGrid for the proportion of transmission circuit required in their particular areas of responsibility.

78. PB Power reported on the detailed assessment of alternative technologies of HVAC overhead transmission line, HVAC underground cable (UGC), and HVDC UGC. The comparisons of the technologies covered the areas of routeing feasibility, environmental impact, installation and cost difference, at a strategic and general level. The technical feasibility element of the assessment did not seek to establish the feasibility of operating a HVDC UGC or HVAC UGC on the all-island transmission network because this was known to require further more detailed power systems analysis (separately performed via the TEPCO and TransGrid studies described below).

79. The key findings from the report are summarised below.

<u>Overhead Lines</u>

80. The transmission of electrical energy worldwide is primarily based on high voltage alternating current (HVAC) overhead line technology.

81. Over 98% of the onshore extra high voltage electricity transmission network in Europe (European Union, Norway and Switzerland) is of HVAC overhead line construction, with the balance being underground or undersea cable. Underground cable is mainly applied in urban or environmentally sensitive areas.

82. HVAC overhead line transmission is most common, primarily because it represents the lowest cost technically feasible approach to establishing and maintaining a secure electrical power grid. Global transmission development activity suggests that this preference by utilities for the use of overhead line is likely to persist into the future.

[86] (Parsons Brinkerhoff, 2009)

[87] The PB Power report makes use of the acronyms OHL (meaning "overhead line") and UGC (meaning "underground cable").

Underground Cables

83. A number of countries have been actively considering the use of UGC in their transmission systems. However, the rate at which transmission circuits are being installed underground is very low.

84. Since the longest cross linked polyethylene insulated (XLPE) transmission cable circuit runs for some 40 km (and this in a tunnel), and since most such circuits are less than 20 km long, the 140 km installation required for the overall interconnection development would be a "world first".

85. The report identified a continuous and technically feasible strategic UGC route search corridor that satisfied the routeing criteria for the Interconnector project, and this was the route applied to the calculation of indicative construction costs quoted within the report.

Construction Schedules

86. Technically and organisationally, an overhead line solution could be delivered quicker (2 to 3 years) than an UGC solution (3 to 4 years). Land owner access consent, which is likely to be an issue for either approach, was recognised to be beyond the scope of the report.

System Security

87. System security all over Europe relies upon the relatively high availabilities provided by overhead line networks. Whilst underground cables suffer fewer weather-related faults than overhead lines, extended cable repair times have caused their overall availability to be lower.

88. Even a double circuit UGC performance may not match that of a single circuit overhead line over the long term. The introduction of significant quantities of UGC in strategic transmission routes within the island of Ireland may thus compromise system security.

Energy Losses

89. Reactive compensation and cable charging currents associated with underground cables would cause the losses of a 2-core per phase 1200mm^2 aluminium cable to be higher than for the proposed overhead line for average circuit transfers below about 900 MVA. For circuit transfers above this level, UGC losses would be lower than those of the overhead line losses. Adoption of a somewhat more expensive 1600mm^2 aluminium UGC design would lower this cross-over point to around 840 MVA.

90. To satisfy the system planning 'N-1 criterion'[88] the peak load on the proposed 400kV interconnector, under normal operating conditions, should not exceed 750MVA (50% of its capacity). Based on this an average power transfer of 500MVA is considered appropriate for calculating the expected operating losses. At this level of power transfer the lifetime operating losses for the overhead line option would be significantly lower than those of the UGC option.

Environmental impact and EMFs

91. Overhead line installations have the potential to impact visual amenity in certain environments, though this may be mitigated by careful routeing. Their effects on other aspects of the environment are more limited since, apart from the sites of tower foundations, they fly over most natural heritage (flora and fauna) and cultural heritage (archaeological) features.

92. Underground cable installations have the potential to impact upon natural heritage and cultural heritage, particularly archaeological features. This impact would be best mitigated through a

[88] NIE Explanatory Note : The "N-1 Criterion" is a planning standard. It refers to the need for a transmission system to remain capable of continued operation following the loss of one, usually the largest, circuit.

combination of careful route selection and a comprehensive programme of land and facility reinstatement following the construction works, avoiding altogether designated areas if possible.

93. Electric fields from the proposed overhead line, and magnetic fields from both the proposed overhead line and the underground cable alternatives, would all be lower than European and Irish adopted ICNIRP[89] Basic Restriction guideline limits.

HVDC

94. HVDC transmission does not naturally integrate with HVAC systems, and does not impart to the network the natural resilience of HVAC connections. HVDC is inherently more complex than HVAC in all respects: design, construction, testing, maintenance, and operation.

95. An HVDC link would provide no advantage to the system operator in this particular application, and the terminal stations would require an HVDC link to have more planned outages than its HVAC equivalents. For these technical reasons HVDC was not recommended over the proposed overhead line connection.

Construction and Lifetime Costs

Using HVAC technology

96. PB Power estimated that the overall construction cost of HVAC overhead line for the whole Meath – Tyrone interconnection development route (including interest during construction) would be in the order of €80m. In comparison, it was estimated that the overall construction cost of HVAC UGC for the whole route would be around €590m. This represented an additional cost to complete the Project with UGC of some €510m, or more than seven times the OHL estimate.

97. The report estimated that the 40 year lifetime running costs of HVAC OHL for the whole Meath – Tyrone interconnection development route would be in the order of €45m. In comparison, it estimated that the lifetime running costs of HVAC UGC over the whole route would be around €75m. This represented an additional lifetime running cost for the Project with UGC of about €30m, or a little over one and a half times that for OHL (average transfer of 500MVA assumed).

Using HVDC technology

98. Similarly, for HVDC with underground cable connections, it was estimated that the overall construction cost of HVDC links between Co. Meath and Co. Cavan, and between Co. Cavan and Co. Tyrone (including interest during construction), would be some €670M. This represented an additional cost to complete the Project with HVDC of around €590M, or more than eight times the OHL estimate.

99. A calculation of the 40 year lifetime running costs of these HVDC links for the whole Meath – Tyrone interconnection development route would be around €105m. This represented an additional lifetime running cost for the Project with HVDC of about €60m, or more than twice that for OHL (average transfer of 500MVA assumed).

4.2.4.10 Technical Study on using HV Underground Cables as Alternatives to Overhead Lines (TEPCO, 2009)

100. TEPCO were instructed to perform a system-wide study to consider the implications, for overall transmission system reliability and stability, of incorporating long lengths of high voltage underground cables within the existing ‘all-island’ AC transmission network. The study was performed by Tokyo Electric Power Company of Japan (TEPCO) which, as owner and operator of a 40km 500kV cable

[89] NIE Explanatory Note: ICNIRP is the abbreviation of the International Commission on Non-Ionizing Radiation Protection.

circuit (the world's longest >400kV underground cable circuit), is uniquely placed to bring its specific experience to bear on the subject.

Background and Objectives

101. A key technical concern with the use of underground cables within a predominantly overhead transmission network, and an area expressly highlighted by the PB Power study, is the potential for network instability and damage arising from voltage and frequency fluctuations under certain power flow conditions. These effects result from significant differences in the electrical performance characteristics of overhead lines and underground cables, due to their different electrical characteristics.

102. Since the worldwide experience with underground transmission cables is limited, and since the possibility of applying underground cable to the proposed Interconnector would represent a significant proportion of the relatively small transmission network on the island of Ireland, both NIE and EirGrid determined a need to understand more fully the potential consequences of introducing underground cable technology as part of their overall assessment of the technical alternatives.

103. TEPCO were requested to address three basic questions in relation to AC underground cable technology:

- What is the potential impact on the all-Island transmission system of installing considerable lengths of HV underground transmission cable, either individually or in aggregate?
- Is it feasible to install 400kV underground cable instead of overhead line as a link between Turleenan in County Tyrone and Kingscourt in County Cavan, and then on to Woodland in County Meath?
- Is it feasible to underground parts of a Turleenan – Kingscourt – Woodland 400kV overhead line circuit?

Technical Background to the TEPCO Study

104. An element of technical background is required to put the above questions into context.

Reactive Power

105. HV transmission underground cables are very capacitive in nature. Capacitance forces the voltage upwards, so if uncompensated, the voltage at the receiving end of an HV underground transmission cable will be considerably higher than the voltage at the sending end. Even by compensating for the capacitance at each end of the underground cable, the voltage somewhere in the centre of the underground cable can become unacceptably high and prematurely age the insulation, and this may require additional compensation at positions along the length of the underground cable.[90] Compensation for the underground cable's capacitance takes the form of large coils or reactors which absorb the capacitive currents, and these must be installed above ground within specialised substations situated along the route of the underground cable.

Resonance

106. The very high level of capacitance across the insulation between the conductor and the outer sheath of an HV underground transmission cable introduces the possibility for resonance with the inductance of the external system at a particular frequency. Resonance arises from the interaction of capacitance and inductance within an electrical circuit. A common everyday example of this is the tuning circuit in a radio, which responds most strongly when these two characteristics reach a critical combination. It is very important to prevent this phenomenon from occurring within a transmission system, since it can

have dangerous and damaging consequences for transmission system equipment, leading to the widespread failure of electricity supply.

107. Wherever long sections of HV underground transmission cables are installed within a transmission system, it is typical to also install large amounts of reactive compensation to manage the reactive power and voltage profile within the cables. This is necessary to optimise power flow conditions and reduce electrical losses, but it also creates low frequency resonance conditions.

108. Since the transmission system supplies energy at 50Hz, it would be disastrous if 50Hz was the resonant frequency. But there are various other key frequencies to be avoided. Most of these are multiples of 50Hz. While the transmission system normally operates at 50Hz, its actual frequency (or speed) can vary between 48Hz and 52Hz during system abnormal operation. So multiples of frequencies in that range could also be a problem. Resonance of this type could lead to voltage spikes risking insulation failure and significant damage to the cable. Over the life of a transmission system there is an unacceptable risk of this phenomenon.

Cable Joints

109. A cable circuit of the size and type applicable to the proposed Interconnector would require three separate underground cables, one for each phase conductor. As noted in the PB Power report referenced above, if underground cable were to be used for the proposed Interconnector this would require the use of two separate cable circuits (six separate cables) in order to provide the required power transfer capacity. For practical reasons associated with the size and weight of the cables, they would need to be transported to site in discrete lengths that would be connected together using specialised cable joints, each of which must be made on site. There would be a large number of buried cable joints throughout the length of the underground cable, and each joint is a source of potential failure and poses a reliability risk for the overall cable circuit.

110. The metallic outer sheath of an underground cable is usually earthed and cross-bonded at every joint position to prevent voltage rises that could present a safety risk, either in normal operation or under lightning conditions (under which travelling impulses from a strike on the above ground cable terminals can present transient voltage rises throughout the cable length). NIE Safety Recommendation 55/4 imposes a maximum of 155V induced voltage on underground cable sheaths during normal operation, and this requirement may limit the maximum distance between joints to between 600 and 800m. This could result in up to 1,440 joints on the six separate cables that would need to be used for the overall development between Tyrone and Meath. Each of these joints would be a possible point of weakness, and a possible source of voltage excursions in the event of a system disturbance such as a lightning strike.

Summary of Conclusions Reached by the TEPCO Study

111. Question 1 - What is the potential impact on the all-Island transmission system of installing considerable lengths of HV underground cable, either individually or in aggregate?

- The studies performed by TEPCO indicate a number of potential difficulties, some of which are severe, but the overall conclusion is that the majority of situations can be compensated through the use of available technologies and equipment. The level of overall difficulty rises sharply with increasing aggregate lengths of cable however, and it is therefore observed that the installation of a significant length of cable at any point on the network will reduce the overall capacity of the network to absorb further lengths of cable elsewhere on the island in the future.

112. Question 2 - Is it feasible to install the 400kV link between Turleenan in Northern Ireland and Kingscourt in County Cavan and on to Woodland, County Meath, a total of approximately 140km, as 400kV underground cable instead of overhead line?

- The studies that have been performed on the specific circuit applicable to the proposed Interconnector demonstrate a number of significant design risks in order to avoid the possibility of switching overvoltages arising from parallel resonance conditions. However, the overall conclusion (as for the general case above) is that it should be possible to compensate for these conditions. A large amount of reactive compensation (i.e. additional inductive reactance in the form of a large coil, or "winding", similar to that found within a transformer) would be required at each of the proposed terminal points plus an additional reactor approximately half-way between Turleenan and Kingscourt. It would also be necessary to apply particular care to the design of the protection and insulation co-ordination systems in order to ensure safe operation.

113. Question 3 - Is it feasible to underground parts of a Turleenan – Kingscourt – Woodland 400kV overhead line circuit, which is approximately 140km in total?

- The study indicates that certain circumstances applicable to cable sections within an overhead line circuit produce potential conditions that are "serious and threatening" insofar that they could create significant overvoltage conditions capable of harming the cable and causing supply disruption. If cable sections were to be proposed then it would be necessary to perform further detailed studies relating to the particular positions and lengths of these sections in order to determine the measures that might be taken to ensure safety and stability on the overall circuit. Whilst certain arrangements may be possible with careful design, others will not.

4.2.4.11 Investigating the Impact of HVDC Schemes in the Irish Transmission Network (TransGrid, 2009) [91]

114. TransGrid were instructed to perform a system-wide study that considered the implications, for transmission system reliability and stability, of incorporating high voltage DC (HVDC) circuits into the integrated all-island AC transmission network. (Note: it should be recognised that HVDC systems, although very advanced and widely used throughout the world for providing an interconnection for electricity transfer between two separate power systems, are rarely applied as an embedded link within a synchronised and meshed AC power system. Given that the Interconnector is required to perform as a synchronised link within an integrated network, it is this issue that has been the primary source of technical concern in regard to the application of HVDC technology for the Interconnector).

115. The TransGrid study indicated that replacing the proposed 400kV 1,500MVA AC overhead line with a HVDC solution is generally technically feasible - but would present no significant technical or environmental advantages and a number of operational limitations.

116. Typically HVDC is attractive for overhead line lengths above 1,000km or undersea cables greater than 50km or where the systems to be linked have different frequencies or excessive fault levels.

117. The study included specific analysis of the implications for installing an HVDC link in parallel with the existing 275kV interconnection circuit between Northern Ireland and the Republic of Ireland. The Tandragee – Louth double circuit tower line is an AC circuit which establishes a synchronous link between the power systems on both parts of the island. This means both parts operate at exactly the same frequency and are constantly synchronised. Any loss of this link leads to loss of synchronism between both parts of the all island network and potential deficit or surplus of generation on each of the two separated networks. This risk is currently managed by limiting the flows across the existing interconnector to prevent instability of the power system in the event of a loss of synchronism (and this is the primary reason for the present constraint applying to the existing network).

118. The TransGrid study examined the consequences of the sudden loss of the Tandragee – Louth Interconnector in the scenario where the second Interconnector had been constructed as a HVDC link. The study indicated that in these circumstances, the HVDC link would have to automatically adjust to replicate the total power system transfers at a point in time immediately before the fault occurred. This process requires complex electronic processing and control systems to be established. However, the report demonstrates that even with this advanced system in place and fully operational, the power system conditions arising from expected lower levels of conventional generation in Northern Ireland (which lead to reduced power system fault levels) could result in the Moyle Interconnector operating

[91] (Transgrid Solutions, 2009)

below its design fault level potentially resulting in excessive harmonic distortion and interference with telecommunication equipment.

119. The TransGrid report also warned that the complex control systems, or special protection systems, required to safely operate an HVDC link within a meshed AC system have a risk of maloperation. A maloperation of the automatic controls on such an HVDC link could result in system collapse and very evident serious consequences across the entire island of Ireland.

120. The report concluded *“Based on the selected power flow cases and contingencies that were studied, there were no significant technical advantages identified for the use of HVDC transmission for the North-South Interconnector.”*

4.2.4.12 Comparison of High Voltage Transmission Options : Alternating Current Overhead and Underground and Direct Current Underground (PB Power 2013) Technology and Costs Update[92]

121. This Addendum to the 2009 PB Power Study report was completed in April 2013. NIE and EirGrid requested PB Power to update their 2009 report to take account of scientific advances in the development of new, feasible transmission technologies, and also to review the cost estimates for practical transmission configurations. The updated PB Power report does not revisit the technical issues examined by TEPCO and TransGrid because these issues, which are inherent to the technology, remain unchanged.

122. The PB Power Electricity Transmission Costing Study published in 2012 by the UK Department of Energy and Climate Change (DECC) was used as a source of information for the technology and cost update. PB Power Transmission specialists made estimates based on recent contracts and experience where data was not available from the DECC Report.

123. The Executive Summary of the PB Power Addendum report is set out below:

> *“Significant changes are currently planned for the structure of the island of Ireland electricity supply network. One major component of the plan, an interconnector often referred to as “the North-South Link (N-S Link), comprises two single transmission circuits linking Tyrone to Cavan and Cavan to Meath.*
>
> *Overhead line (OHL) has been the standard transmission technology around the world for many years, however feasible alternatives to OHL do exist for some transmission applications so, in 2008, EirGrid and Northern Ireland Electricity (NIE) jointly commissioned Parsons Brinckerhoff to consider the alternatives to 400 kV alternating current (AC) OHL for the N-S Link.*
>
> *The results of this study, which included on-site assessments as well as a desk-top review by technical specialists, was reported in February 2009....and is referred to in this document as the ‘2009 Report’. However, in order to pursue their planning applications, NIE and EirGrid now require an update of the technical options and cost estimates provided there. They have thus requested Parsons Brinckerhoff to provide this cost update in the light of any recent technical developments. This present document reports the results of that task.*
>
> *Comparative cost estimates have been provided for 400 kV AC overhead line and underground cable (UGC) options, and for a high voltage direct current (HVDC) voltage sourced converter (VSC) underground cable option. In all cases the estimates assume the full Tyrone – Cavan – Meath route would be built.*
>
> *Alternative configurations of the HVDC options have been considered – in particular, the use of 1500 MW capacity converters and HVDC circuit breakers, and exploitation of the existing HVDC East-West interconnector. However, some of these technologies are still*

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[92] (Parsons Brinkerhoff, 2013)

developing into commercial reality, and a separate 3-terminal link using 720 MW terminals, as costed and compared in this document, appears to be the best techno-economic HVDC option at present.

These cost estimates offer a comparison between alternative technologies for the N-S Link, but do not attempt to include all the costs for the final N-S Link project. In particular, other work at the three connecting substations, and work on other parts of the network that might be required at the same time, is not included. We provide single line diagrams that indicate, for each alternative, what equipment has been costed.

Whole-of-life cost estimates are presented – that is, the cost of planning and constructing the equipment, and the cost of running it throughout its life. The discounted cash flow technique is used to compare these lifetime costs; a discount rate of 8.1% is applied – see Section 3.2 of this document (i.e. the PB Power report) *for further details.*

Our estimates for the full Tyrone – Cavan – Meath route are summarised in the following table. Please note that the currency values here have been rounded to the nearest €5M.

	Total: Turleenan - Kingscourt - Woodland €M		
	AC OHL (base case)	**AC UGC**	**HVDC-VSC UGC**
Construction + IDC	125	890	990
Transformers and switchgear	40	45	15
Construction Total	165	935	1005
Lifetime running	55	90	110
40 year replacement	5	45	55
Whole of life Total	225	1070	1170
Lifetime difference above OHL (€M)	0	845	945
Construction difference ratio (times)	1	5.7	6.1
Lifetime difference ratio (times)	1	4.8	5.2

The above costs are presented separately for each Company – NIE, and EirGrid – in Appendix B of the PB Power Report.

In summary, the most cost effective solution for the proposed N-S Link would be an AC overhead line, estimated to cost around €165M to construct and around a further 35% of this to run over its lifetime.

An AC underground cable is estimated to cost over 5.7 times as much as AC overhead line to construct, and would also cost significantly more than overhead line to run, over its lifetime.

Similarly, HVDC UGC links would be expected to cost 6 times as much as AC overhead line to construct, and would then cost twice as much as overhead line to run, over its lifetime."

4.2.5 Further Specific Technical Studies and Reports of Direct Relevance to the Proposed Interconnector

4.2.5.1 Overview

124. There are a number of other technical studies of relevance, two of which were specifically focused on the proposed interconnection. These are:

- **The ECOFYS Study (2008).** A study on the Comparative Merits of Overhead Transmission Lines versus Underground Cables, performed on behalf of the Irish Government;
- **UK Electricity Transmission Costing Study (2012**). This study was performed on behalf of the UK Department of Climate Change (DECC) with the purpose of informing the Infrastructure Planning Commission (IPC) in regard to the costs of feasible transmission options; and,
- **The International Expert Commission (IEC) Report (2012).** A review of the case for undergrounding (all or part of) the Meath Tyrone 400kV power link, performed on behalf of the Irish Government.

125. The objectives of each of these studies, and the conclusions set out in each of the associated reports, are described in further detail below.

4.2.5.2 Study on the Comparative Merits of Overhead Transmission Lines versus Underground Cables (ECOFYS)[93]

126. Separately to reports and studies commissioned by NIE and EirGrid, the ECOFYS "Study on the Comparative Merits of Overhead Electricity Transmission Lines Versus Underground Cables", commissioned by the Government of the Republic of Ireland (via the Department of Communications, Energy and Natural Resources[DCENR]) and published in July 2008 (the ECOFYS Study), had as its brief *"to provide the best available professional advice to the Minister on the relative merits of constructing and operating overhead transmission lines compared to underground cables, having regard to technical characteristics, reliability, operation and maintenance factors, environmental impact, possible health issues, and cos*t". The ECOFYS Study is available on the DCENR website.[94]

127. Chapter 3 of the ECOFYS Study refers to current international practice, and confirms in Table 3-1 (p.38) that globally, the vast majority (over 99%) of the 315kV-500kV transmission grid is by means of overhead lines. In particular, it states that "*Until now, 400kV to 500kV AC cables for transmission are nearly exclusively used in short sections in urban areas and only rarely in open country*" (p.38). Underground cables are generally used in areas of high population density or high land values – generally urban areas - where it is difficult to find suitable overhead line routes. This is consistent with the publicly stated positions of NIE and EirGrid on this matter, and with the conclusions of the PB Power study. This is also consistent with PSU 11 (see Chapter 3 of this ES for further details).

128. The ECOFYS Study refers specifically to the example of Denmark, where approximately one-third of the world's HV underground XLPE[95] transmission cables have been laid; however, currently the longest underground cable project implemented in that country is only 20km in length and consists of two circuits divided by a transmission substation. In addition, the graph in Figure 3–5 of the ECOFYS Study (p.41) shows that, by 2006, the combined length of all of the 400kV XLPE cables installed in Europe was only 160km. The longest underground cable of 400kV or greater in the world (which is installed in Tokyo) is 40km in length.

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[93] .ECOFYS, 2008.

[94] www.dcenr.gov.ie.

[95] XLPE, which stands for "cross-linked polyethylene" is the type of insulation most widely used for modern HVAC cables.

129. Whilst decisions may be taken to underground lower voltage networks of distribution systems, this is not normally applied to the higher voltage networks of transmission systems, as the technology involved is substantially different and more demanding. The ECOFYS Study concludes in this regard that while underground cables may, in general, "*be justified with the growing number of successful cases worldwide, care is required as most existing underground cable cases are not representative of transmission*" (p.51).

130. Chapter 4 of the ECOFYS Study provides generic information regarding design characteristics of the various relevant technology options – namely 400kV AC overhead lines and 400kV AC underground cables. The study concludes in this regard that "*With more than 50 years of experience overhead lines are state-of-the-art and are the reference technology for transporting large amounts of electric power over distances of several hundreds of kilometres*" (p.53).

131. Chapter 4 of the ECOFYS Study also provides information on the two variants of HVDC transmission, referred to here as VSC (voltage source converter) and CSC (current source converter). The Study concludes that, unless there was some very specific system requirement for a HVDC transmission circuit, for the circuit lengths expected in Ireland, a case cannot be made for embedding a HVDC transmission circuit in the HVAC network due to the higher capital costs and operating costs – "*for distances as discussed in Ireland, HVDC does not offer economic advantages in common transmission system projects*" (p.186).

132. Chapter 5 of the ECOFYS Study presents a comparison of specific techno-economic characteristics of these systems, addressing issues of transmission system adequacy, operation and maintenance, and costs. The conclusions of this Chapter are that from a capital cost point of view "*overhead lines are the most attractive option. This does not change significantly when operating costs are included to give a whole life cycle analysis*". From a performance and power system adequacy point of view "*The expected Forced Outage Rate of underground cables are estimated by a variety of sources to be at least one order of magnitude higher than that of overhead lines. From a transmission adequacy perspective both technologies do not yet offer the same performance and, hence, are not equivalent".* These conclusions are consistent with the stated joint position of NIE and EirGrid on this matter.

133. Chapter 6 of the ECOFYS Study is a comparison of the environmental impacts of the two technologies. It opens with the quotation *"Any economic or social development project will result in an insertion into the environment and the reduction of the impact of this insertion has a cost: Zero impact on the environment is not a realistic possibility, and a balance is the key solution*". The Study then goes on to compare the impacts of the two technologies under the following headings:

- Land Use;
- Geology and Soils;
- Water Resources;
- Ground Restoration;
- Ecology and Nature Conservation;
- Landscape and Visual;
- Cultural Resources;
- Traffic and Noise;
- Air Quality;
- Communities; and,
- Recreation and Tourism.

134. The findings of the comparative analysis are summarised in Table 6-1 of the ECOFYS Study. Not surprisingly, both technologies are found to have an environmental impact but these impacts are different for the different technologies. In general underground cables are found to have a greater environmental impact than overhead lines in terms of Land Use, Geology and Soils, Water Resources,

Ground Restoration, Ecology and Nature Conservation, Traffic and Noise and Air Quality. The impacts of the technologies in terms of Cultural Resources are found to be similar in significance, while overhead lines are found to have a greater environmental impact than underground cables in terms of Landscape and Visual, Communities and Recreation and Tourism.

135. Of particular note, the ECOFYS Study distinguishes between perceived health risks associated with EMFs, (though acknowledging that these can lead to an increased sense of anxiety within a community), and actual health risks associated with EMF. In respect of actual health risks arising from exposure to EMFs from transmission infrastructure, the ECOFYS Study concludes in this regard as follows:

> *"Based on the limits published by the International Commission on Non-Ionising Radiation Protection (ICNIRP) [ICNIRP 1988] the WHO recommends a permanent exposure level to magnetic fields below 100 µT and this recommendation has been adopted by the EU (1995/519 EC) and many non-EU countries. EirGrid designs and operates transmission assets according in line with these guidelines" (sic). (p.120)*[96]

136. The ECOFYS Study notes that expected greater public opposition to an overhead line development will tend to increase construction time for that development. On the other hand, the relatively limited availability of high-voltage underground cables and associated components, and technical and civil engineering construction challenges may impact upon the development programme and deliverability.

137. The ECOFYS Study was published in July 2008, and recorded the following primary conclusions (Extract below; copy of letter attached at Appendix 4A):

- The Study notes that, internationally, diminishing public acceptance for new overhead lines has become an important driver for the assessment of underground cables as an alternative. The Study also reported the continued technology development in the field of underground cables at high and extra high voltages;
- The Study stated, however, that the size and number of existing underground cables internationally was limited and the majority of existing projects did not represent transmission connections in conventional networks. It also noted that underground transmission cables can be expected to have forced outage rates (likelihood of unplanned system breakdowns) which are at least ten times higher than that of overhead lines. This is a severe limitation for underground cables. Currently, underground cables do not therefore compare to overhead lines in terms of adequacy of the electricity transmission system and in terms of reliability and security of electricity supply;
- For two case studies the Study revealed the capital costs of underground cables would be about five times that of overhead lines and the lifecycle costs would be about three times that of overhead lines[97]. Further, the Study noted that the cost estimates for underground cable proposals rely on assumptions derived from limited experience and provisional industry information and could therefore be even higher; and,
- In relation to electro-magnetic fields, the ECOFYS Study noted that EirGrid[98] designs and operates overhead lines in compliance with WHO guidelines on magnetic field exposure. In practice, under normal operating conditions in Ireland, magnetic field strengths directly under transmission lines are as low as 10 – 20% of the WHO guidelines.

138. A key conclusion of the final ECOFYS Study was that "the difference in transmission adequacy is the defining criterion when comparing the technologies. Other aspects certainly affect the technology

[96] Both NIE and EirGrid operate transmission infrastructure in accordance with established national and International guidelines.

[97] These are different cost ratio estimates from those given in the PB Power study commissioned by NIE and EirGrid. The ECOFYS Study was a high level desktop study, whilst the later study performed by PB Power was a detailed study that was based on specific information applicable to the transmission system on the island of Ireland and upon the actual terrain applicable to the proposed connection route.

[98] NIE also designs and operates all overhead lines in compliance with the WHO guidelines.

evaluation. However, any of the advantages of underground cables which were identified in the study cannot compensate for the negative impact on transmission adequacy”.

139. It should be noted that there have been some advances in HVDC VSC technology since the ECOFYS report was written. This was one of the reasons for commissioning the PB Power Costing Update. The primary conclusions expressed in 2008 as above however are not affected by these changes and therefore are still valid.

4.2.5.3 UK Electricity Transmission Costing Study (2012)[99]

140. This study was performed by Parsons Brinkerhoff on behalf of the UK Department of Climate Change (DECC) with the purpose of informing the Infrastructure Planning Commission (IPC) in regard to the costs of feasible transmission options. The study and report, whilst commissioned by DECC and National Grid, was overseen by the Institution of Engineering and Technology. The commissioning organisations were excluded from the preparation of the report, except for a late review for factual accuracy by National Grid.

141. Route lengths between 3 and 75 km, circuit capacities between 1600 and 3500 MVA, and the technologies of AC OHL, UGC, and GIL (Gas Insulated Transmission Lines) were considered alongside that of submarine HVDC. Amongst the main findings of the study (in regard to AC technology) were the following:

- Overhead Line is the lowest cost transmission technology, with lifetime cost estimates for double circuit 400kV connections varying between £2.2m and £4.2m per km, depending upon length and circuit capacity; and,
- Underground cable, direct buried, is the next cheapest technology after overhead line, with lifetime cost estimates for double circuits varying between £10.2m and £24.1m per km, depending upon length and circuit capacity. Operating losses for UGC start at a higher base than those for OHL, but are less sensitive to circuit loading.

4.2.5.4 Meath Tyrone Report, Review by the International Expert Commission[100]

142. In July 2011 the Republic of Ireland’s Minister for Communications, Energy and Natural Resources, Mr Pat Rabbitte TD, appointed an International Expert Commission (IEC) of three international specialists to review expert literature already available both in Ireland and internationally, and report on the case for, and cost of, undergrounding the Interconnector.

143. The Commission reviewed the findings of the TEPCO, TransGrid, ECOFYS and PB Power reports, with their findings generally being upheld. The main comments relate to better understanding of the VSC HVDC cable alternative that has emerged over the recent years since other reports were completed. Notably however, the Commission was not persuaded by the ASKON report (see further below), concluding that its findings were not consistent with industrial practice for other similar projects in Europe.

144. The report of the IEC[101] was published in January 2012. It examined five reference projects of relevance in comparison with the proposed Interconnector. As a part of this examination the Commission concluded that the technical solution must be designed to accommodate local conditions.

145. The report suggested that whilst HVDC had some advantages there were also issues relating to installation costs, metal prices, a limited supply base, and cost uncertainty relating to this new technology. These issues are due to the fact that there are only a small number of European projects being considered and being constructed using this HVDC VSC technology presently. Of the 8

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[99] IET / DECC, 31 January, 2012 http://www.theiet.org/factfiles/transmission-report.cfm

[100] Meath-Tyrone Report, Review by the International Expert Commission, August – November 2011.

[101] Available at www.dcenr.gov.ie.

contracted projects in 2010/11 only one of these is to be operated higher than 320kV. From the European examples considered, the France Spain 65km HVDC link was the only solely land based Interconnector and was estimated to cost €750m for the project which includes a €120m 8.5km tunnel.

146. The Commission's report stressed that an overhead line still offered significantly lower investment costs than any underground cable alternative. The report specifically recommended against a fully underground AC solution. However, the report observed that if the link was required to be undergrounded, wholly or mainly, that it should incorporate HVDC VSC technology.

4.2.5.5 Other Reports to Note

ASKON Report (2008) (produced for NEPP):

147. This report was taken into account; it did not introduce any feasible new alternatives not already considered. Further, the conclusions of this report were addressed in the IEC Report, which has been referenced above. Notably the Commission was not persuaded by the ASKON report, concluding that its findings were not consistent with industrial practice for other similar projects in Europe.

EirGrid Final Re-Evaluation Report (2013)

148. This report was also taken into account. Its findings did not raise any issues which occasioned further consideration or assessment beyond that which has been described above.

4.2.5.6 A Summary of Conclusions drawn from independent expert studies and reports in regard to alternative technology choices

149. The main findings from the various reports relevant to this particular project are as follows:

- The PB Power Study (2009) indicated that the vast majority (98%) of onshore EHV network in Europe is overhead. It also indicated that there is a feasible UGC route search corridor for the length of the proposed N-S connection. However, it estimated that an HVAC underground solution would be over seven times more expensive that overhead, whilst HVDC would be more than eight times more expensive (however see also the 2013 PB update to these figures, referenced below);
- The ECOFYS study highlighted that, to date, 400kV cable had only been installed in short lengths, and mainly through urban areas (in locations where overhead lines are not achievable). The longest XLPE transmission cable in the world (which is installed in Tokyo) is only 40km in length;
- The TEPCO report by the company responsible for the Tokyo cable highlighted that there would be risks to continuity of supply associated with undergrounding the whole interconnector using HVAC cable, due to resonance and the consequential failure of critical equipment;
- The TransGrid report indicated that in theory an HVDC connection could be made to work with the existing network. However, for the loss of the existing 275 kV AC Tandragee – Louth circuits, there would be a fault level close to the minimum design level required for operation of the Moyle interconnector – again risking continuity of supply;
- The TransGrid report also highlighted that such an HVDC scheme would require a special protection scheme that would adjust the HVDC power flow immediately after the loss of the Tandragee – Louth interconnector. The report warns that such a "special protection scheme" would rely on remote signals and would be prone to error and mis-operation." The report also advised that there would be difficulties in fully testing the installation, because testing would require the actual tripping of the 275 kV interconnector which would risk an all-island blackout;
- The IEC report recommended against the use of HVAC underground cables and confirmed that overhead lines represent the technology option of choice. The report also indicated that, if undergrounding was essential, then VSC HVDC technology with XLPE cables should be used. However, although the IEC report drew this conclusion about the use of HVDC, it did not address the specific technical issues raised in the TransGrid report regarding an HVDC option and did not

assess environmental impacts. Importantly, too, this IEC conclusion specifically ignored the future need for additional connections along the proposed route.; and,

- The Technology and Cost Update (PB Power 2013) has concluded that an HVDC solution has estimated the cost of the HVDC alternative to be around six times more expensive than the proposed AC overhead option.

4.2.6 NIE's Review and Consideration of HVDC Technology as an Alternative to HVAC Technology for the Proposed Interconnector.

150. In 2009 when preparing the ES associated with the 2009 application for planning approval, NIE considered HVDC technology as an alternative to the then AC proposal. NIE's conclusion at that time was that HVDC is not an acceptable alternative to the proposed AC solution since:

- It would not be the least cost technically and environmentally acceptable solution;
- It would not facilitate future grid connections and reinforcements; and,
- Its use would not be in compliance with good utility practice.

151. This conclusion was supported by the findings of the ECOFYS Report and also by the findings of the PB Power and TransGrid Reports, both of which were commissioned jointly by EirGrid and NIE (see above).

152. The publication in January 2012 of the report by the International Expert Commission (IEC), although supportive of the conclusion that overhead line remains the technology of choice, alluded to the possible acceptability of HVDC technology for this Proposed Development. As noted above, the IEC has indicated that if the proposed Interconnector were <u>required</u> to be placed underground, then the fast developing HVDC VSC technology would be technically capable of performing the required functionality and would therefore become a viable alternative.

153. NIE is familiar with the latest developments in HVDC technology, and notes that HVDC VSC technology has been applied to the design and construction of the recently commissioned East-West Interconnector that connects between Ireland and Britain and which is owned and operated by EirGrid. This 500MW East-West Interconnector is the largest and most modern VSC HVDC system in operation in the world today. The only significant differences between the version of VSC HVDC employed on the East-West Interconnector and the next version of VSC HVDC is that the efficiency of the conversion process in the newer version has been improved, thus reducing the electrical losses, and the DC voltage has increased, allowing greater power capacity.

154. NIE has considered the latest position in relation to the most up to date technology as part of a thorough assessment of a VSC HVDC circuit versus a standard high voltage AC circuit for the implementation of the proposed Interconnector against the following Key Objectives (KO).

<u>KO1 - Compliance with all relevant health and safety standards</u>

155. Both options are equally compliant.

<u>KO2 - Compliance with system reliability and security standards</u>

156. Both technologies can be considered to be reliable in their own right. However the proposed Interconnector will form the North – South backbone of the 'all-island' transmission network, and is required in order to enable the two networks, north and south, to operate as if they were one network. This is a very different requirement to that of the East-West Interconnector which connects between two independently operated networks. To the Irish transmission system, whenever the East-West Interconnector imports electricity from Britain, it appears like a source of electricity, equivalent to a

generation station, with the quantity of power imported being controlled by the operator. Conversely, whenever the East-West Interconnector exports electricity, it appears to the Irish transmission system as a consumer of electricity. In either case, it acts at the periphery of the network, controlled by human intervention in a pre-planned manner.

157. However, operation of the proposed North-South Interconnector would be quite different. It would be an integral part of the 'all-island' meshed network, and as such would have to react instantaneously to dynamic system changes such as rises and falls in system demand, and sudden and unplanned changes in system configuration due to trips on other circuits. If the proposed Interconnector is of standard AC design then it would achieve these requirements naturally and instantaneously, without any input from a human operator.

158. A DC installation, on the other hand, would not naturally integrate within an AC network and will not react to such changes unless prompted to do so by a controller. In these circumstances, a human operator would not be able to react quickly enough, so the control would have to be computerised. Such a control system would be bespoke and very complex, and would require ongoing maintenance to ensure it continued to match the developments of the transmission network, since its mal-operation could well result in the collapse of the entire 'all-island' electricity system. Such a scheme was developed for the Nelson River HVDC scheme in Manitoba Hydro in Canada. Whilst this scheme has operated successfully to date, TransGrid pointed out that this type of scheme is prone to failure.

159. Taking such unnecessary risks with the Irish economy when there is an appropriate alternative has been rejected by the transmission system operators, and for these reasons NIE cannot recommend the use of HVDC in this main interconnected system application.

KO 3 - Integration within the Northern Ireland Transmission Network

160. There is currently only one high capacity AC Interconnector linking Northern Ireland and the Republic of Ireland – the 275 kV AC Tandragee – Louth double circuit overhead line. If VSC HVDC technology were applied to the proposed Interconnector, the loss of the 275 kV AC interconnector would result in synchronism having to be maintained by existing 110kV low capacity cross-border connections. This could be successful only if the power flow on the HVDC link was automatically and continuously controlled using a complex special control system to manage the power balance between the two ends of the interconnector. NIE and EirGrid both consider this approach to present considerable risk to continuity of supply for the whole island system, due to voltage and frequency instability.

161. This reliance upon the 110 kV connections close to, and across, the border would raise their strategic importance, leading to difficulties in scheduling their maintenance.

162. Additionally, there would also be a need to ensure that any application of an HVDC link for further interconnection would not interfere with the correct operation of the existing Moyle (LCC HVDC) Interconnector between Northern Ireland and Scotland. This becomes a very difficult and uncertain task because automatic computer controls would need be specified, written, and tested, to accommodate system conditions across the whole island. (It is also likely that the Moyle interconnector controls would need to be modified to accommodate the operations of a new HVDC Interconnector between Northern Ireland and the Republic of Ireland.)

163. It is NIE's view that, while theoretical studies indicate that the HVDC option could deliver a secure supply over a number of scenarios, there are also a number of credible scenarios under which the HVDC option is not technically acceptable. This is due to the complexity of the control systems and communications required to be designed and operated between the existing 275kV and 110kV interconnectors and any new HVDC Interconnector, in a timeframe that would require only an automatic response with no manual intervention. It is noted that any mal-operation of such an automatic control system would be very likely to result in widespread voltage and frequency instability, which in turn would probably lead to system collapse.

164. NIE therefore concludes that an HVDC option for integration into the all-island transmission system presents much greater risk than an AC option, as well as higher cost.

KO4 - Environmentally acceptable solution

165. Both the DC and the AC technologies theoretically could be installed in such a way as to be environmentally acceptable (subject to the differing environmental impacts of overhead line installations compared to underground installations).

KO5 - Technically acceptable solution

166. Both the DC option and the AC option are theoretically achievable with current technology. Both technologies can demonstrate a proven track record, although HVDC VSC converters of the capacity envisaged for the proposed Interconnector are not currently commercially available, and not expected to become available for many years to come.

167. However, “achievable” does not mean acceptable, since it is important to consider both operational risks, and any inhibitors to future development being built into the system. The system operator in the Republic of Ireland has expressed concern with regard to the complexity and risk of operating the DC option in an AC system and has cautioned that “taking such a risk when there is a technically superior and less risky option readily available is unnecessary” (EirGrid Final Re-Evaluation Document 2013). SONI has endorsed this view.

Be the least cost, technically and environmentally acceptable solution

168. Given that both the DC option and the AC option can be installed in such a way as to be technically feasible and environmentally acceptable, it is the cost difference which will be the deciding factor in the context of this criterion. The International Expert Commission (IEC) estimated that the standard AC circuit would cost €167m whereas the DC alternative would cost €500m. That is a difference of €333m. This estimate was, however, made on the basis of the Commission’s understanding that EirGrid had no identified strategic need for a future AC transmission connection point in the vicinity of Kingscourt, Co Cavan - such that only two AC/DC conversion stations were required.

169. The Cost and Technology Update Report compares the expected costs of the two technologies after taking full account of the required transmission system functionality (which would require three separate system connection points). The report concludes that, for the circumstances applicable to the overall interconnection development, a HVDC VSC scheme would be approximately six times more expensive over its lifetime than the AC overhead line currently proposed. The overall additional lifetime cost being in the order of €945m

170. The significant additional cost of the HVDC VSC technology is such that it would fail to meet this criterion for this reason alone.

KO7 - Providing a power carrying capacity in the region of 1,500MVA, and connecting between appropriately robust points[102] on the transmission networks north and south of the border

171. Both technology options are equal under this criterion.

KO8 - Facilitating future grid connections and reinforcements

172. All circuits forming a meshed transmission network have the potential to be ‘tapped’ into at an intermediate point to provide a new grid connection or reinforcement sometime in the future.

173. If the Interconnector were to be implemented using HVDC technology, then the cost and complexity of additional connections would be much more significant than for the AC option and would therefore limit future options for network development and extension.

[102] The meaning of ‘appropriately robust points’ in the context of this ES is explained in Section 2.4

174. In addition to the excessive cost of tapping into a DC circuit, a 'multi-terminal' DC circuit requires significantly more complex control systems with each additional connection point, thus increasing the already unacceptable risk of mal-operation.

175. The poor facilitation of future grid connections and reinforcements presented by the DC option makes the use of HVDC technology for the implementation of the proposed Interconnector unacceptable to both NIE and EirGrid.

KO9 - Compliance with good utility practice[103]

176. There are no working examples anywhere in the world of a DC circuit embedded in a small and isolated AC transmission network such as that on the island of Ireland. The examples of planned DC interconnectors in Europe that were identified in the IEC Report (that is the proposed France-Spain Interconnector and the proposed Norway – Sweden Interconnector) are not comparable with the proposed Interconnector.

177. The electricity networks in those four countries are much larger and stronger than that in Ireland and they already have multiple AC interconnections with each other. The France / Spain and Norway / Sweden Interconnectors will therefore not be expected to perform the same function as that of the proposed Interconnector, and they will not be as critical for overall system security as the proposed Interconnector would be for the 'all-island' network.

178. Based on the above, it is clear that implementing the proposed Interconnector using HVDC technology would not be considered as 'complying with good utility practice' or 'good international practice'.

Overall Conclusion on a DC circuit as an alternative to a standard AC circuit

179. The IEC concluded in its report that, if the proposed North-South Interconnection Development must be implemented using underground cable, then "*with today's technology the best solution is a VSC HVDC solution combined with XLPE cables*". Whilst noting this conclusion, NIE does not consider that the Interconnector should be undergrounded (see below). Based on this judgement, NIE is of the opinion that a VSC HVDC circuit would be vastly more expensive and technically inferior to a standard AC solution, and is therefore is not an acceptable option for the proposed Interconnector.

4.2.7 Consideration of "Partial Undergrounding"

4.2.7.1 Overview

180. The initial identification of Transmission Alternatives for evaluation recognised that if an environmental impact assessment were to conclude that an overhead line would be environmentally unacceptable in certain identified sections of the interconnector route, then a theoretical alternative might consist of a partially underground solution in which underground cable technology would be applied to those particular sections of the primarily overhead line route.

181. A "hybrid" option employing a mix of AC overhead line and DC underground cable is not practical because of the requirement for large and very costly AC/DC converters at each point of change between the two technologies. NIE's consideration of a partially underground alternative is therefore limited to a fully AC circuit employing AC overhead line in combination with a section (or sections) of AC underground cable.

182. When considering partial undergrounding for a 400 kV AC circuit, it is essential to understand the environmental, technical and cost implications of such a development. These issues are assessed in

[103] Note: Compliance with good utility practice does not preclude the use of innovative practices, methods or technologies; however, when such innovative practices, methods or technologies are under consideration, the accompanying risk of failure and consequence of such failure must also be considered.

general terms in a joint position paper prepared by Europacable and ENTSO-E that was submitted to the European Commission in December 2010 *(Feasibility and Technical Aspects of Partial Undergrounding of Extra High Voltage Power Transmission Lines* (December 2010)[104] The joint paper "*merges the experience European Transmission System Operators (TSOs) have gained with the inclusion of underground EHV cables into their transmission networks over many years with the technical expertise of the leading XLPE EHV cable systems manufacturers in Europe*".

183. The implications of partial undergrounding for the proposed Interconnector are considered below.

4.2.7.2 Partial Undergrounding - Environmental Issues

184. The size of the underground cables that would be required for the Interconnector are such that they cannot be installed along the routes of public roads, as most existing roads within the vicinity of the proposed overhead line route are not sufficiently wide. The only practical option would be to install the cables directly across the land. This would have the following environmental implications.

185. The construction effort associated with the installation of the underground cable section would be considerably greater than that of the overhead line. Installation of the cables would require a construction swathe, some 20 metres wide – similar in width to a dual carriageway (PB Power 2009), to be cut through the countryside. This swathe would include a "haul road" able to accommodate vehicles to transport cable drums weighing 45 tonnes or more, as well as and large cranes for offloading and equipment handling. This would result in much greater disruption to farming activity and disruption to the wider community than would arise from the relatively minor works associated with construction of the proposed overhead line (as described in Chapter 5 and the assessment chapters of this ES).

186. The underground cable construction swathe would have to cut through every hedgerow in its path. Gaps in the hedgerow would need to be replaced with fences or other non-vegetation barriers, since deep rooted vegetation cannot be permitted to grow in proximity to underground cables for safety reasons. This is unlike the case of the overhead line where in many cases the line will sail right over the hedgerows without unduly interfering with them. In circumstances where an overhead line tower is positioned straddling a hedgerow, a section of the hedgerow will be affected during construction, but it will be allowed to re-establish itself afterwards, only requiring periodic management of the hedgerow to prevent its interference with the overhead line.

187. No buildings, deep rooted trees, or deep ploughing are permitted within a cable reserve to ensure safety and future access. That reserve would coincide in width with the construction swathe, that is, it would be around 20 metres wide, so the application of an underground cable for any section of the proposed route inevitably sterilises those swathes of land from future development. Buildings can, and have been, constructed below overhead lines as long as sufficient height clearance is provided (see Chapter 7 (EMF) and Chapter 14 (Community Amenity and Land Use) of this ES for further discussion).

188. It would be necessary to have a 400kV compound at every location where the 400 kV circuit changes from overhead to underground. Where such a facility is required solely for the purpose of accommodating a transition between underground cable and overhead line, it is known as a 'transition station' and has the same appearance as a small 400kV substation. It would require a land area of about one hectare and would consist of an inner compound enclosing the live high voltage equipment, and a small building, with a buffer strip around the compound to accommodate an earth berm, and / or vegetation, for screening.

[104] http://ec.europa.eu/energy/infrastructure/tent_e/doc/off_shore_wind/2010_annual_report_annex7_en.pdf

Illustration 4.1: Example of a 400kV Underground Cable to Overhead Line Transition Station

4.2.7.3 Partial Undergrounding - Technical Issues

189. Inserting a section of cable into an overhead line circuit will have a negative effect on the reliability and performance of the overall circuit. The latest fault statistics confirm that, on a kilometre for kilometre basis, 400 kV overhead lines have a much better service availability record than 400 kV underground cables. If a hybrid arrangement were to be applied to the proposed Interconnector, then it would require two cables per phase in order to achieve the required power carrying capacity. This would substantially increase the size and impact of the transition stations described above.

190. The risk to transmission system stability associated with the installation of a long length of EHV underground cable exists regardless of whether that long length of cable forms an entire underground cable circuit, forms a single section of a hybrid overhead / underground circuit or is made up of multiple shorter sections of underground cable within a single hybrid overhead / underground circuit. As a result, some utilities have set down the maximum permissible single length of EHV underground cable that can be installed on their transmission system either as a single underground cable circuit or as part of a hybrid overhead / underground circuit and the maximum permissible cumulative length of EHV underground cable on the system. In the Netherlands for example, the maximum permissible length of a single 400kV underground cable is 20 km. In practice, the longest 400 kV underground cable circuit installed in Europe to date is a 20 km long cable installed in an air conditioned tunnel in London. When considering what should be the maximum permitted length of 400 kV underground cable on the island of Ireland, EirGrid, NIE and SONI needed to take account of the accompanying risk of circuit failure and consequence of such failure. The transmission system on the island of Ireland is much smaller than that on the island of Great Britain and of course much smaller than that of mainland Europe, to which the system in Netherlands is connected. The transmission system in Ireland is therefore able to accommodate much shorter lengths of 400 kV underground cable than is the case in say Great Britain or the Netherlands. The Transmission System Operators TSOs and the Transmission Asset Owners (TAOs) in Ireland are also much smaller and less well resourced than their counterparts in Great Britain and the Netherlands, and a prudent operator approach (good utility practice) thus dictates that they must carry correspondingly smaller risk.

191. Based on this EirGrid, NIE and SONI have determined that the maximum length of 400 kV underground cable that can be installed as part of the entire Meath-Tyrone interconnection development circuit must be considerably less than 20 km, whether installed in one continuous length or in an accumulation of shorter lengths. It should be noted that any application of EHV 400kV underground cable will reduce the future capacity of the entire electrical network to accept the use of underground cables elsewhere on the network in the future. NIE does not consider that there is any section within the proposed

overhead line route that presents technical or environmental constraints of sufficient magnitude to require the use of underground cable.

4.2.7.4 Partial Undergrounding - Cost Issues

192. The Technology and Cost Update (see section 4.2.4.12) contains the most detailed site specific cost comparison of underground cable and overhead for the proposed overall interconnection development circuit carried out to date. The report found that a single km of 400 kV HVAC underground cable would cost on average around €5.4 million more than the equivalent OHL.

193. Depending upon the length of an underground section of circuit (and therefore the facilities required at each end), transition stations could add an additional €5 - €20 million (approximately) per installation. Two such transition stations would of course be needed for each section of underground cable.

194. Underground cables are electrically capacitive in nature. Capacitance produces a form of 'reactive power'. Every km of a 400 kV AC underground cable typically 'produces' about 10 MVArs (megavolt ampere reactive) of reactive power, while a comparable 400 kV OHL will only 'produce' 0.5 MVars, a 20 fold difference. Reactive power due to capacitance has two cost implications: it leads to additional thermal losses and, depending upon the circuit loading, can also cause the system voltage to rise in proportion to the cable length. Regarding this second aspect, if the cable is sufficiently long the voltage will eventually rise above the design rating of the cable. Exceeding the voltage rating of a cable, even by a small margin, will result in an acceleration of the ageing process of the insulation and ultimately premature failure of the cable.

195. The capacitance produced by the underground cable can be cancelled out by installing appropriately sized reactors. The process of controlling capacitance by installing reactors is known as 'reactive compensation'. If the accumulative length of the AC underground cable is of sufficient length to require reactive compensation then this would add substantially to the project cost, and increase the land take at one or more of the transition compounds.

4.2.7.5 Conclusion on a Partial Underground option for the Proposed Interconnector

196. A partly undergrounded AC circuit (with a limited aggregate underground route length) may be technically feasible, where the substantial additional cost, and the additional environmental impacts can be proven to nevertheless offer an environmentally advantageous and cost effective way of overcoming an otherwise unavoidable environmental or technical constraint to an overhead line. However, NIE does not believe that any section of the proposed overhead line route presents either technical or environmental constraints sufficient to justify either the additional cost or the additional environmental impacts arising from the inclusion of an underground cable section.

4.2.8 Evaluation and Assessment by the Transmission System Operator

197. SONI, as the Transmission System Operator of Northern Ireland, fully endorses and supports the full content of the EirGrid Re-Evaluation Report (2013) and has specifically identified Sections 3.2, 3.3, 3.4, 3.5, 3.6, 3.7 and 3.8.

198. In their January 2012 submission to the PAC SONI stated:

> *"With regard to the interconnector, SONI would express a preference for the construction of an overhead line. This preference is predicated on the comparative operational impacts of overhead and underground technologies. Fault outages on underground transmission cable systems can be difficult to locate, and can take significantly longer to repair. As a result, the total outage time tends to be substantial. On the other hand, faults to overhead transmission systems tend to be easily located and repaired. This minimises the total outage time and therefore, the operational impact. The loss of an underground interconnection for an extended period imposes system security restriction which would result in higher*

costs to customers. SONI is also aware that extra high voltage underground transmission cable options present technical complexities which may adversely impact its ability to manage the transmission system voltage profile.”

4.2.9 Expression of Support by the Regulatory Authorities for the AC Overhead Option

199. By letter from the Single Electricity Market Committee dated 30 April 2013, the two Regulatory Authorities on the island (the Utility Regulator and the CER) expressed support for the AC overhead option because of the excessive costs associated with the underground option:

> *“Of course the project must not only be progressed quickly but also cost effectively. The Committee understands from the Irish government review that the cost for the undergrounding of the project would be significantly higher than the AC overhead line construction employed elsewhere in Europe. The regulatory authorities would therefore be of the view that customers should not be expected to pay for any unnecessary costs associated with undergrounding of the cables given there would be no enhancement in service.”*

4.2.10 NIE Overall Conclusions and Observations in Regard to the evaluated transmission technology alternatives

200. Having at all stages engaged a process that:

- incorporated due regard for the likely significant environmental impacts;
- included consideration of the conclusions drawn by the above independently commissioned reports;
- has taken full account of the further review and assessment of HVDC technology and partial undergrounding solutions as described above; and,
- has recognised the clear views of the Transmission System Operator and of the Regulatory Authorities.

201. NIE’s conclusion is that an HVAC overhead line is the most appropriate technology choice for the proposed Interconnector.

4.2.11 Operating Voltage and Circuit Configuration

202. Consideration was given jointly by NIE and EirGrid to operating voltage alternatives of the proposed Interconnector and, specifically, whether the Interconnector should be constructed and operated at a voltage of 400kV or 275kV, and whether it should be configured as a single circuit arrangement or as a double circuit arrangement.

203. As noted in Chapter 2, Need, the transmission network in Northern Ireland primarily comprises a 275kV double circuit system, which has been designed to operate at voltages up to 400kV. In the Republic of Ireland, the Moneypoint power station is linked to the major load centre of Dublin by 400kV single circuit lines, one of which terminates at the Woodland sub-station (being the southern terminus of the proposed overall development).

204. Consideration has been given to constructing the proposed Interconnector with an operating double circuit design of 275kV, matching existing circuit operation in Northern Ireland, thereby meeting 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 400kV option. In comparison, the 400kV

option results in better power sharing with the existing interconnector, better voltage performance, and reduced power losses.

205. The circuit design and operating circuit voltage are both important variables which determine the eventual size, scale, and ultimately, appearance of the supporting steel towers that would need to be constructed to facilitate an overhead transmission line. These variables therefore have a direct influence on potential landscape and visual impacts arising from the proposed overhead line. It is acknowledged that the scale of a single circuit 400kV overhead line is likely to have a greater environmental impact than a single circuit 275kV overhead line. However, a single circuit 275kV overhead line would not be able to deliver the required 1,500 MW capacity (see section 2.5.7 of Chapter 2 Need of this ES). The taller towers required for the double circuit 275kV line that would be necessary in order to deliver the required 1,500 MW capacity have a greater visual impact than those required for a single circuit 400kV overhead line. There would effectively be no difference between the two options in terms of land requirements.

206. Overall, having regard to these factors, and including due consideration of environmental impact, NIE and EirGrid determined that a 400kV single circuit arrangement represented the most appropriate selection for the proposed Interconnector. This conclusion was accepted by both of the relevant regulatory authorities (the Utility Regulator and CER).

4.2.12 Consideration of Design Alternatives for the Preferred Transmission Option

207. In order to select the type of tower to be used along the proposed overhead line route, NIE and EirGrid jointly commissioned a visual assessment of technically feasible 400kV single circuit tower types (see Appendix 4C for Report *Turleenan - Kingscourt 400kV Project Visual Assessment of New Tower Outline* 2007).

208. Four basic tower designs (NL 401, CIVI-1, CVVV-I, Inverted Delta) were identified as capable of meeting the technical requirements, and all of these were assessed in order to evaluate the comparative level of visual impact associated with each of the tower designs. The design assessment report is attached at Appendix 4C.

209. All of the tower designs were symmetrical in form with similar weight, footprint and finish. The span lengths would be the same, resulting in a similar frequency of supports along a given length of overhead line, and they would also each have had a similar capacity for flexible routeing. The overall height of the towers was also similar with the exception of the Inverted Delta tower type which was taller by 2.5m.

210. The main difference in the visual appearance of the towers and consequently their ability to successfully be accommodated into the landscape related to the specific design features, density, and outline complexity and phasing arrangements. The NL-401 design features were such that a relatively denser and more complex structure was created although the phasing arrangement was relatively compact and simple. Tower designs CIVI-1 and CVVV-1 followed a relatively similar structure although the phasing arrangement and design density were more complex in tower CVVV-1 than CIVI-1 increasing the towers visual prominence. The increased height of the Inverted Delta tower, combined with its greater width and bulk, created the most substantial and visually prominent form out of all the structures.

211. The tower types were ranked in order of preference, and tower type CIVI-1 was considered to have the least visual impact of the alternative tower designs, and was therefore chosen as the preferred tower type for the Proposed Development.

212. NIE has during 2012 performed a further review of available and fully type tested tower designs, and remains of the view that the CIV-1 tower design is the most appropriate for this particular application.

4.3 Part Two: Overhead Line Routeing and Substation Site Selection

4.3.1 Introduction

213. Part Two of this Chapter 4 describes the process undertaken by NIE to evaluate alternative positions for the connection point to the transmission system in Northern Ireland (NI), and viable route corridors for an overhead transmission line between the selected connection point and the transmission system in the Republic of Ireland (ROI). It describes the process of detailed route selection within NI and the issues and options evaluated as part of a process to determine the finalised route for the proposed overhead line.

214. Part Two also describes the process undergone to evaluate alternatives for location, design and layout of the proposed substation.

215. Article 41 of Schedule 9 to the Electricity (NI) Order 1992 requires the holder of an electricity transmission licence to have regard to the need to conserve the natural beauty and amenity of the countryside and do what it reasonably can to mitigate the effect of its proposals on the natural beauty of the countryside. As a transmission licence holder, NIE is therefore required to consider technical, economic and environmental issues as a fundamental part of any proposal for transmission system development.

216. The substation site selection and overhead line routeing process described in this Part Two of Chapter 4 has been performed in accordance with NIE's objective to minimise the environmental impact of the Proposed Development in accordance with its published Guidelines.

217. For the reasons set out in Part One of this Chapter, NIE determined that the proposed transmission interconnection should be secured by means of an AC overhead transmission line. All of the potential connection routes described in this Chapter were therefore determined and evaluated on the basis of an overhead transmission line construction.

4.3.2 Overall Process Description

218. The key stages within the site selection and routeing process are described below.

<u>Identification of system connection options (See Section 4.3.3 Below)</u>

219. The identification, analysis and selection of potential technical options for achieving an effective electrical connection between the transmission systems of NI and the ROI.

<u>The technical evaluation of identified connection options (See Section 4.3.4 below)</u>

220. The technical evaluation of each identified option against key performance criteria, having regard to the need for development of a technically feasible, reliable and economically viable overhead line connection option.

<u>The evaluation of preferred study areas and the identification of route corridor options. (See Section 4.3.5 below)</u>

221. High-level consideration of alternative study areas derived from the preferred connection options and route corridor options within these study areas; having regard to the nature of electricity transmission infrastructure, the strategic objectives of the proposed Interconnector, and the environmental imperative to present the lowest reasonably achievable impact on the human and natural receiving environment; resulting in the determination of a preferred electrical connection option and a preferred geographic route corridor for further development.

Overhead transmission line route selection (See Section 4.3.6 below)

222. Detailed line routeing including tower positioning for the full length of the proposed overhead line within Northern Ireland.

Substation site selection (See Section 4.3.7 below)

223. Detailed consideration of alternative substation sites.

Alternatives to substation technology and design (See Section 4.3.8 below)

224. Detailed consideration of alternative technology and designs within the preferred substation site.

225. The development process described above required decisions to be taken at key stages, based upon available economic, technical and environmental information. When preferred options were identified, this did not preclude returning to other options if, on further detailed study, the preferred option was in fact shown to be unfeasible.

4.3.3 Identification of System Connection Options

226. NIE and EirGrid have worked together over a period of many years to determine joint proposals for the selection of transmission system connection points and for the geographic positioning of the infrastructure needed for further interconnection between the two transmission systems. The transmission systems in Ireland are illustrated in Figure 4.1, attached separately in Volume 4 of this ES.

227. The starting point for identifying preferred system connection options, from which to route the proposed Interconnector, was extensive technical analysis. NIE and EirGrid performed load flow simulations based upon a wide range of scenarios. Load flow analysis of this type examines possible energy transfer requirements arising from a combination of events such as system or power generation failures, locational changes in either power generation sources or customer demands for electricity, and underlying forecasts of energy demand changes. Load flow and fault analysis simulations were used to determine the most effective methods for connecting the two transmission systems in the context of their ongoing operational requirements. Load flow analysis considered the power systems in normal operation and identified future expansion of the power system. Fault analysis considering the impact faults would have on the remaining network. Dynamic and stability analyses were also performed to investigate whether the connection options would perform as expected. These studies consider the frequency disturbance and its consequences on the stability of the network.

228. Technical analysis was undertaken over the period from 2001 to 2004. The primary purpose was to quantify the potential improvements in transmission capacity and system security that would be provided by each of the interconnection options. Six development options were identified, as summarized below and illustrated in Figure 4.2. The suitability of these options is discussed in the following section.

Connection Option 1: Multiple 110kV Development

229. This option consisted of the development of 110kV transmission lines between existing substations:

- Coolkeeragh, County Londonderry – Trillick, County Donegal;
- Tandragee, County Armagh – Lisdrum, County Monaghan; and,
- Newry, County Down - Louth, County Louth,

Connection Options 2, 3, 4 & 5: 275kV/400kV Development

230. Several options were considered based on the geographic location of appropriate connection points on the existing 220kV and 400kV transmission systems in the ROI and the 275kV network in NI. These options were:

- Connection Option 2: Eastern Option

231. This option involved reinforcing the existing double circuit transmission line connection between substations at Tandragee, County Armagh and Louth, County Louth by constructing a further transmission line connection to be operated at either 275kV or 400kV.

- Connection Option 3: Western Option

232. This option was based on a new 275kV transmission line connection between Coolkeeragh, County Londonderry and Srananagh, County Sligo.

- Connection Options 4 and 5: Mid-Country Options

233. These options were based on a new 275kV or 400kV transmission line connection between Drumkee, County Tyrone and potential connection points at Arva (Option 4) or Kingscourt (Option 5), both in County Cavan.

Connection Option 6: Up-rating the Existing Interconnector

234. The up-rating of the existing interconnector, which comprises a double circuit 275kV overhead line between Tandragee and Louth substations, was also considered. The existing interconnector has a design capacity of 1,500 MW; however, in practice the useable transfer capacity is only 450 MW, primarily owing to the severe transmission system stability consequences that might arise from the sudden and unforeseen loss of both of the existing interconnector circuits at the same time (see Chapter 2 Need). If the existing Interconnector was run at design capacity, and there was a major incident (such as severe weather) affecting both circuits on the double circuit tower line, then large blocks of customers would be off supply for protracted periods of time.

4.3.4 Technical Evaluation of Identified Connection Options

235. Further analysis was carried out on each of the connection options described above in order to evaluate each in relation to technical performance and suitability for the fulfilment of the need as set out in Chapter 2.

236. A summary of the technical findings in respect of the connection options is set out below:

Connection Option 1: Multiple 110kV Development

237. Transmission system analysis carried out in respect of this option found that multiple additional 110kV circuits would not increase net transfer capacity in either direction. This option was thus determined not to meet the strategic needs and objectives for the proposed Interconnector.

Connection Option 2: Eastern Option

238. Transmission system analysis carried out in respect of this option found that it would offer increased power transfer capability in both directions. However, the transmission line connection would terminate in the Louth substation and the Tandragee substation, the same substations as the existing interconnector. Thus, because the routes of the new and existing transmission line connection would

not be sufficiently separate, there remained a risk of operational system separation arising from the concurrent loss of all interconnector circuits.

Connection Option 3: Western Option

239. Transmission system analysis carried out in respect of this option found that it would increase power transfer to the Republic of Ireland, facilitate power transfer out of the existing Coolkeeragh power station near to the Coolkeeragh connection point, and help support the 220kV network in the north-west of the Republic of Ireland. However, this option would connect weaker and more peripheral parts of both networks, and the transfer capacity to Northern Ireland would be poor compared with other connection options.

Connection Options 4 and 5: Mid-Country Options

240. Transmission system analysis carried out in respect of these options found that they would significantly increase transfer capabilities in both directions. They would also offer physical separation from existing interconnection, thereby reducing the risk of concurrent failure.

Connection Option 6: Up-rating the Existing Interconnector

241. The unused capacity of the existing interconnector can only be utilised in circumstances where a second, and entirely independent interconnector, is able to immediately absorb the additional load arising from the sudden loss of either or both of the circuits on the existing interconnector. If the transmission system cannot adequately respond to the loss of any given circuit at any given time then there is a high risk of loss of system stability and the operational separation of the transmission systems in Northern Ireland and the Republic of Ireland. In such circumstances, there is a high risk of widespread and extended loss of supply. Unnecessary exposure to this risk is normally considered unacceptable by system operators. It follows therefore that no option based on uprating of the existing interconnector could address the risk. Only a physically separate circuit could do this.

242. As a result of this analysis, the Mid-Country options were identified as the preferred technical options, although the Eastern option was also carried forward as constituting an option that was also potentially feasible from a technical perspective.

4.3.5 Evaluation of Preferred Study Areas, the Identification of Route Corridor Options and the Selection of a “Preferred Route Corridor”

4.3.5.1 General Approach

243. The preferred connection options, the two Mid-Country options and the Eastern option were then assessed in terms of environmental, technical and economic considerations.

244. Two study areas based on the preferred connection points were identified. These were contained within an overall geographical area that had a northern boundary defined by the existing 275kV double circuit overhead line between Tandragee and Dungannon, and a southern boundary corresponding to the existing 220kV overhead line between Louth and Flagford. The study areas are described in more detail below.

245. NIE and EirGrid jointly agreed a scope of works for undertaking environmental, technical and economic feasibility studies of the identified study areas and route corridors applicable to each connection option and covering broad geographic areas both north and south of the border.

246. The constraints mapping and environmental evaluation processes in Northern Ireland and in the Republic of Ireland were undertaken by NIE and EirGrid separately. However, during this evaluation

period, there were ongoing and regular co-ordination meetings between the companies, including joint review of evaluation documents, in order to ensure a consistent approach.

4.3.5.2 Environmental, Technical and Economic Approach

247. NIE's environmental analysis involved the following elements:

- The development of a physical and environmental constraints map based on:
  - Physical/terrain issues which could potentially impact on construction and maintenance of a route within each study area, including, inter alia, identification of topography and elevation, urban and rural development, road crossings (particularly major road crossings), geology and soils, quarries/mines/airstrips.
  - Environmental constraints to identify and address key environmental issues arising in respect of each study area. This included, inter alia: ecology and nature conservation designations, known nature conservation areas of interest (available ecological data sources), landscape designations, landscape character, land zoning (including settlements), archaeology and cultural heritage, community sites, tourism amenities, water bodies and large watercourses;
- As landscape and visual and ecological impacts were considered to be likely to cause the most significant environmental impacts, NIE's advisers included a landscape architect and an ecologist from this preliminary stage;
- Reference to guidelines for electricity development, including the Holford Rules and NIE's Guidelines for NIE Networks and the Environment[105]; and,
- The salient environmental features of the area were further investigated by means of surveys and other sources of geographical and environmental information.

248. Technical and economic analysis was applied to the identified study areas and route corridor options. In accordance with NIE's general obligation under Article 12(2) of the Electricity (NI) Order 1992, the assessment process recognised the need to ensure that the proposed solution should avoid areas of technical difficulty and thus major additional cost and that overall route solutions should be as short and direct as reasonably possible consistent with the obligations of Article 41 and Schedule 9 of the Order. This included inter alia:

- Initial assessment of operational considerations associated with reliability in service;
- Practical assessment of constructability and deliverability; and,
- Further and updated information on developments and reinforcement plans arising in each jurisdiction since completion of the initial suite of technical analysis.

249. Utilising the above studies, route corridor options were identified within the study areas based on environmental, economic and technical considerations. Principles for route corridor identification were to:

- Identify the shortest and straightest route corridor that was technically, economically and environmentally preferable. Any additional length or additional turns in the route would require additional structures or larger structures (in the case of a turn in the overhead line) with associated additional economic and environmental impacts;
- Minimise environmental impacts through avoiding as far as geographically possible and technically practical known environmental constraints as determined through the constraints mapping exercises; and,
- Minimise environmental impacts through the incorporation of ongoing advice from a landscape architect and an ecologist.

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[105] (NIE 1998)

250. The selection of a preferred study area and route corridor to take forward for more detailed design was made by NIE and EirGrid on a balance of environmental, technical and economic considerations, as explained below.

4.3.5.3 Description of Eastern and Mid Country Study Area

251. The northern part of the overall geographic study area was observed to be characterised by a number of physical and environmental constraints, as it comprised a large area encompassing the western hills of the Mourne mountain range and the drumlin landscape of Counties Armagh and Tyrone. With regards to designations, the Ring of Gullion was designated as an Area of Outstanding Natural Beauty (AONB), and there were Special Protection Areas (SPAs) and Special Areas of Conservation (SAC), and Areas of Special Scientific Interest (ASSIs). There were a number of small settlements within the northern part of the study area, and also large settlements at Newry, Armagh and Dungannon.

252. To the south-east of the Mournes the study area topographically declined to the open agricultural landscape of County Louth. The south-west of the study area within Monaghan was a drumlin landscape overlain on a very gradual north-south ridge, punctuated with lakes. Within the southern part of the study area there were Natural Heritage Areas (NHAs) of note, as well as settlements including Clontibret, Monaghan, Castleblayney, Carrickmacross, Kingscourt and Dundalk.

4.3.5.4 General description of the chosen environmental study areas within Northern Ireland

253. The studies undertaken by NIE in relation to those portions of the study area within Northern Ireland are described in more detail below. The Northern Ireland portions of these study areas are shown on Figure 4.3. This work is part of the studies undertaken jointly between NIE and EirGrid within the larger cross-border study area.

<u>The Eastern Study Area</u>

254. The Eastern Study Area was defined as running north to south from the existing 275kV Tandragee substation, to the Louth substation. Within Northern Ireland the eastern boundary of this study area was the settlement of Newry and the nearby uplands of the Mourne Mountains. To the west the study area merged with that of the Mid Country study area.

<u>The Mid Country Study Area</u>

255. The Mid Country Study Area was defined as the region running north to south situated between the Drumkee Main substation in Northern Ireland to the Flagford – Louth 220kV Line in County Cavan (which runs generally east to west). Within Northern Ireland the western boundary of the study area was not fixed but generally defined by the built up area of Dungannon and higher ground of Aghnahoe, Ivy and Brandy Hills. To the east, the study area merged with that of the Eastern Study Area.

4.3.5.5 Route Corridor Option Identification

256. Within the two study areas, route corridor options were identified that minimised environmental impact utilising the constraints mapping approach of the salient geographic features and evident environmental constraints as set out in 4.3.5.2., as well as connecting to technically feasible points in the existing transmission systems.

257. The route corridors were linear areas of no set width. (No specific width was defined as this would have been an arbitrary limit; this approach allowed for a flexible analysis.) They are illustrated on Figure 4.3 with thick lines. A specific line route is then developed within a route corridor (see section 4.3.6.5).

Route Corridor Options in the Eastern Study Area

258. Two interconnection route corridor options were identified for this area based on the guiding principles stated above in 4.3.5.2.

- Route Corridor Option (A) An addition to the existing Louth-Tandragee Circuit

259. This option would increase the transfer capacity of the existing interconnector between Tandragee and Louth by constructing a third circuit along essentially the same geographic path and in close proximity to the existing development.

- Route Corridor Options (B) A new Louth - Tandragee Circuit

260. Route corridor options were identified to the east of the existing interconnector. One option ran east from the Tandragee Main substation, across the A51, the Belfast/Dublin Railway line and the disused Newry Canal. From here it turned south, and ran parallel to the canal until Jerrettspass where it turned south-west to pass between Drumilly Mountain and Sturgan Mountain to avoid the populated area around Newry. The line continued southward through the Ring of Gullion AONB to the border south of Forkhill.

261. Another route assessed in the Eastern study area was generally similar but included an alternative route from the A51 road crossing west of Tandragee, turning south to follow the Cusher River from the vicinity of Clare Glen to Sturgan Mountain. From Sturgan Mountain the route rejoined the route described above.

Route Corridor Options in the Mid Country Study Area

262. Two potential options were identified for this area:

- Route Corridor Option (A) A new Drumkee – Arva circuit: This potential route corridor option traversed the drumlin landscape of South Eastern Tyrone, and Western Armagh, generally following the shortest path south-west from Drumkee towards the ESB substation at Arva; and,
- Route Corridor Option (B) A new Drumkee - Kingscourt circuit: This potential route corridor option also originated in the drumlin landscape of Tyrone at Drumkee. The corridor ran south, avoiding the Armagh green belt and the ASSI and Forest Nature Reserve south of Keady, generally following the shortest path towards Kingscourt.

4.3.5.6 Appraisal of Route Corridor Options

263. A summary of the conclusions of the route corridor assessment is set out below.

The Eastern Study Area

- Route Corridor Option (A) An addition to the existing Louth-Tandragee Circuit

264. The principal feature of this option was that it would follow essentially the same route as the existing interconnector and would terminate in the same geographic locations. Investigations also found that a new route corridor would necessarily cross the existing interconnector at least once. This is not good practice, especially where circuit separation has been recognised as an important objective. It also adds cost. Additionally, given the geographic proximity to the existing interconnector, the investigations were not able to identify a route corridor option that could overcome the potential operational risk of exposing all circuits to a common mode of failure due to the common termination points.

265. Route Corridor Option (A) was also in relative proximity to the Ring of Gullion AONB, and would require a lengthy crossing of land over 150m in elevation.

- Route Corridor Option (B) a new Louth-Tandragee Circuit

266. The physical and topographical constraints of the Eastern Study Area combined with the resulting pattern of settlement and urban development within that area, were found to be major constraints to the identification of a viable route corridor for a new Tandragee – Louth circuit. Also, the potential route corridors identified passed through the Ring of Gullion AONB. Standard line routeing practice (as set out in the Holford Rules, see 4.3.6) is to avoid a direct impact to a site designated for landscape value where possible. Alternative route options were considered, but these resulted in substantial increased route length. As per line routeing practice it is preferable to adopt the most direct and shortest route between two points (Holford Rule 3). In addition, even where the potential overhead line route was some distance from the existing interconnector, the operational risks (such as system separation) associated with the use of common termination points remained significant.

<u>The Mid Country Study Area</u>

- Route Corridor Option (A) a new Drumkee - Arva circuit

267. This route corridor passed through the built up outskirts of Dungannon and then continued in a south-west direction through rural land with few identified environmental constraints. The settlement of Dungannon was a notable constraint. As illustrated in Figure 4.3, the few environmental constraints encountered in the rural area this option passed through were not generally of highest amenity value or scientific interest (such an AONB or European site) and there appeared to be suitable distance to avoid known constraints at the line routeing stage. The technical and environmental studies performed for this option demonstrated the possibility of a viable overhead line route corridor between Drumkee and Arva. However, the overall length of the route, at circa 100km, would be considerably longer than the alternative route to Kingscourt (Holford Rule 3 states "*Other things being equal chose the most direct line..."*). Given the option to pursue the shorter option, this option was abandoned in favour of Route Corridor Option (B). The overall route length of each connection option was recognised to be a key environmental impact consideration, since a longer overhead line would necessarily have impacts upon an enlarged area and a greater number of receptors.

- Route Corridor Option (B) A new Drumkee - Kingscourt circuit

268. This route corridor avoided the built up area at Dungannon to a greater degree than Option A, was in an area with few identified environmental constraints. As illustrated in Figure 4.3, there were no areas of highest amenity value or scientific interest (such an AONB or European site). The ASSIs near the border were of note, however, there appeared to be suitable distance to avoid known constraints at the line routeing stage. It was also significantly shorter in distance than Option A (Drumkee to Arva). This option also delivered the required transfer capacity in either direction, and met the primary technical requirements.

4.3.5.7 Selection of Option (B) within the Mid Country Study Area as Preferred

269. A decision to select the Mid Country Option (B), a new circuit running from the vicinity of Drumkee, County Tyrone south to south-westwards to the vicinity of Kingscourt, County Cavan, as the preferred route corridor was agreed between NIE and EirGrid.

270. The EIA Regulations require an ES to contain "*An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects.*"[106] The key environmental considerations that had informed this decision were:

- Consideration of the Holford Rules and line routeing practice to reduce environmental impacts
- Avoiding direct physical impacts on the Ring of Gullion AONB and the Mourne Mountains AONB;
- Avoiding proximity to the SAC at Ring of Gullion.

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[106] Schedule 4 Part 1 paragraph 2 of The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 19991999, and[106] The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2012.

- Avoiding large settlements such as Newry and Dungannon;
- A preference for a shorter route length with fewer associated environmental impacts; and,
- Selection of a route with few identified environmental constraints.

271. The process described above established a potential border crossing zone in the region of Clontibret, County Monaghan and broadly defined the preferred route corridors for further development by NIE and EirGrid within their relevant geographic areas of specific responsibility.

4.3.6 Overhead Transmission Line Route Selection

4.3.6.1 Introduction

272. Following identification of the preferred route corridor, detailed line routeing studies were undertaken in order to identify an achievable overhead line route within the study area applicable to the identified Drumkee – Kingscourt route corridor.

273. This section describes in detail the process which was followed by NIE to select the proposed overhead line route.

4.3.6.2 Line Routeing Approach

274. The overhead line routeing process was performed in compliance with the NIE Guidelines and with the goal of minimising environmental impacts. This process was important because the most effective method of avoiding or reducing the environmental effects of an overhead line is by careful routeing.

275. The approach to route selection included the following steps:

- Establishing objectives;
- Identifying potential environmental effects;
- Following established practice for overhead line routeing;
- Establishing a routeing strategy;
- Development and assessment of route options;
- Selection of preferred route;
- Modifying and refining the preferred route; and,
- Selection of the proposed route.

276. It should be noted that the last three bullet points were repeated as required, reflecting the evolution of the Proposed Development.

277. This is explained in what follows.

4.3.6.3 Establishing Objectives

278. The overall objective of the route selection process was the identification of a technically feasible, environmentally acceptable, and economically viable overhead line route that would create the least visual intrusion and would have the least impact on the environment.

279. A well-routed overhead line should be routed to avoid, wherever possible, the most sensitive and valued natural and man-made features in the landscape. The environmental approach was based on the premise that the major environmental effect of an overhead line is visual, and that the degree of visual intrusion can be reduced by careful routeing. Reduction in visual intrusion can generally be achieved by routeing the line to fit topography, by using topography and trees to provide screening and a background where practicable, and by routeing the overhead line at a distance from settlements and roads.

4.3.6.4 Identifying Potential Effects

280. Whilst the major effect of a transmission line is the visual intrusion of the towers on the area through which the line is routed, it may also have an effect on other aspects of the environment through which it passes during construction works, operation and maintenance. Key potential environmental effects are set out below.

- Construction can cause disturbance, including water pollution, dust and noise;
- Construction may require temporary access tracks to be built;
- The towers occupy a ground area and require below-ground foundations which may disturb environmental receptors such as archaeological remains, contaminated land, or habitats of nature conservation interest;
- The tower foundations will require soil removal, which may indirectly cause water pollution;
- The main visual effects are those relating to the presence of steel lattice towers;
- The towers and conductors may be visible from houses, roads, tourist attractions and other important locations and may alter the character of the landscape in which they are situated;
- For amenity purposes it is preferable to route an overhead line as far from dwelling houses as possible; and,
- Conductors strung between towers require clearance from trees and other objects.

4.3.6.5 Established Practice for Overhead Transmission Line Routeing

281. Broad principles for overhead transmission line routeing have been established within the UK electricity supply industry. Guidelines for transmission line routeing known as the 'Holford Rules' have been produced and are widely used. These rules are reviewed below, together with discussion on their relevance and limitations in connection with the Proposed Development.

282. The Holford Rules articulate general environmental principles and best practice in line routeing that provide guidance on line routeing within the more comprehensive EIA process.

Holford Rules

283. The Holford Rules were formulated by the late Lord Holford, Professor of Town Planning, University College London in 1959. The Rules, originally intended for the guidance of way leave officers, are as follows:

1. *Avoid altogether, if possible, the major areas of highest amenity value, by so planning the general route of the line in the first place, even if the total mileage is somewhat increased in consequence.*

2. Avoid smaller areas of high amenity value, or scientific interest by deviation; provided that this can be done without using too many angle towers. i.e. the more massive structures which are used when lines change direction.

3. Other things being equal chose the most direct line, with no sharp changes of direction and thus fewer angle towers.

4. Choose tree and hill backgrounds in preference to sky backgrounds wherever possible; and when the line has to cross a ridge, secure the opaque background as long as possible and cross obliquely when a dip in the ridge provides an opportunity. Where it does not, cross directly, preferably between belts of trees.

5. Prefer moderately open valleys with woods where the apparent height of towers will be reduced, and views of the line will be broken by trees.

6. In country which is flat and sparsely planted, keep the high voltage lines as far as possible independent of smaller lines, converging routes, distribution poles and other masts, wires and cables, so as to avoid a concatenation or 'wirescape'.

7. Approach urban areas through industrial zones, where they exist; and when pleasant residential and recreational land intervenes between the approach line and the substation, go carefully into the comparative costs of undergrounding, for lines other than those of the highest voltage[107].

Application of The Holford Rules

284. National Grid Company (NGC), which owns the electricity transmission network in England and Wales and operates the electricity transmission system throughout Great Britain, has stated that it intends to continue to employ the Holford Rules as the basis for its approach to transmission line routeing, and the company has produced a set of notes of clarification for use in conjunction with the rules. NIE endorses this approach and follows NGC's Guidelines for the routeing of new overhead transmission lines ("the NGC Guidelines" 2012).

285. The following comments on the Holford Rules are applicable to the Proposed Development:

- Rules 1 and 2 place emphasis on avoiding areas of high amenity value. The term 'high amenity' is not defined in the Holford Rules but is generally interpreted as a designated area of scenic, scientific or historical interest. An overhead transmission line will have a visual intrusion on such areas and disturbance of the area may be required to accommodate the line.
- Rules 3, 4 and 5 are concerned with routeing in relation to topography and tree cover to minimise visual intrusion.

286. The degree of visual intrusion depends on the scale of the towers in relation to the topography through which they are routed, and relation to objects in the landscape which may obstruct views, for instance trees and buildings. Where a line is routed through topography of a scale greater than that of the towers, then the topography will contain the spread of visibility of the line. If a line is routed in a valley bottom, for instance, and the surrounding land is higher than the towers, then the visibility of the line will be contained within the valley. The visibility of the line within the valley may be reduced by the presence of trees, buildings and other objects which obstruct views.

287. In a flatter landscape the topography may not contain the spread of visibility. In this instance, the visibility will be influenced by a combination of topography and trees, buildings and other objects which obstruct views.

288. A well-routed line will generally follow valleys of sufficient scale that the visibility of the line is contained within the valleys. In such locations, the line will tend to be seen against a backcloth of hills rather than on the skyline where it will be more conspicuous.

289. In a flat landscape, if the visual intrusion of the towers were the sole concern in line routeing, then a line would be routed to have as few angle towers as possible, as these towers are larger than intermediate towers. In general, however, a compromise has to be reached between the number of angle towers used, the overall visibility of the line its 'fit' to the topography, and technical and other environmental considerations.

290. The presence of trees can reduce the degree of visual intrusion of a transmission line by obstructing views of the line and by directing views away from the line. The scale of a tree in relation to a transmission line tower is such that a screening effect only takes place when the tree is close to the viewer and at some distance from the tower. In addition, trees are relatively transient elements in the landscape with a limited life span. Their effectiveness as a screen depends upon their age and species and, if deciduous, upon the season of the year.

[107] The Holford Rules are not published as a single work and consequently there is no document reference. The rules have been systematically written down and are referred to in a number of planning publications, such as the Department of Energy and Climate Change's National Policy Statement for Electricity Networks Infrastructure (EN-5), July 2011.

Limitations of The Holford Rules

291. Lord Holford presented his rules to the Royal Society of Arts in November 1959 and following point was made:

"…this (is a) *rough guide, which can never become a formula, because each line has to be considered in great detail and on its merits." (Hansard 1960)*

292. The Holford Rules were written over 50 years ago and are a product of a specific time and set of circumstances which have subsequently changed. At the time the Holford Rules were written, the area of land designated for amenity value was far smaller than it is at present and options for routeing to avoid such areas were therefore much less restricted.

293. In addition, land designated for amenity in the 1950s was largely confined to areas with sparse population. The Holford Rules give no guidance on how to reconcile routeing to avoid areas of amenity value where this would have a greater visual intrusion due to the proximity of the line to people. This limitation of the Holford Rules is clarified in Supplementary Notes in the NGC Guidelines. These notes state that, for residential areas:

"Avoid routeing close to residential areas as far as possible on grounds of general amenity." (National Grid 2012:20)

294. The Holford Rules may also be limited in their value for the routeing of an interconnection between separate jurisdictions. The rules were written at a time when overhead transmission lines were being developed to link coastal power stations in the UK to load centres or to expand the transmission system into more remote areas. New transmission lines could generally be routed to follow existing service corridors for roads, overhead lines and other services between settlements. These corridors had often developed in relation to topography, generally following valleys. However, an interconnector links adjacent jurisdictions, between which there may not be an established pattern of service corridors. This is particularly true between the Republic of Ireland and Northern Ireland. In these circumstances, interconnection has to be routed through rural areas with little or no existing industrial development and which are likely to be valued for their (undesignated) amenity value.

295. The Holford Rules provide a valuable basis for an approach to transmission line routeing, but require adaptation to meet present day circumstances, the particularity of routeing of an interconnection, and should be considered with reference to the specific and local constraints of a given overhead line project. The routeing practice followed for the proposed overhead line has therefore been based on NIE's desire to minimise the environmental impact of the proposed overhead line and on the Holford Rules as modified by the NGC Guidelines.

4.3.6.6 Routeing Strategy

296. Within the preferred route corridor, a three-staged process of line routeing was conducted.

297. Firstly a data gathering exercise was undertaken. This used aerial photography, mapping, known environmental constraints and site visits to gather accurate data throughout a continuous 5km wide corridor surrounding the most direct route through the study area from Drumkee, County Tyrone to the border crossing area agreed with EirGrid.

298. Secondly, a site survey was undertaken to identify dwellings and other towers not noted on available mapping or aerial photographs, and planning applications were reviewed on an ongoing basis to ensure that account was taken of all existing and proposed development.

299. Thirdly, line routeing was then undertaken to determine a continuous route with no known impediments.

300. Following the determination of an achievable continuous line route, detailed line design and specific locations for towers were determined and refined in various iterations (See section 4.3.6.7).

301. This process is described in more detail below.

Baseline Conditions: Landscape Considerations

302. The first stage (also known as "baselining" as it establishes context) entailed a review of the existing landscape and visual resource in the preferred route corridor. This information was then used to assess the sensitivity of the existing landscape, and to identify key considerations for the line routeing. The assessment was primarily aimed at sympathetically accommodating the proposed overhead line within the landscape by identifying a technically achievable route or routes which would produce the least landscape and visual impact.

303. Baselining was undertaken with mind to the dynamic and changing nature of the landscape, and to take account of landscape management strategies and guidelines.

304. The landscape character of the area was considered, including the Landscape Character Areas (LCAs) established by the Northern Ireland Environment Agency[108] through which the preferred route corridor passed (the Loughgall Orchard Belt and the Armagh Drumlins) with particular reference to landscape sensitivity and the ability of the landscape to accommodate change.

305. Since it was noted that the landscape throughout the preferred route corridor is a drumlin landscape, it was recognised that line routeing should be undertaken with a priority to avoid higher land, where possible, and in particular the "skylining" of towers, and to use corridors of lower land, where possible.

Baseline Conditions: Other Environmental Considerations

306. Other environmental considerations were identified in relation to potential line routes. These included, inter alia, land use constraints, designated sites, topography, watercourses, archaeological sites and sites of nature conservation interest. Some of the constraints identified are outlined below.

307. Land use constraints included the Armagh rural/urban fringe to the east of the route corridor. Other larger towns in the study area included Keady and Moy. A number of smaller settlements were also of note, including Eglish, Benburb, Charlemont, Blackwatertown, Milltown, Killylea, Middletown and Derrynoose. Scattered rural dwellings were noted to occur throughout the search area. The density of scattered dwellings was marginally greater to the north of the study area. To the south and east of the corridor, agricultural and development land constraints were identified in the form of current planning permissions and planning applications.

308. Other factors noted included forests, historical and archaeological sites, open water and marshy ground, land over 150m altitude, geology, existing NIE overhead lines, sites of nature conservation interest (including whooper swan sites and breeding wader sites) and designated sites of conservation importance (SACs, SPAs and ASSIs).

Line Routeing

309. NIE's methodology for designing a line route was employed to establish a technically feasible line route.

310. This methodology comprised consideration of the Holford Rules, NIE's "Guidelines for NIE Networks and Environment"[109] including the "Technical Supplement to Guidelines for NIE Networks and the Environment,"[110] and project-specific constraints such as finding "gaps" between constraints and existing and proposed development wide enough to allow the proposed overhead line to pass though, and where possible careful tower positioning away from individual residences and in low areas to use the rolling drumlin landscape to "hide" or screen towers.

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[108] (DOE, 2001)

[109] (NIE, J63413 10/98 C 10 CN9261)

[110] (NIE, Technical Supplement to Guidelines for NIE Networks and the Environment)

311. Field visits and input from NIE's routeing expert were used to establish a technically achievable continuous overhead line route. This brought together issues on the ground, particularly those of close range visual impact and technical achievability. The line routeing was undertaken by NIE in close consultation with a landscape architect and ecologist, including extensive site work.

312. Following the determination of an achievable continuous overhead line route, specific locations and design details (height etc) for towers were technically determined.

4.3.6.7 Development and Assessment of Line Route Options

313. The technically achievable tower locations were then further refined in conjunction with environmental specialists, including input from advisers with expertise in landscape architecture, archaeology, ecology (including ornithology), water quality, noise, geology and soils, socio-economics, and environmental planning) and as a result of ongoing consultations. Consultations were undertaken as set out in Chapter 6 of this ES.

314. In conjunction with the collection of relevant data and the assessment of line route options, the routeing strategy was reappraised and updated as more information became available and potential environmental impacts could be more accurately assessed. Line route options that were considered to have an unacceptable environmental impact were rejected and new line route options were developed.

315. Line routeing identified route options that appeared possible in desktop studies but site survey work determined that there were constraints that could not be resolved, therefore ruling out options. Some of the key decisions on the line routeing process are summarised below. These are illustrated in Figure 4.4.

316. For presentation purposes the line routeing alternatives have been described in sections comprising areas where key constraints were determinative of a section of the line route.

Table 4.1: Line Routeing Alternatives

Area of Option Shown on Figure 4.4	Main environmental reasons for line route option being ruled out or selected
A: Turleenan to Major's Lane	The southern option was in close proximity to houses. The northern option was farther from Clonmore Tower.
B: Major's Lane to Tobermesson	Relatively dense rural housing (ribbon development) at Major's Lane restricted crossing points of Major's Lane. It was preferable to avoid higher ground and proximity to Moy Village to the south.
C: Tobermesson	The western routes required direct crossing over agricultural structures. It was preferable to avoid higher land to the west. No western route was achievable with suitable distances to dwelling houses. It was preferable to avoid new houses on Blackwater Town Road.
D: Benburb to B115	It was preferable to avoid the settlement of Edenderry, (in the townland of Artasooly), proximity to Glenhaul Park (listed building grade B2), new housing (planning applications), Edenderry Lough and the Blackwater River Flood plain to the west.
E: B115 to A28	New housing (planning applications), a new pig farm, and close proximity to a farm ruled out the western options.
F: A28 to A3	Higher ground at Fisher's Hill, new housing (planning applications), and no technically suitable road crossing on the Brootally Road ruled out the western options in favour of an eastern option through lower land where a road crossing was achievable.
G: Norton's Cross Roads	Eastern options were ruled out due to a factory expansion, proximity to a scheduled monument, high ground, and new housing (planning applications).
H: Drumhillery to the border	The eastern options from Drumhillery to the border were ruled out due to new housing (planning applications), higher ground, and the cluster of historic sites, community sites, and dwelling houses at Derrynoose.

4.3.6.8 Selection of the Preferred Route

317. The preferred overhead line route arose from a detailed consideration of the environmental impacts of the line route options. In summary, the key environmental considerations included:

- A desire to keep the overhead line route straight in order to minimise route length and avoid use of angle tower locations (the assumption being that angle towers would be larger towers with a higher level of visual impact),
- Landscape character,
- Consideration of visual aspect from dwellings,
- Use of topography of the landscape and avoidance of higher land,
- Maximising distance from dwellings and other buildings,
- Maximising distance from settlements,
- Maximising distance from community sites,
- Avoidance of areas of ecological interest such as woodlands, large trees, loughs and marshlands,
- Avoidance of designated sites (ASSIs etc), and,
- Avoidance of historic sites (both direct physical impacts and maximisation of distance to reduce setting impacts).

318. These considerations had direct influence on the preferred line route.

4.3.6.9 Modifications to the Preferred Route

319. Following the determination of the preferred line route, the route was then reviewed for potential environmental impacts with the assistance of advisers with expertise in landscape architecture, archaeology, ecology (including ornithology), water quality, noise, geology and soils, socio-economics, and environmental planning.

320. This process was integrated with the EIA process reported in this ES, and included site survey and desktop study as appropriate to each assessment topic. Consultations were also undertaken with local authorities and with statutory and other stakeholders as well as with a wide range of individuals, public representatives and other stakeholders. Where potential significant impacts were identified the proposed location of tower(s) was changed if possible. This entailed an extensive, ongoing and sometimes circular process of technical design, specialist assessment, and consultations with landowners.

321. Whilst there were a number of suggestions and proposals made by individuals and consultees for minor and short-run deviations in NIE's proposed overhead line route, NIE did not receive, at any stage in the line routeing process, any submission or suggestion that an alternative overall route corridor should be considered or that there was a more desirable or appropriate method (other than undergrounding) for delivering the proposed Interconnector. The consultation thus confirmed the preferred route corridor and method as acceptable.

4.3.6.10 Refinement of Proposed Route

322. In response to statements received from members of the public during preparation for the public inquiry in 2012, NIE re-examined the location of each tower in light of all design, environmental and engineering constraints. The purpose of this re-examination was to investigate each tower location and to further improve (if possible) its location in environmental terms. The re-examination was not intended to reassess the overall routeing for the proposed overhead line as it was considered that the routeing assessment had optimised the continuous line route in terms of environmental and engineering constraints and no changes were required. The refinement process has resulted in the now proposed tower locations which represent, in NIE's judgment, the best achievable balance between environmental impacts, technical requirements, and economic limitations.

323. Because of the nature of the proposed overhead line design, changes at one tower location could result in location, height or tower type changes at the adjacent towers. This is due to requirements arising

from overhead geometry (i.e. angular changes affecting the angle of the overhead line) and technical limitations associated with angular deviations and span lengths.

324. For these reasons there are a number of minor changes from the positioning shown in the 2009 Environmental Statement.

325. All towers have remained the same type of tower, i.e. either intermediate/suspension or angle (see Chapter 5 for explanation of different tower types). Two angle towers have changed in degree of angle: Tower 1 was proposed to be a 60 degree angle tower in 2009 and is now proposed as a 90 degree angle tower, and Tower 13 was a 30 degree angle tower and is now a 60 degree angle tower. The change of tower types arose from technical requirements.

326. The proposed location of a number of towers has been moved marginally to optimise the location and also to reduce environmental impacts. These movements have resulted in both decreases and increases in tower height. The overall stated maximum height of the 400kV towers is now 41m (it was previously 42m) and the maximum height of the 275kV towers associated with the substation connection remain unchanged at 54m. The maximum change in proposed height is 6m and the average change in proposed tower heights is minus 0.5m (a reduction compared to the 2009 design).

327. The average change in tower location is 8.8m as is apparent from Figure 4.6. The refinement process brought about no significant difference in the proposal for routeing, location and arrangement of the proposed overhead line.

4.3.7 Substation Site Selection

4.3.7.1 Overview

328. This section describes the process undertaken to determine an appropriate position and methodology for connecting the Proposed Development to the existing NIE 275kV transmission system.

329. Connection needs to be made at a substation location capable of accommodating the voltage transformation, switching, control and protection equipment required for a major transmission circuit.

330. The first consideration was whether an existing substation could be used or if a new substation would be required. An existing substation could be used if it was technically, economically and environmentally feasible to enlarge it to the degree that would be required to accommodate the new connection. If not, a new substation that fulfilled these criteria would be required.

4.3.7.2 Introduction and Methodology

331. In all cases where a new substation may be required, NIE undertakes a detailed analysis of the options. Suitable substation locations are primarily constrained by the requirement to be at or near an existing transmission line. This is a practical requirement, as otherwise additional overhead lines would be required to connect the substation to an existing overhead line. These additional overhead lines would themselves have additional technical and environmental impacts, as well as presenting additional cost. In the case of the Proposed Development, this study was especially important since the location of the substation would form a key strategic node within the future transmission system.

332. The option study process identified four potential substation locations - the existing site at Drumkee, since renamed “Tamnamore”, and three new sites. All are shown in Figure 4.5.

4.3.7.3 Principal Requirements

333. The key technical locational requirements were established as follows:

- An available area capable of accommodating the required equipment.

- To avoid the proliferation of lines connecting to a substation, a location adjacent to, or underneath, the existing Magherafelt to Tandragee 275kV overhead line, and towards the south-western extremity of that line, was preferred within the context of the preferred route corridor.
- Acceptable access for both construction and regular maintenance purposes.
- The availability of natural screening.
- The availability of a suitable overhead line route corridor into the site.

334. In assessing the available options a study process was performed in accordance with (i) the primary objective of minimising the environmental impact of the Proposed Development, and (ii) guidelines published within the "Technical Supplement of Guidelines for NIE Networks and Environment" and which are briefly summarised below:

- Utilise zoned industrial areas or semi-industrial areas where practicable.
- Avoid locations which impact upon existing properties, proposed building sites and land designated or potential housing development.
- Avoid locations which have a significant visual value.
- Consider implications of civil works to develop the site, including road traffic implications.
- Consider potential alternatives or amendments to substation designs.
- Consider suitability of site and immediate surrounds of site for routes for overhead line feeders.
- Assess the impact on the community during the preparation, construction, operation and dismantling of the site.
- Avoid areas of natural beauty and local amenity.
- Avoid elevated ground.
- Identify sites with existing screening from landform and vegetation.
- When existing screening is not available, identify a site large enough to allow for new landform and planting.
- Implement new landform and screen planting prior to construction of development.
- Avoid fronting onto roads.
- Locate new service roads along existing lanes or existing hedge lines.
- New development boundaries should integrate into existing field patterns.

4.3.7.4 Base Option –Utilise the Existing Tamnamore Substation

335. A study of the modifications that would become necessary in order to accommodate the 275/400kV transformers, switchgear and control equipment needed for termination of the proposed Interconnector demonstrated that this option would have required a substantial redesign of the existing Tamnamore substation components. It also showed that ongoing residential development in the Tamnamore area was severely restricting the scope for achieving an acceptable overhead line route corridor into the vicinity of the substation from the south. The study considered the possibility of undergrounding a short section of the required line connections in the final approach to the substation, but the technical complexities were recognised to be substantial. Practical considerations including the need to cross the M1 motorway would also have resulted in very high costs. Therefore this option was rejected.

336. In view of the preference for a site in close proximity to the existing Tandragee to Magherafelt 275kV overhead line and located near the south – western extremity of that line route, it was determined that a search should be undertaken for a suitable strategic location more suited to the development of a substation expressly designed for termination of the proposed Interconnector.

4.3.7.5 Alternative options for the development of a new 275/400kV substation south of Tamnamore

337. A location for a new substation was sought to the south of Tamnamore substation. Conducting a search south, rather than north, of Tamnamore would reduce the overall length of overhead line required for the proposed Interconnector.

338. This new substation should also be within the general Drumkee to Kingscourt preferred route corridor to minimise additional length.

339. An environmental constraints mapping exercise was conducted for a study area from Tamnamore substation, following the existing 275kV Magherafelt to Tandragee overhead line, and taking full account of the overall locational principles set out above. This is summarized below.

340. Three sites were identified from the mapping search as being potentially suitable. Each of these potential sites was then assessed in detail as summarised below. The sites are shown in Figure 4.5.

<u>Site 1</u>

341. This was the most easterly of the three sites investigated and was located some 200m west of the River Blackwater.

342. This site was located in a natural depression and benefited from natural screening by both mature established vegetation and by the general undulating topography.

343. The site was approximately 500m southwest of the Argory, a National Trust property. Views south-westward from the Argory were noted to be restricted as a result of the undulating landscape.

344. A prominent unscheduled archaeological feature, Clonmore Tower, was visible some 1.5km south of site.

345. Extensive peat deposits were suspected in this area which could pose technical difficulties during construction. A preliminary geotechnical investigation was undertaken for this site, which confirmed the presence of peat. It was also determined that excavations for foundations at this site would extend below ground water level.

346. Generally, ecology at this location did not appear to restrict development.

347. Housing density around this location was relatively low.

348. A key point of concern was that the site was within the Blackwater River floodplain.

349. As this was the most southern of the three sites investigated, the length of the overhead line circuit required for the proposed Interconnector would likely be minimised.

350. This site also benefited from the proximity of a suitable route corridor which could comfortably accommodate the proposed overhead line.

<u>Site 2</u>

351. This site was situated approximately 200m west of the Site 1 location and was located some 400m west of the River Blackwater.

352. This site benefited from extensive natural screening by surrounding hills and higher ground. Mature broadleaf trees, established at the eastern periphery of this site, could assist in screening, but would require mitigation measures to ensure minimal impacts (particularly during construction).

353. Clonmore Tower (an unscheduled monument) was visible to the south of the site.

354. The Argory was around 1.2km to the east of this site.

355. Other than the potential impact on the existing vegetation, which could be retained as screening, other ecological factors at this location did not appear to restrict development.

356. Housing density in the immediate area was relatively low and few residential properties directly overlooked this site from close proximity.

357. Geological conditions in this area were shown to consist primarily of glaciofluvial sands and gravels. A preliminary geotechnical investigation was undertaken, which determined that this site had more favourable ground conditions than Site 1 in that it was unlikely that the foundations would encounter groundwater and also no peat was found on Site 2.

358. The site was determined to be mainly above the Blackwater River flood plain.

359. As for Site 1, this site also benefited from being located further south than Tamnamore substation, which would reduce the overall length of the proposed overhead line.

360. Connection into this site could also utilise the same route corridor proposed to serve Site 1.

<u>Site 3</u>

361. This was the most northerly of the three sites investigated. It was situated in a large shallow depression, surrounded by gently undulating landforms and lay immediately north of the River Rhone, a tributary of the River Blackwater. Soil type in the general area was listed as alluvium.

362. There were no records of any archaeological features in the immediate vicinity, and ecological factors did not appear to restrict development.

363. This site was overlooked from all aspects by residential properties. A private airfield was situated approximately 600m to the west of this site. For these reasons alone, it was considered that additional overhead lines or substation infrastructure in this area would be undesirable for both safety and visual amenity reasons.

364. Site 3 was further disadvantaged by its position further north than Sites 1 and 2, therefore requiring a longer overhead line route for the proposed Interconnector. Routeing into the actual substation site was determined to be problematic due to the general topography around the site and density of private housing.

365. The site was also located within the Blackwater River floodplain.

4.3.7.6 Selection of a Substation Location

366. The following were key environmental considerations in the selection of the substation location:

- Sites 1 and 2 required a shorter overall overhead line route;
- Sites 1 and 2 were generally less visually intrusive with the added benefit of established natural screening in place;
- Fewer residential properties directly overlooked Sites 1 and 2 from close proximity;
- Site 3 was in close proximity to a private airfield; and
- Sites 1 and 3 were within the Blackwater River floodplain.

367. Access to any of the three locations did not appear to be an issue for either construction or future maintenance purposes.

368. Site 2 was selected as the preferred location taking into account the following key environmental considerations:

- Adequate distance from dwelling houses (over 200m);
- Existence of natural screening due to mature vegetation and topography, which would reduce landscape and visual impacts;
- Further from the Argory and the Clonmore Tower than Site 1;
- A more southerly location than Tamnamore and Site 3, requiring a lesser overhead line route length than either of these options;
- Site 2 was mainly above the Blackwater River flood plain, whereas Sites 1 and 3 were located wholly within the flood plain.
- Site 2 was preferred over Site 1 for geotechnical reasons based on preliminary geotechnical investigations, which determined that Site 2 consisted primarily of glaciofluvial sands and gravels, had minimal peat, and that excavations were unlikely to encounter ground water (whereas Site 1 was determined to have peat deposits and was likely to encounter ground water).

369. Site 2, in the townland of Turleenan, was taken forward to EIA as the preferred substation site.

4.3.8 Alternatives to Substation Design

4.3.8.1 Civil Engineering Constraints

370. With the site at Turleenan selected as the preferred location for a new substation, detailed site investigations were undertaken. Preliminary civil engineering work was conducted to determine the preferred location of the substation within the general site area identified.

4.3.8.2 Design Considerations of Proposed Substation

371. The substation itself will be located between a hill and existing mature vegetation. This will provide an element of screening from receptors beyond the hill and the woodland, respectively.

372. The proposed substation location is located above, but close to, the upper part of the Blackwater River flood plain. Hydraulic modelling was undertaken as part of a detailed Flood Risk Assessment (See Chapter 17). This assessment determined in detail the extent of the flood plain, and the specific location and design measures that would be needed in order to locate the permanent development associated with the substation in a position wholly outside the modelled 1% Annual Exceedance Probability (AEP) or Q100 flood plain.

373. The hard standing area of the substation has been located outside of the 1% AEP floodplain. During the construction period of the substation, the temporary alignment of the access road will encroach onto the floodplain; however, this is not considered to be significant and is temporary in nature.

374. The proposed SuDS pond will be within the 1-in-100 year (Q100) flood plain but constructed below the existing ground level. This will mean that there is no loss of flood plain as a result of its construction. The risk of pollutant mobilisation during a flood event is a low risk due to the location and low velocity of flood waters in this location (see Chapter 8 Water Environment of this ES for further details).

375. Also, as part of the temporary works required to construct the substation and facilitate connections to the existing overhead line, two temporary structures are required to be constructed adjacent to the substation site. One of these towers will be located within the Q100 floodplain of the Blackwater River. The duration of the temporary structure being in position will be 2-3 months and the construction of the structure has limited activity at ground level, with small foundations and stayed supports. The assessment considers that the primary floodplain function at each tower location is for the storage of floodwater, however, should the location provide conveyance, the effect will be localised and considering each location and there being no vulnerable receptor in close proximity (See Chapter 17 for further details). Therefore, the effect of the temporary structure construction will be temporary, minor and limited only to minor loss of floodplain storage.

376. Given the scale of the impact to the floodplain, no compensation is considered to be required and has been confirmed in consultation with the Rivers Agency. The Proposed Development can be considered to be of regional importance and consists of essential infrastructure that has an operational requirement to be at this location.

377. The permanent development of the substation was designed to avoid direct impact on the flood plain, and also to be elevated above the Q100 flood level. This means that the permanent substation development will be located outside and above the maximum modelled “once in 100 years” flood level. The civil design objective additionally requires a further elevation (or “freeboard”) of 500 mm above this level. Planning Policy Statement 15 (DOE 2006) requires development outside the 1% or Q100 flood plain which is more than achieved; the permanent development footprint of the substation nears[111] the 0.5% Annual Exceedance Probability (AEP) or Q200 flood level.

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[111] The Q200 level was not modelled and thus its precise location at Turleenan is not known; however, it is likely that this level is achieved based on available information.

378. It was recognised, as part of the design considerations, that whilst requiring the substation site to be located at the minimum level described above, it should also be located as low as possible below the crest of an existing hill. This was in order to minimise visual impacts.

4.3.8.3 Components of the Substation

379. Two alternative technical designs for the substation were considered.

380. A design utilising "Air Insulated Switchgear" (AIS) would be the least cost option and was initially considered. An AIS substation is an open busbar substation with air insulation. This would be an open-air substation of a similar type to others elsewhere in Northern Ireland. An area of 36,900m^2 with an overall width of 180m and an overall length of 205m was determined to be required for an AIS, but the design objectives set out and the topography of the site above would have resulted in a proposal involving a significant amount of "cut and fill" in order to achieve the level area required for the substation, with consequent visual and other impacts on the immediate environment.

381. An alternative design using "Gas Insulated Switchgear" (GIS) was therefore considered as an alternative. A GIS substation is metal clad with sulphur hexafluoride gas used for insulation. While GIS is widely used throughout the world, this would be the first 275kV GIS substation used by NIE. Key considerations in terms of the GIS option were:

- A smaller area compared with the AIS option;
- GIS technology can be housed in a building similar to a farm building, with a resulting reduction in landscape and visual impacts compared with an AIS arrangement. (See Viewpoints 1- 4 in Volume 4); and,
- There is substantial additional cost associated with a GIS substation.

382. A decision was made by NIE to propose the GIS option for the 275kV switchboard, but to retain the less costly AIS layout for the 400kV switchgear. The significantly smaller overall footprint of the GIS option for the 275kV switchboard also means that NIE could ensure that the substation would be located entirely above and outside the Blackwater River flood plain. The GIS option would also reduce the landscape and visual impacts of the substation since the building enclosure for the GIS switchboard can be designed to closely resemble a farm building, and such a building can be located to block views of the outdoor substation equipment from the north.

4.4 Conclusions

383. The examination and evaluation of technological alternatives described in this revised and consolidated Chapter 4 has been performed in accordance with the EIA Regulations, which require that an ES should contain *"An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects."* They have also been performed to comply with Policy PSU 2 and PSU 8 to ensure that the most suitable alternative is provided.

384. Part One of Chapter 4 has re-examined identified alternatives for achieving enhanced transmission system interconnection between NI and ROI meeting the specific performance requirements set out in Chapter 2, Need and having regard to key environmental issues. The process involved a number of separate elements including the consideration of options for the initial design capacity, an assessment of available transmission methods, and the identification of critical performance features required of the proposed Interconnector.

385. The examination of technological alternatives contained within Part One of Chapter 4 includes reference to studies and reports produced by internationally recognised consultants, some commissioned by NIE, EirGrid and SONI, and others commissioned by Government. The more recent reports commissioned have also been considered. The conclusions from these reports have informed

and updated NIE's and EirGrid's assessment of the alternatives, and confirmed their view that the most practical solution to meet the need for interconnection would be a HVAC overhead transmission line

386. The principal conclusions confirming the selection of an overhead line as the selected method for delivery of the proposed Interconnector are as follows:

- The rejection of undersea technology as presenting unnecessary elements of risk, environmental impact and significant additional cost where practical overland transmission system connection alternatives exist;
- Recognition that HVDC including VSC technology offers no significant technical or environmental advantages, but presents considerable additional significant complexity, cost and risk in comparison with HVAC technology;
- The worldwide predominance of HVAC overhead lines for transmission applications, and the absence of any transmission application worldwide of an underground HVAC cable circuit approaching the length of the proposed Interconnector at the designed voltage;
- The significant additional lifetime cost and technical complexity associated with the adoption of underground cable technology for high voltage transmission circuit applications;
- The superior reliability and performance of AC overhead line technology when applied to integrated transmission systems.

387. The overall conclusion drawn by NIE, as informed and supported by the specific technical studies described in this section, is that the re-examination of the transmission alternatives fully supports and confirms NIE's proposal to construct the Proposed Development by means of a 400kV AC single circuit overhead transmission line.

388. Part Two of Chapter 4 has described the process undertaken by NIE to evaluate alternative positions for transmission system connection, viable route corridors for an overhead transmission line between the selected connection point and the transmission system in the Republic of Ireland, and detailed overhead line route selection within Northern Ireland.

389. Part Two also describes the process undergone to evaluate alternatives for location, design and layout of the proposed substation.

390. The substation site selection and overhead line routeing process described in this Part Two of Chapter 4 has been performed in accordance with NIE's objective to minimise the environmental impact of the Proposed Development in accordance with its published Guidelines.

391. Numerous alternatives have been considered for the connection, design, location and routeing of the Proposed Development:

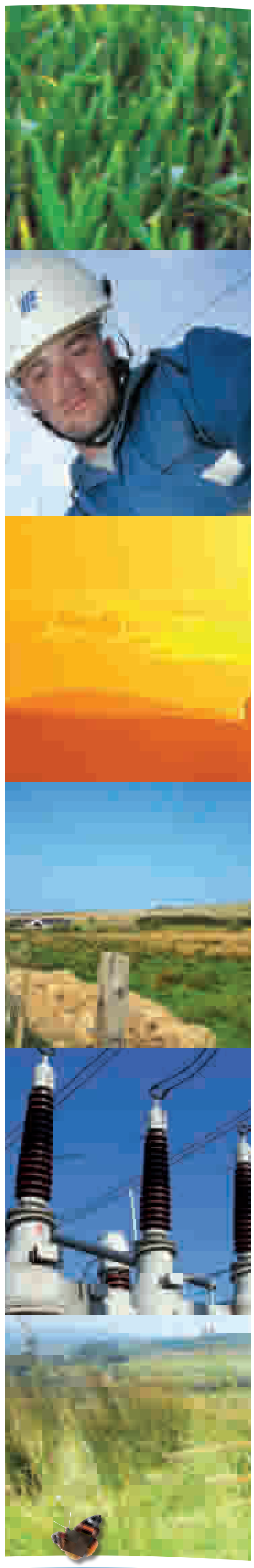
- Alternative system connection options. The identification of five possible and technically feasible solutions. Of these five, two (the Western Option and the Multiple 110kV Option) were rejected at a relatively early stage since they were considered to present poor power transfer capabilities in comparison with other feasible options.
- Alternative study areas were identified in association with the remaining three connection options, two alternative "Mid-Country" connection options (including the eventually selected option of a connection between Drumkee and Kingscourt) and an Eastern connection option that would have duplicated the existing interconnector connection between Tandragee and Louth.
- Identification and assessment, having regard to the likely significant environmental impacts, of alternative route corridor options within the Mid-Country and Eastern study areas, leading to the choice of a preferred route corridor between Drumkee and Kingscourt.
- The identification and evaluation of alternatives to the detailed overhead line routeing within the preferred route corridor, and the application of established overhead line routeing principles (including land owner consultation and a combination of environmental and practical considerations) to the identification of a finalised route for the proposed overhead line.

- The identification and evaluation of three alternative substation locations in the vicinity of the chosen transmission system connection point, leading to the choice of Turleenan near Moy, County Tyrone (rather than the initial presumption of a location near Drumkee).
- The evaluation of alternatives for the substation design and layout, and the final choice of GIS in order to reduce the overall footprint and environmental impact of the proposed substation.

392. The Proposed Development has been subject to an extensive examination of alternatives. As this Chapter 4 has demonstrated, the mitigation of environmental impacts by design has been a fundamental aspect of NIE's development process, and the location of the proposed substation and the routeing of the proposed overhead line are both considered to represent the best overall options amongst the many alternatives considered throughout the development process.

Chapter 5

Proposed Development



Consolidated Environmental Statement

Volume 2

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Northern Ireland Electricity

5 Proposed Development

5.1 Introduction

1. The Proposed Development is summarised below:

- **The Proposed Substation:** the construction and operation of a new 275kV / 400kV (source) substation at Turleenan townland, north-east of Moy, County Tyrone (hereafter referred to as the substation);
- **The 275kV Towers:** the removal of an existing 275kV suspension tower and the construction and operation of two new 275kV terminal towers, including the temporary diversion of the 275kV line, to provide for connection of the Turleenan substation to NIE's existing 275kV line;
- **The 400kV Towers and Overhead Line:** the construction and operation[112] of a single circuit 400kV overhead transmission line supported by 102 towers for a distance of some 34.1km , from the source substation (at Turleenan) to a border crossing between the townlands of Doohat or Crossreagh, County Armagh and Lemgare, County Monaghan, 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 proposed by EirGrid for placement within that jurisdiction. However, owing to geographic border definitions in the immediate area of the border crossing, there will be 200m of line oversail in the Northern Ireland townland of Crossbane (as shown on Figure 1.5, contained separately in Volume 4 of the ES); and,
- **Associated Works:** Works to include site levelling, site preparation works, modifying existing access points, construction of new access points, construction of new access lanes, construction of working areas, stringing areas, guarding, site boundary fencing, related mitigation works, formation of access tracks and other associated works at the substation and at the tower locations.

2. This is described in detail in this Chapter in the following sections:

- Section 5.2 Connections to Existing Infrastructure;
- Section 5.3 Design of the Substation;
- Section 5.4 Construction and Maintenance of the Substation;
- Section 5.5 Design of Overhead Line and Towers;
- Section 5.6 Construction and Maintenance of the Overhead Line and Towers; and,
- Section 5.7 Excavated Materials.

5.2 Connections to Existing Infrastructure

3. The Proposed Development will connect to existing electricity infrastructure at the proposed Turleenan substation, which will provide a connection between the existing 275kV overhead line and the proposed new 400kV overhead line.

[112] The System Operator Northern Ireland (SONI) will be operating the Proposed Development. NIE will have continuing responsibility for maintenance.

4. One existing 275kV intermediate suspension tower in the vicinity of the proposed Turleenan substation will be removed, and two new 275kV terminal towers will be constructed to provide a connection to the proposed substation.

5. The positioning of the proposed substation compound has been aligned with the existing 275kV overhead line. This is a design consideration that has sought to minimise the number of additional overhead line structures required and the corresponding impacts (for instance in relation to the floodplain, and visual and landscape impacts).

6. The connection to the existing NIE overhead line will be made from two new 275kV terminal towers. The down leads from the two new towers will terminate on cable sealing ends, and a short length of 275kV underground cabling will be installed to the substation.

7. The 275kV towers will be constructed to overall heights of 46m and 54m above ground level[113]. The two proposed 275kV towers at the substation will have an excavation depth of approximately 6m and an area of 625m^2.

8. The proposed new 275kV terminal towers are illustrated in Figures 5.4 and 5.5, and shown in Photomontage Viewpoints 1, 2, 3 and 4 (see Chapter 13 Landscape and Visual).

9. Prior to the construction of the proposed 275kV towers, one side of the existing 275kV overhead line will be temporarily diverted on to temporary structures while the other will be disconnected for the duration of the works. This is to allow for the construction of the proposed 275kV towers and bases while maintaining use of the existing line in service. The temporary structures will be constructed within the substation application area, approximately 35m from the location of the proposed 275kV towers (see Figure 5.6). The temporary structures will be in place for approximately 2-3 months and will be approximately 50m in height. The temporary structures will comprise prefabricated light-weight aluminium sections which bolt together in an operation typically lasting less than half a day. The temporary structures will be held in place by a metal base plate and supporting aerial stay wires.

10. The existing overhead line will be uncoupled from the existing 275kV towers and mounted to the temporary structures. The maximum diversion of the line will be approximately 10m (all alterations remaining within the substation application area) and the diversion will cross over agricultural land and over the Trew Mount Road and Derrygally Way. Access to the existing tower locations outside of the substation area for the diversion works will be via the existing field access locations (see Figure 5.6).

11. The removal of the existing 275kV intermediate suspension tower will be undertaken by cutting apparatus and crane. The steel will be disposed of offsite to a licensed waste disposal site (see Chapter 18). The two new 275kV terminal towers will be assembled on site by crane. The existing tower foundation will remain in situ and will be covered with topsoil to allow vegetation growth.

5.3 Design of Substation

5.3.1 Overview

12. The substation installation will incorporate a control building, a 275kV Gas Insulated Switchgear (GIS) building, provision for three power transformers with associated firewalls, and an open air 400kV switchyard containing high voltage electrical equipment. The entire installation will be constructed within a 193m x 134m[114] securely fenced compound, and will have a maximum height of 12.5m to the top of the proposed GIS building, as well as proposed concrete enclosures for the transformers. The

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[113] The heights of towers are given as above the ground level at the centre point of the tower – this is the height from the ground level at the centre point of the tower to height of the tallest point of the tower.

[114] Maximum dimensions to external fencing.

proposed ancillary works will include an access road, surrounding earthworks, land contouring, a surface water drainage system (including pond), and landscape planting.

13. Access to the proposed substation will be from the B106 Trew Mount Road. The proposed 400kV overhead line will emerge from the southern perimeter of the substation compound, and connection to the existing 275kV overhead line will be to the north of the substation compound. The proposed overall arrangement, including the access road, is shown in Figure 5.1.

5.3.2 Proposed Substation Access Road

14. The proposed substation access road will provide for the transport and delivery to site of all necessary substation elements, including heavy equipment such as the power transformers.

15. The junction between the proposed substation access road and the existing Trew Mount Road has been designed to provide for visibility splays (or emerging traffic “sight lines” derived from a speed survey) of 4.5 x 168.3m. A 15m radius at the entrance to the access road will ensure adequate space for large vehicles as they turn into the site (further detail is contained in Chapter 18).

16. The access road will be 10m wide for the first 20m to allow vehicles to pass each other safely, reducing to a 6m width for the remaining distance to the substation. The road will be contained within a border of stockproof fencing and an embankment as shown on Figure 5.1. The road surface will be built above a level of 16.61m Above Ordnance Datum (AOD) (the modelled 1:100 year or 1% AEP flood level).

17. New field accesses from the substation access road will be fitted with gates to allow access to adjoining land. These accesses will be for agricultural purposes only.

18. During construction of the proposed substation, a temporary site entrance will be constructed to the north of No. 152 Trew Mount Road. This provides for the existing buildings at No. 152 Trew Mount Road to be used during construction. However, this temporary arrangement will be replaced by the proposed permanent entrance following the completion of construction, and the existing dwelling will be demolished. The demolition material will be sent to landfill (as outlined in Chapter 18). There will be no likely significant environmental effects as a result of the demolition.

5.3.3 Substation Compound Arrangement

19. The proposed substation compound will be approximately 193m x 134m [115] and will be generally in a rectangular arrangement. The area of the substation to the outer boundary fence will be 22.5ha (22,500m^2), with a height of 12.5m to the top of the GIS building.

20. The substation is illustrated in Figure 5.1, and shown in Photomontage Viewpoints 1, 3 and 4.

21. The substation will be located within the Turleenan site with a combination of cutting and embankments, to a final finished site level of 17.75m above ordnance datum (AOD).

22. There will be a flat-topped bund 1m above the finished site level of the substation along the eastern perimeter of the substation to provide visual screening. The bund will be planted to further screen views from the east.

23. The whole of the northern and western perimeters, and the majority of the southern perimeter, of the substation will be cut into the hill. The cutting will be, from the elevated hill, a 1:2 slope, followed by a 3m level strip, and a 1:3 slope. The cutting screens views of the substation from the west, and partial views from the north and south.

24. The total estimated volume of cut material based on excavation level 17.25m will be 261,130m^3 for the substation. Including the access road cut, the amount of material will be approximately 265,000m^3.

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[115] Maximum overall dimensions to external fencing.

25. The access road and substation site drainage will be run through oil interceptors and then to a wetland storage settling pond.

26. Drainage from the southern portions of the development will be to a field drain and directed to the south.

5.3.4 Substation Compound Components

27. The general configuration of the sequence of build elements that will be required to transmit and transform electricity from 275kV to 400kV will consist of two buildings (a substation control building and a GIS building), and an open air switch yard. The buildings are shown on Figure 5.1.

28. The control building will be 8.8m tall and 30m long by 9.3m wide. It will consist of two floors. The ground floor will contain a kitchen, a store room, a toilet room, a metering room, a locker room, a low voltage alternating current room, and a battery room. The first floor will contain a protection and control room, a telecoms room, and an office.

29. The external finish of the control building will be concrete blockwork with a rendered finish (mid grey[116]) on the ground floor, and metal wall panels (NATO green or similar) on the first floor. The roof will be galvanised metal (NATO green or similar).

30. The GIS building will be 12.5m tall, and 33m long by 13.5m wide. It will contain circuit breakers, disconnectors, instrument transformers, earth switches, surge arresters, busbars, and ancillary components.

31. The GIS building will be a composite framed structure consisting of main steel trusses and roof members supported on in situ reinforced concrete columns. The external wall will consist of horizontal insulated metal cladding panels supported on vertical steel rails above, or in conjunction with, brick and block panels, which will extend from ground level to a 2.4m above ground. The external colour will be NATO Green or similar. The roof will be galvanised metal (NATO green or similar).

32. The GIS and Control buildings will conform to all building control regulations and the finished ground level will be 300mm above the outside finished ground level of 17.75m.

33. The open air switch yard will comprise 400kV air insulated switchgear consisting of circuit breakers, disconnectors, instrument transformers, earth switches, surge arresters, busbars, and ancillary components.

34. The three 500 MVA, 275kV/400kV transformers will be immediately south of the GIS building. They will be connected via underground cabling and will be contained by 12.5m high wall barriers on three sides. This is a fire protection and noise mitigation measure. The transformers, which contain oil, will be positioned within the firewalls and bunded areas for oil containment.

35. There will be six car parking spaces located immediately outside the fenced compound area to the north-west of the substation entrance.

36. The substation will be enclosed by a palisade security fence 2.4m high with a sterile zone between the outer and inner fence. As a security feature, high level illumination lighting around the perimeter fencing will automatically switch on in the event of intrusion and the site will be monitored by remote cameras.

37. As with all buildings containing electrical equipment there is a risk of fire generated by electrical faults. The risk will be minimised by utilising components, materials and practices following the approach adopted by electricity utilities worldwide. Furthermore all buildings will be internally equipped with smoke/fire detection equipment which will be remotely monitored on a continual basis.

38. The transformers to be installed at the site contain insulating mineral oil, which also acts as a coolant. The oil is classed as low flammability. The risk of a fire associated with transformer failure is very low. In the unlikely event that there is a fire, transformer protection devices will automatically de-energise

[116] British Standard 381C Colour 626.

the transformer and signals will be sent to a remote location resulting in a call to the Fire Service. The oil bund is fire proof and will retain and suffocate any burning oil released.

39. NIE will inform all relevant authorities (e.g. local councils, PSNI, Fire and Rescue Service, etc.) that the site be considered as key infrastructure development and all emergency services will be instructed of its location and appropriate emergency response procedures will be adopted. The remote security cameras will ensure any incident is immediately detected.

40. Concrete roads, to appropriate standards, will be laid across the substation compound for access. The rest of the site will be stoned to provide hard standing. The stoning will also inhibit weed growth.

41. A low level of sensor-operated access lighting will be provided to allow safe access to the building and manually operated high level lighting will be used to permit general maintenance and operation of local controls in the hours of darkness. There will be no lighting in general use during the normal operation of the substation.

42. The substation will be a permanent part of NIE's infrastructure. Components within the substation will be designed for a minimum overall life of forty years at specified high availability, reliability and efficiency. It will be maintained throughout its life with effective routine maintenance, ongoing refurbishment, replacement of redundant equipment and upgraded designs to ensure a permanent transmission facility. Accordingly NIE have no plans for the decommissioning of the substation.

5.3.5 Planting Proposals

43. Vegetation planting is proposed to facilitate the integration of the substation into the existing landscape. The planting proposals are contained in Figure 5.7. The planting proposals are illustrated in Viewpoints 1 through 4, attached in Volume 4 of this ES.

44. The effects of the substation on landscape character and its individual elements (such as hedges and trees) have been limited by choosing the most appropriate location and detailed on-site positioning. Mitigation of the subsequent residual visual effects of the completed development are aided by the opportunities to use appropriate materials and finishes for the built elements and a combination of surrounding earthworks, to include earth mounding around the site, and suitable hedge and tree screening.

45. These design measures are summarised below.

- Use of excavated material for all peripheral earthmounding;
- Completion of the mounding and planting prior to the installation of substation components;
- Providing the height of mounding necessary to screen the lower construction elements;
- Grading new landforms gradually into existing surrounding levels;
- Use of indigenous hedge and trees along with fast growing pioneer and climax trees;
- Selection of an appropriate planting specification and mix to provide short and long term screening of the development;
- Avoidance of the show of kerbs on the edges of the new access road;
- Avoidance of the use of roadside signs relating to the completed development;
- All metal security fencing will be galvanized/painted to match the colour of the new service buildings and the inner palisade fence;
- Field enclosures will be timber post with appropriate galvanised rabbit proof wire, and planted with local hedge and tree species;
- Security lighting will be located to minimise light spillage and pollution on the local area, The lights will be activated by motion controlled sensors; and,
- Avoidance of reflective finishes.

5.3.6 Earthworks and Screen Planting Detail

46. An earth mound to the eastern perimeter of the substation compound, combined with the cutting into the hill on the western, northern and southern sides of the substation, will immediately screen views and consequently help to mitigate visual impacts.

47. The mound area on the eastern boundary will be 1m high above the finished site level of the substation to screen the lower elements within the compound, and will be reinforced by appropriate tree planting. The screening will be amplified by the ground level dropping away to the east.

48. The proposed earthmounds and planting, combined with the surrounding existing mature planting to the north-east of the substation, will provide an immediate visual screen of the substation development.

49. The proposed planting of mixed native vegetation, ranging in size from whips (60-80cm high) to heavy standards (3-6m high), in strategic locations throughout the development will reinforce the visual screen and blend the development into the existing landscape.

50. Existing topsoil will be stripped from the development site and stored in an agreed location on site and protected from the main works for use in the reinstatement of the landscape. Topsoil will be used to dress the slopes and incorporated into the planting areas at appropriate depths to ensure successful establishment of the planting proposals.

51. The proposed boundary livestock fence will also act as a rabbit-stop fence, reducing the opportunities for rabbits to access the site. This combined with rabbit spirals and guards incorporated for all new planting, will reduce the opportunities for rabbits to cause damage during the establishment of the planting.

52. Planting on the earth mounds will consist of indigenous hedgerows and trees to the fenced boundaries around the outer perimeter, while the remaining slopes and top flat areas will be planted and maintained to give scrub undergrowth below medium and tall trees.

53. Plant species of local provenance will be specified and located to suit local conditions. This will stabilise the steeper slopes and provide a fast growing screen consisting of “pioneer species” planting to shelter the taller growing “climax” trees.

54. The site will be maintained according to a five year maintenance schedule, which will ensure appropriate seasonal operations such as grass cutting, weed control, replacements, wind firming, and thinning to various densities, so as to establish an informal, naturalised and diverse planting screen.

5.3.7 Substation Drainage

5.3.7.1 Overview

55. The drainage for the proposed substation site (hardstanding area and access road) has been designed in accordance with the Sustainable Drainage Systems (SuDS) principles and the Construction Industry Research and Information Association (CIRIA) SuDS Manual 2007.

56. A three stage treatment to ensure water quality has been designed. This is detailed in Appendix 5B, shown in Figure 5.9 and is summarised in this chapter.

5.3.7.2 Treatment Stage 1 – Treatment of stormwater using infiltration (interception storage)

57. The site compound will be constructed of gravel material filtering the stormwater at location. This will provide pollutant filtration at source. There will also be some hydrocarbon removal at this stage as the hydrocarbons will be attached to the suspended solids removed via filtration. The infiltration technique will treat smaller events via filtration through the soils and discharge them to groundwater.

5.3.7.3 Treatment Stage 2a – Filter Drains

58. Water from the site will be conveyed through a series of filter drains (half perforated and unperforated). These linear drains will be filled with a permeable material and offer filtration, atsorption, biodegradation and volatilisation pollutant removal. There are also a number of perforated field drains proposed which will allow infiltration throughout the site.

5.3.7.4 Treatment Stage 2b – Oil interception

59. Two oil interceptors (see Figure 5.1) are proposed and will act to separate the hydrocarbons from the water which can then be drawn off during maintenance. The interceptors are located outside of the 1-in-100 year floodplain. Sediments will also settle within the system and can be drawn off during maintenance procedures. Interceptors will conform to the European Standard PR EN 858 – 1 & 2.

5.3.7.5 Treatment Stage 3 – Pond/Wetland

60. A pond has been proposed and will provide secure water quality by capturing the small rainfall events and settling out fine silts and promote plant and microbial activity to encourage adsorption and biodegradation of contaminants and nutrient removal.

61. The pond design has been developed following the flood risk assessment (Chapter 17), which has allowed for the appropriate size of the pond and the details of discharge to and from the treatment facility. The designed treatment volume is designed to capture 75-90% of the storms in a year. This is in line with the industry guidance for the design of SuDS (CIRIA 2009) – the remaining 10-25% of storms will discharge to the existing minor watercourses/drains on site and through the pond. The designed four stages of treatment will treat all flows generated from the hardstanding area and the access road of the substation. This ensures that the smaller volumes of runoff are stored within the treatment systems and treated in accordance with the guidance from the SuDS Manual, by following the principles of Surface Water Management. The smaller volumes of runoff are those in which pollution is most concentrated, as the initial runoff from surface washes the pollutants into the surface water collection systems.

62. The pond will be within the 1-in-100 year (Q100) flood plain but constructed below the existing ground level. This will mean that there is no loss of flood plain as a result of its construction. The risk of pollutant mobilisation during a flood event is a low risk due to the location (at the edge of the flood plain) and low velocity of flood waters in this location. In the event of a 1-in-100 year flood, the level of any pollutant mobilisation from the site will be insignificant in comparison to pollutant mobilisation in the wider area.

63. The pond includes a safety bench for access during routine maintenance and an aquatic bench to support wetland planting. This acts as a biological filter and provides ecological and safety benefits.

64. Inlet velocity from the access road and site compound will be between 0.3 to 0.5 m/s to avoid re-suspension of sediments. As attenuation is being provided upstream, the flows to the pond will be relatively low.

65. The outlet will be built into the embankment (see Figure 5.9) with easy access for maintenance. A concrete headwall will be installed in the embankment with the outlet pipework located below the permanent water level/normal water level. The outlet pipework discharges to a concrete chamber containing a weir and gate valve arrangement. The weir will control the water permanent water level and the gate valve can be opened if the pond needs to be drained for maintenance operations. The concrete chamber is located in the safety bench/dry bench area to ensure maintenance can be carried out safely.

5.4 Construction And Maintenance of the Substation

5.4.1 Construction Sequence

5.4.1.1 Overview

66. The construction of the proposed Turleenan substation is a major civil engineering scheme requiring significant earthworks and infrastructure development.

67. The construction can be split into seven segments:

- Site Entrance;
- Access Roads;
- Site Clearance, Landscaping and Preparation of Bund Construction;
- Installation of Drainage and Ducting;
- Construction of Roads and Bases within the Site;
- Installation of Equipment and Construction of Buildings; and,
- Completion of Access Road and Entrance, Including Final Surfacing.

68. Following these segments the site will become operational.

69. Construction of the Turleenan substation will take up to three years, and will be undertaken in parallel with the overhead line construction activity.

5.4.1.2 Site Enabling Works

70. This will involve the following and will require the use of excavators, lorries and dump trucks:

- Removal of hedges and fences,
- Stripping of topsoil and setting aside for reuse,
- Ground stabilisation,
- Excavation to formation level of road construction, and,
- Placement and compaction of stone and erection of fencing to new entrance splays.

5.4.1.3 Access Roads

71. Hedges and fences will be removed as required, and the topsoil set aside. Excavation to the road formation level will then occur, followed by the initial stone placement to permit construction access to the site. Stock proof fencing will be installed to the edge of the road.

72. The internal access road will be 10 m wide for the first 20 m, reducing to 6 m towards the substation with stockproof fencing and embankment. It will be built above a level of 16.61 m AOD (the modelled 1:100 year flood level).

73. The road will be used by bulldozers, excavators, dump trucks and lorries as well as other smaller plant and vehicles.

5.4.1.4 Site Clearance, Landscaping and Preparation of Bund Construction

74. The first stage in this construction segment will be to provide temporary stock proof fencing to the site boundary. With this in place earthworks, including excavation of the topsoil followed by subsoil will occur. This material will be used to fill low areas of the site and to create bunds to the site boundary. The delivery of hardcore material is outlined in Chapter 18.

75. The northern, western and most of the southern perimeter of the substation will be cut into the hill. The cutting will be, from the elevated hill, a 1:2 slope, followed by a 3m level strip, and a 1:3 slope. The cutting blocks views of the substation from the west, and partial views from the north and south.

76. Any surplus material will be dealt with as outlined in Section 5.7 of this chapter.

77. A large excavation will be necessary for the substation. However the substation design will not involve any excavation below the groundwater table and hence it is considered that the construction of the proposed substation will not impact significantly on the groundwater level or on flow in the underlying sands and gravels as no dewatering will be required.

78. Landscaping will be put in place as soon as possible after the earthworks are complete to allow planting to mature and provide maximum screening during construction and operation. The substation works will result in the loss of 6 existing mature trees and 538m of hedgerow, which will be compensated for by the proposed landscape planting (see Figure 5.7).

79. Work will be carried out by bulldozers, excavators, dumpers and rollers.

5.4.1.5 Installation of Drainage and Ducting

80. Newly constructed bunds will have drains installed and the runoff will discharge to existing minor watercourses.

81. On completion of drainage installation, ducts and cable trenches will be installed for electrical connections to the site equipment.

82. This will require the use of excavators and dump trucks. It will also require the delivery of stone and pipes – estimated at 40 lorry loads (detailed in Chapter 18 Transport).

5.4.1.6 Construction of Roads and Bases within the Site

83. The roads and equipment bases will require significant volumes of concrete, reinforcing steel and stone to be delivered to the site. The concrete will be brought to site ready mixed. This is estimated at a total of 1,200 lorry movements over a period of 8 weeks (see Chapter 18 Transport for further details). This is estimated to occur as a maximum of 60 lorries per day at construction peak. Piles may be required, subject to ground investigations, for the large items of equipment. Piling, if required, is estimated to take approximately two weeks.

84. This period of construction will utilise excavators and dump trucks as well as the material delivery vehicles.

5.4.1.7 Installation of Equipment and Construction of Buildings

85. Buildings/Panels will be required on the site to house switching and control equipment.

86. Electrical equipment will be brought to site from the appropriate manufacturers using road transport. Most equipment will arrive in component form and will be assembled on prepared foundations on site. Major plant items will be more significant, with large loads coming to site and the requirement for large cranes to upload and place these items. These will be galvanised steel busbars circuit breakers and transformers which are approximately 5m high.

87. Although the traffic volume for major plant items will be small, it will include large slow moving loads for example, transformers. These will be brought by sea to a suitable port. Thereafter they will be taken to site by road as detailed in Chapter 18.

88. Construction of permanent palisade and security fencing 2.4m high and gates will be followed by the installation and commissioning of security equipment – lighting, CCTV in a 3m sterile zone between security fencing and palisade fencing.

5.4.1.8 Completion of Access Road and Entrance, including Final Surfacing

89. Once the main construction and installation of the substation site is complete, the access road and entrance will be completed to standard (as outlined in Chapter 18 Transport).

90. This will require excavators, dump trucks and surfacing vehicles. Lorries delivering stone and surfacing material will access the site, estimated at a total of 60 (see Chapter 18 Transport).

5.4.1.9 Operations and Maintenance

91. A maximum of two vehicles per day is anticipated during operation and three or four per day during maintenance, which will normally take no longer than one week each year.

92. To ensure its normal operation, there will be routine inspections of the drainage systems. The oil interceptors will be maintained every six months, in accordance with manufacturer's instructions. There will be bi-monthly inspections of the proposed outlets. The drainage pond will also be inspected bi-monthly and after major rainfall events. General maintenance of the pond will be required on a regular basis (once every year) and would include litter/debris removal, inlet/outlet cleaning, vegetation management and sediment monitoring and removal when required. The waste material will be generally sent to landfill.

5.4.1.10 Road Access and Construction Traffic

93. Vehicle movements associated with the construction of the substation are likely to come from a number of sources including ports.

94. The proposed substation site has good access routes and all construction traffic will access the site using A and B class roads including the B106 itself, the B28 from Craigavon and the A29 from Armagh to the south and Dungannon to the north, as well as the M1 Motorway providing excellent access to Belfast and its port to the east, as well as to the west. Access routes have been determined and assessed in Chapter 18 Transport.

95. As stated previously, the daily construction traffic movements at the proposed substation are considered to be no more than 60 per day at the peak of the construction stage. This is associated with the delivery of concrete; on other days the maximum traffic movements are expected to be less.

96. Parking will not be permitted on public roads or on verges near the substation site. Signs will be erected at the road verges to ensure this is adhered to and it will form part of the contract with NIE's appointed contractor.

97. Parking of construction vehicles will be within the area of the proposed substation.

98. Part of the temporary hard standing area at the construction site will be set aside for access and parking of emergency vehicles.

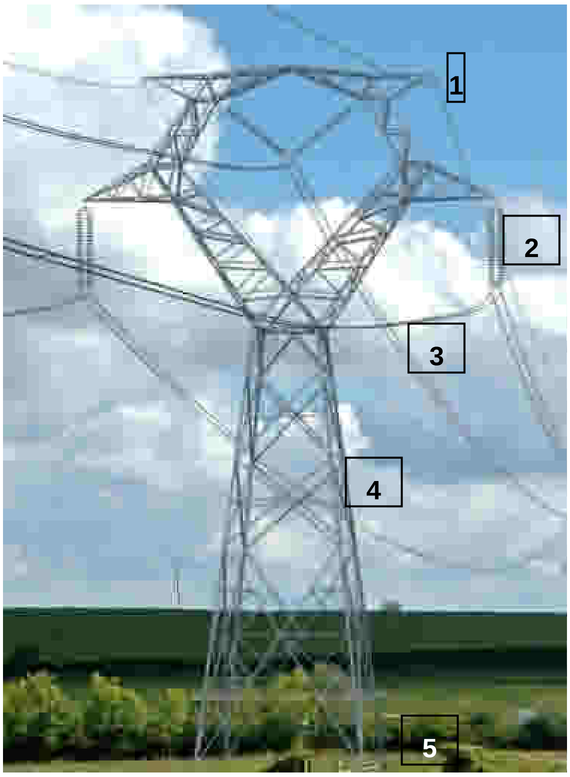
5.5 Design of Overhead Line and Towers

5.5.1 Elements of Overhead Line Design

5.5.1.1 Overview

99. The illustration below shows the general arrangement of the CIVI-1 tower design that has been selected for the proposed single circuit 400kV overhead line. This is shown in further detail in Figure 5.2 attached in Volume 4.

Illustration 5.1: Arrangement of Proposed Tower



1. Earthed Shieldwires
2. Insulators
3. Conductors
4. Tower
5. Concrete foundation for each tower footing

100. It is the practice, jointly, of NIE as the Transmission Asset Owner, and System Operators Northern Ireland (SONI) that standard equipment and material is identified and approved for use on the transmission network. This practice ensures rationalisation of material quantities, procurement, construction, operation, and maintenance procedures. During construction, inspections will be carried out at a number of stages to confirm that the proposed overhead line is built in accordance with its specification and design, and completed as a secure and reliable addition to the NIE transmission system. A Commissioning Certificate will be issued prior to energisation.

5.5.1.2 Conductors

101. Conductors are the wires that carry the electricity. The standard conductor for use on 400kV overhead lines is one that is made up of aluminium and steel stranded wire, with steel wire used for the strands in the centre and aluminium wires used for the remainder.

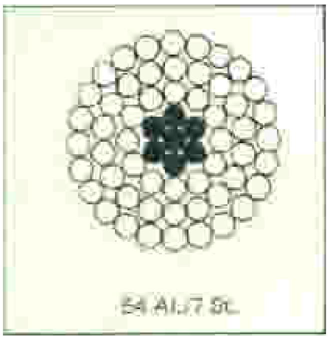


Illustration 5.2: Cross section of a typical conductor

102. To achieve the required power carrying capacity of the proposed Interconnector it will be necessary to install a pair, that is a twin bundle, of these conductors per phase. The conductors will be separated by spacers installed at regular intervals.

103. The distance from the conductors is determined not only by the lateral distance away from the line but also by the height of the conductors overhead. For the 400kV overhead line proposed for the Proposed Development, the minimum conductor height above ground has been designed to 9.0m.

5.5.1.3 Shield Wires

104. Shield wire, also known as earth wire or ground wire, is installed above the live conductors. The CIVI tower is designed to accommodate two shield wires connected to the extremities of the upper most cross arm. Shield wires are also conductors but they serve a very different purpose to that of the live conductors. Their main purpose is to shield the live conductors from lightning. Should lightning strike the line it will in all likelihood strike a shield wire rather than a live conductor as they are installed above the live conductors. This will not necessarily prevent the line from tripping out but it will protect the line from being damaged by very quickly dissipating the energy in the lightning strike away from the line and into the ground. In such circumstances if the line did trip out it can be restored automatically in less than a second. One of the shield wires will carry optical fibres for power system communication and protection purposes.

5.5.1.4 Insulators

105. Insulators are required to secure the live conductors to the support structures while at the same time insulating the conductor from the earthed metal of the support structure. The proposed insulator for use on this proposed 400kV overhead line is the composite type.

106. This is a modern design made of composite materials and provides a number of advantages over the traditional glass insulators and porcelain insulators. These advantages include: slim-line appearance, resulting in an overall lower visual impact; lighter in weight; more repellent to airborne pollutants (resulting in a reduction in the noise or 'crackle' that can emanate from high voltage overhead lines (HVOHLs)) during periods of high humidity; and silicon rubber insulator sheds are less susceptible to being damaged by vandals.

5.5.2 Suspension Towers

107. The CIVI-1 Suspension tower is used at positions where the line route is straight, between two angle positions – they are never used at angle positions (i.e. locations at which the alignment changes direction). The CIVI-1 suspension towers are called suspension towers because the electricity conductors are suspended from the cross arm and are not pulling against the crossarm. These towers are taller and slimmer than angle towers and typically require smaller foundations. The majority of

support structures for the proposed 400kV transmission line will be suspension towers. The “suspension” or “intermediate” towers have a height which ranges from 28m to 41m and a base that varies between 120m^2 - 196m^2. The height of the tower at a specific location is dictated by technical requirements and topography and are as set out in Table 5.2. The upper components of the towers remain the same for all heights.

108. The side elevation forms a tapering profile from the base to a point 1m in width at the top of the structure. The side elevation profile is a relatively narrow structure with a more open lattice structure in its lower portion.

109. From the front elevation, the tower tapers from the base up to a point slightly less than three quarters of the elevation. From the top of this column, the tower forms an approximate diamond shape with two arms angled away from the column to support two symmetrical side wings. The wings, at the mid-section of the diamond shape, are located symmetrically at either side of the structure. From these wings the insulators are arranged in a vertical formation. Two separate arms are angled back towards the centre of the tower structure where they link together completing the diamond shape. At either side of the top of the diamond, smaller wings support the earth wire. Arranged in vertical formation from the lower section of the top two arms, insulators form a V-shape pointing to the centre of the structure.

110. From both front and side elevation, the tower forms a symmetrical structure comprising a typical steel lattice framework composed of a large number of smaller members.

111. The towers are manufactured from galvanised steel and are therefore grey in colour. The towers may be (re)painted matt grey at intervals throughout the life of the towers as protection against corrosion.

112. The CIVI-1 suspension tower is illustrated in Figure 5.2, and in various photomontage viewpoints (Photomontage Viewpoints 6 and 7, for example).

5.5.3 Angle Towers

113. The CIVI-1 “Angle” or “tension” towers are so-called as they are used to accommodate locations at which the alignment changes direction. At Angle tower positions the conductors pull off the crossarm; that is they connect to the towers under tension. This requires angle towers to have a greater mechanical strength than that of the suspension tower. The increase in mechanical strength is achieved by using stronger steel members and increased bracing in the lattice construction. Angle towers can also be shorter than comparable suspension towers while still maintaining required electrical clearances. This gives the angle towers the appearance of being ‘stockier’ than the suspension tower. Three types of angle tower are required for the proposed overhead line: a 30 degree angle tower, a 60 degree angle tower and a 90 degree angle tower. The use of each type of tower is determined by technical requirements at each location along the line route. Detail on which type of tower is used in each location is contained in Table 5.2.

114. The three types of angle towers are all similarly constructed, as shown in Figure 5.3. The tower arms vary to allow for the appropriate tension angle on the line.

115. The towers are also illustrated in various viewpoint photomontages. The 30 degree angle tower is shown in Viewpoint 6 and Viewpoint 13. The 60 degree angle tower is shown in Viewpoint 3 (to the left) and Viewpoint 20 (at centre right). The 90 degree angle tower is shown in Viewpoint 24 (at right).

5.5.4 Overview

116. The spacing, type of angle tower and the height of the towers vary depending on technical requirements which relate primarily to topography. Spacing between the towers proposed ranges from 158m to 476m and averages 335m. The one hundred and two 400kV tower heights range from 25m to 41m and average 34m.

Table 5.1: Proposed Overhead Line Tower Design Ranges

Tower Type	Number Proposed	Maximum Height (m)[117]	Minimum Height (m)	Average Height (m)
Suspension	66	41	28	35
30^{o} Angle Tower	14	36	27	30
60^{o} Angle Tower	18	34	27	30
90^{o} Angle Tower	4	36	25	31
Overall	**102**	**41**	**25**	**34**[118]

Table 5.2: Proposed Overhead Line Tower Design Summary

Tower Number	Tower Type	Tower Height (m)	Elevation (mAOD)	Overhead Line Span to Next Tower (m)[119]
1	90^{o} Angle Tower	31	24	391
2	90^{o} Angle Tower	33	26	339
3	Suspension	41	31	349
4	60^{o} Angle Tower	27	26	245
5	Suspension	32	38	158
6	60^{o} Angle Tower	27	26	313
7	Suspension	31	40	476
8	60^{o} Angle Tower	33	35	244
9	Suspension	40	38	359
10	30^{o} Angle Tower	31	44	311
11	Suspension	33	38	353
12	Suspension	36	44	388
13	60^{o} Angle Tower	31	36	263
14	60^{o} Angle Tower	29	44	401
15	Suspension	30	57	240
16	Suspension	36	57	366

[117] The heights of the towers are given as above ground level at the centre point of the tower to height at the centre point of the tallest point of the tower. For the 400kV towers, the tallest point is the earthed shieldwires (see Illustration 5.1). The heights are rounded to the nearest metre.

[118] This is the average of all tower heights.

[119] This is the distance to the next tower i.e. there is 391m from Tower 1 to Tower 2. It is rounded to the nearest metre.

Tower Number	Tower Type	Tower Height (m)	Elevation (mAOD)	Overhead Line Span to Next Tower (m)[119]
17	60 ^{o} Angle Tower	29	45	327
18	Suspension	36	41	345
19	60 ^{o} Angle Tower	31	33	435
20	Suspension	40	38	330
21	Suspension	29	45	226
22	Suspension	30	29	278
23	60 ^{o} Angle Tower	27	20	221
24	Suspension	28	31	225
25	Suspension	32	27	382
26	60 ^{o} Angle Tower	31	18	351
27	Suspension	32	34	219
28	60 ^{o} Angle Tower	33	22	411
29	30 ^{o} Angle Tower	35	22	371
30	Suspension	40	35	394
31	Suspension	40	18	400
32	Suspension	41	17	429
33	60 ^{o} Angle Tower	31	20	407
34	60 ^{o} Angle Tower	27	25	263
35	Suspension	30	20	271
36	Suspension	30	17	295
37	60 ^{o} Angle Tower	31	17	279
38	Suspension	40	17	358
39	60 ^{o} Angle Tower	32	17	381
40	Suspension	36	25	363
41	30 ^{o} Angle Tower	27	31	302
42	Suspension	38	24	370
43	Suspension	41	25	379
44	Suspension	41	46	327
45	Suspension	36	46	327
46	30 ^{o} Angle Tower	27	61	248
47	Suspension	28	69	284
48	Suspension	28	64	278
49	30 ^{o} Angle Tower	29	58	377

Tower Number	Tower Type	Tower Height (m)	Elevation (mAOD)	Overhead Line Span to Next Tower (m)[119]
50	Suspension	41	62	363
51	Suspension	40	73	363
52	90 ^{o} Angle Tower	36	61	238
53	Suspension	28	70	320
54	Suspension	28	69	319
55	30 ^{o} Angle Tower	28	59	320
56	Suspension	41	53	349
57	Suspension	36	58	328
58	30 ^{o} Angle Tower	27	54	364
59	Suspension	30	62	347
60	Suspension	31	54	346
61	Suspension	31	57	340
62	30 ^{o} Angle Tower	27	56	240
63	Suspension	31	56	330
64	Suspension	28	61	445
65	Suspension	36	67	354
66	Suspension	36	71	378
67	Suspension	32	63	373
68	30 ^{o} Angle Tower	32	67	288
69	Suspension	35	73	389
70	Suspension	36	77	370
71	60 ^{o} Angle Tower	29	86	275
72	Suspension	38	80	414
73	Suspension	38	90	303
74	30 ^{o} Angle Tower	27	87	368
75	Suspension	32	72	400
76	60 ^{o} Angle Tower	30	92	437
77	Suspension	41	91	237
78	Suspension	38	102	333
79	30 ^{o} Angle Tower	29	90	380
80	Suspension	36	90	239
81	30 ^{o} Angle Tower	36	102	419
82	Suspension	41	95	332

Tower Number	Tower Type	Tower Height (m)	Elevation (mAOD)	Overhead Line Span to Next Tower (m)[119]
83	60 ^{o} Angle Tower	32	104	232
84	Suspension	28	111	204
85	90 ^{o} Angle Tower	25	110	346
86	Suspension	32	141	326
87	Suspension	32	142	332
88	Suspension	41	137	282
89	60 ^{o} Angle Tower	34	143	397
90	Suspension	36	150	422
91	Suspension	36	147	296
92	Suspension	34	148	427
93	Suspension	41	156	355
94	Suspension	39	163	448
95	Suspension	41	162	372
96	Suspension	41	162	285
97	30 ^{o} Angle Tower	36	172	375
98	Suspension	41	160	445
99	Suspension	41	149	318
100	Suspension	32	139	370
101	Suspension	30	139	291
102	30 ^{o} Angle Tower	33	131	(Next tower to be proposed by EirGrid)

5.5.5 Proposed Overhead Line Route

5.5.5.1 Overview

117. The proposed overhead line route is 34.1km in length from Tower 1 to the first border crossing, with an additional 200m oversail section in Crossbane. The route is described below with the details presented in Figure 1.5. The route has been chosen to minimise environmental impacts as detailed in Chapter4.

5.5.5.2 Towers 1 to 23

118. The overhead line will begin at the Turleenan substation, which lies to the north-east of the village of Moy in County Tyrone. The line emerges from the southern side of the substation. The line generally travels in a westerly direction, crossing the B106 Trew Mount Road and Majors Lane before Tower 8. After Tower 8, the line crosses the A29 Road and turns in a south-westerly and then southerly direction, to the West of Moy. The line crosses the Culkeeran Road and Gorestown Road before Tower 15. After Tower 19 the line moves in a south-easterly direction, crossing the B106 Benburb Road between Towers 21 and 22.

5.5.5.3 Towers 23 to 51

119. At Tower 23 the line turns south-westerly for a stretch of four towers, crossing the Drumlee Road between towers 25 and 26. It then turns south-easterly from Tower 26 to Tower 28, before turning southerly at Tower 28. The line passes over the B128 Clonfeacle Road at Towers 29 and 30, between the settlements of Benburb and Blackwater town. Between Towers 32 and 33 the line passes over the Blackwater River. As outlined in Chapter 10 (Ecology) of this ES, bird deflectors will be fitted to the earth line (highest line) between T30 and T43.

120. The overhead line angles across the Artasooly Road between Towers 33 and 34, then continues in a generally southerly direction from Towers 34 to 37. At Tower 37 the line travels south-westerly to Tower 41, to the east to Artasooly settlement. The line crosses the Tullysaran Road before Tower 41, passing to the west of Tullysaran settlement. The line then turns more southerly, in a relatively straight section to Tower 49. The line crosses the B115 Battleford Road between Towers 44 and 45, to the east of Killylea. At Tower 49 the line turns south-westerly until Tower 52.

5.5.5.4 Towers 52 to 73

121. The overhead line turns sharply to the south-east, passing over the A28 Killylea Road between Towers 54 and 55. It turns southerly after Tower 55, making a turn to the south-west at Tower 58, after which point it continues in a generally south-westerly direction until Tower 71. The line crosses the Cormeen Road between Towers 55 and 56, then Brootally Road between Towers 65 and 66. At Tower 71 the line turns more southerly, crossing over the A3 Monaghan Road between Towers 72 and 73, to the east of the Norton’s Cross Roads Junction.

5.5.5.5 Tower 74 to 102 and the Border with the Republic of Ireland

122. The overhead line crosses the B132 Maddan Road between Towers 73 and 74, turning south-westerly until Tower 76. At Tower 76 the line turns to a south-easterly direction until Tower 81. It then “dog legs” to Tower 85, where it turns sharply south-westerly to Tower 89. The line crosses over the Drumhillery Road between Towers 85 and 86. The line to the east of Drumhillery and Glassdrummond settlements.

123. At Tower 89 the overhead line turns to a southerly direction, proceeding in that direction generally until Tower 102, before the border with the Republic of Ireland. It crosses the B3 Fergort Road between Towers 94 and 95, the Derrynoose Road between Towers 98 and 99, and the Doohat Road between Towers 99 and 100, passing to the west of Derrynoose.

5.5.5.6 Beyond the Border

124. The overhead line continues beyond Tower 102 and the Northern Ireland border into the Republic of Ireland. It will be carried on towers to be proposed by EirGrid and to be located in the Republic of Ireland, however, the overhead line passes back into Northern Ireland (described as “oversail”) in the townland of Crossbane, some 1.3km past the first border crossing point at Doohat or Crossreagh and Lemgare. There are no additional towers in Northern Ireland past Tower 102. The line oversail in Northern Ireland in Crossbane is 200m long and will be no less than 9.0m above ground level.

5.6 Construction And Maintenance of the Overhead Line and Towers

5.6.1 Introduction

125. This section describes the construction methods that have been assessed for the 400kV overhead transmission line. The general construction methods and strategies described are based upon the existing methods used in constructing 400kV overhead lines in the UK and the Republic of Ireland.

126. This section aims to set out clearly the various stages of construction, and to describe the methods which will be used at the construction site. It contains photographs and excerpts of drawings from similar projects that are included for reference purposes only.

5.6.2 Health and Safety

127. All design work completed, future design work, construction, and all other works of the Proposed Development comply with, and will continue to comply with, current health and safety legislation.

5.6.3 Pre-Construction Period

128. Pre construction surveys will be undertaken during this period, including ground investigations and ecological surveys (as set out in Chapter 10 Ecology of this ES).

129. Prior to commencing the works consultation will take place between NIE and landowners to ensure that landowners are aware of the specific works that will take place pursuant to the Proposed Development.

130. 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.

131. A statement of the condition of land will be agreed and recorded with the landowner prior to the commencement of works.

132. NIE will liaise with landowners in regard to compliance with DARD animal disease regulations and where required take precautions against the spread of disease (see Chapter 14 and Appendix 14A of this ES).

5.6.4 Construction Period

133. The construction period for the Proposed Development is anticipated to be up to three years from the start of the site works.

134. The construction of each tower in the overhead line will be undertaken in five general stages, according to the following sequence, on a rolling programme of estimated durations: These stages are not necessarily consecutive due to the work required at adjoining tower bases and construction process. For example 21 days curing time will be required between stages 2-3. Likewise between stages 3-4 periods of time will lapse to allow for constructing the suspension towers between each angle tower. This could typically be 2-4 months. Final land reinstatement can be up to a year following the completion of all works allowing for ground consolidation and reseeding land damage.

- Stage 1 – Preparatory Site Work (1 – 7 working days);
- Stage 2 – Tower Foundations (3 – 6 working days);
- Stage 3 – Tower Assembly and Erection (3 – 4 working days);

- Stage 4 – Conductor/ Insulator Installation (7 working days); and,
- Stage 5 – Reinstatement of Land (1 – 5 working days).

135. The construction methods carried out by NIE and its contractors will be in line with international best practice and will fully comply with all health and safety requirements. The overhead line construction methods are outlined in this section and are based on NIE's long and successful overhead line construction experience.

136. The ground conditions encountered vary along the proposed overhead line route and hence the construction techniques and machinery/equipment required will vary to accommodate this. This variance has been considered through design assumption (such as worst case tower bases) and in the EIA, in determining likely significant environmental effects.

137. Access to the site will be between the hours Monday to Friday 0700 - 1900 or hours of daylight for steel erection. Saturday 07:00-13:00 or hours of daylight. No anticipated Sunday or night working except for emergency works (pumping of excavations).

5.6.5 Stage 1 – Preparatory Site Work

5.6.5.1 Overview

138. Site preparation works for transmission line construction will include minor civil work at the tower locations including, where appropriate:

- Installation of temporary access tracks as described below (Section 5.6.5.2);
- Levelling of tower foundation area - The towers are designed such that a difference in ground level can be accommodated from one side of the tower to the other, hence minimising the quantity of local disturbance. Where the gradient between two legs is greater than 1m, the tower will be installed with a leg extension. Depending on the particular gradient at each location, the tower may require a single leg extension, or it is possible to add an extension to any number of the four tower legs to overcome a gradient. Where the gradient is less than 1m, and the impact is moderate, consideration will be given to levelling the site foundation area. Prior to construction a site survey will be conducted at each structure location to confirm the requirement for leg extensions and/or site levelling. The detailed proposal for each tower location is contained within the planning application;
- Where towers are located on boundaries which contain hedgerows, portions of this hedgerow, cutting back of trees and other vegetation will have to be removed as detailed below (Section 5.6.5.6);
- Diversion of field drains (Section 5.6.5.7);
- Delineation of on-site working area (e.g. erection of temporary fencing for safety of personnel and livestock using timber post and wire or steel mesh panels, as appropriate (Section 5.6.5.6); and,
- Diversion of existing utilities (e.g. BT lines and undergrounding of lower voltage (LV) transmission or distribution lines – Section 5.6.5.5).

5.6.5.2 Need for and Use of Accesses

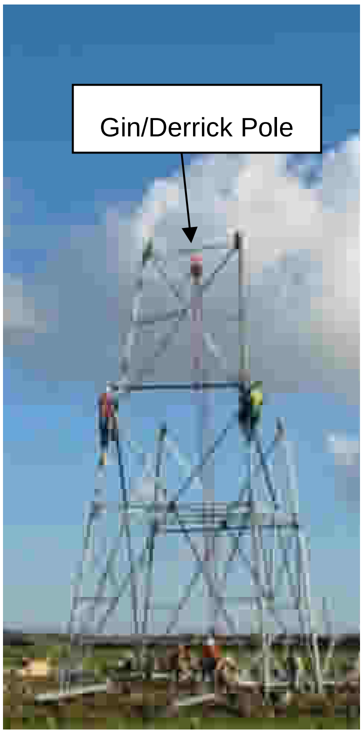
139. Temporary accesses capable of taking construction plant, construction materials and personnel are required for the construction of each tower, installation of the conductor and the setting up of guarding locations.

140. There are four forms of proposed access required for the construction:

- Access Tracks – shown on Figure 5.8 and are labelled as 'AT16' etc – these are temporary accesses that will be used to gain access to the working areas from the public road network. There are a total of 113 access tracks as part of the Proposed Development. Vehicles will follow the routes shown on Figure 5.8 which include access over fields The proposed access tracks have been selected to minimise disruption to agricultural land by using existing tracks and accesses as far as possible;
- Access to Stringing Locations – shown on Figure 5.8 and are shown in the legend. Stringing locations will be accessed by stringing equipment (see Section 5.6.8 for further details). Generally access is directly from the proposed tower to the stringing location, where the two points are in the same fields and there are no obstructions. Where obstructions (e.g. a hedgerow) occur between the points, a separate access track has been designed and shown on Figure 5.8;
- Access to Guarding Locations – shown on Figure 5.8 and are shown in the legend, see also section 5.6.8.3. These will be accessed to construct and then remove the guarding location. The guarding locations will be accessed by 4x4 vehicle and excavator with two trips, one for erection, and one for disassembly;
- Access to LV Crossing Locations – shown on Figure 5.8 and are shown in the legend. These will be accessed by a tracked excavator in order to underground existing LV lines.

141. Access tracks enable the deployment of excavators or piling rigs together with foundation materials (shuttering, concrete, steel re-enforcement, piles), and for the removal of excess spoil. For tower erection approximately 12.5 tonnes of steelwork will be delivered to each site and erected using a Gin/Derrick pole (see Illustration 5.2).

Illustration 5.2: Example of a Gin/Derrick pole during tower construction



5.6.5.3 Track Construction

142. There are several types of track which could be used to facilitate access for construction and subsequent maintenance. The type of track which will be used will depend on a variety of factors including the sensitivity of the location, the type of land use and the ground conditions.

143. The proposed arrangement for required access arrangements are detailed in the planning application. The track construction relevant to different types of land is summarised below.

Stone Access Tracks

144. Topsoil will not be removed for the construction of stone access tracks. Geogrid and/or geotextile protective mats will be placed on the existing surface and approximately 100mm of stone placed on top and compacted to form tracks. The stone will arrive on site pre-washed from the supplier. These tracks will be 3m wide.

145. Similar techniques will be used on gently undulating pasture or wet ground although some levelling might be required which will be achieved by use of extra stone. This is shown in Illustration 5.2 below.

146. The access tracks to the following 40 towers will be temporarily stoned: 2 4 6 8 13 14 17 18 19 23 26 28 33 34 36 37 39 42 43 45 47 49 52 57 58 62 63 68 71 76 78 82 83 85 89 92 93 97 101 102.

147. In addition, a section of the access to the following 13 towers will be temporarily stoned: 20 54 56 60 61 65 75 79 80 81 91 94 100.

Illustration 5.2: Typical Stone Road as used on another project

Temporary Aluminium Access Roads (Trackway Panels)

148. Trackway panels, which are a modular roadway system, can be used to provide temporary access. Trackway is not suitable for use on steep inclines or in prolonged wet weather. These aluminium access roads will be removed on the completion of the construction work, leaving no permanent damage. See Illustration 5.3 below.

149. Where minimal disturbance is a key objective, temporary Trackway Panels will be used for access (provided that the ground is relatively level and dry).

Illustration 5.3: Temporary Aluminium Access Road as used on another project

5.6.5.4 General Access Arrangements and Working Areas

150. The proposed approach to traffic management is set out in Chapter 18. In summary, it is proposed that the contractor will use temporary traffic measures to minimise disruption to the road network as the preferred access option. These measures will be required at times of delivery of large machinery to the site (e.g. excavators). The temporary traffic measures will include temporary traffic lights resulting in limited lane and road closures during delivery times. This is estimated to be no more than 15 minutes at any one location. Large machinery will be delivered to site on low-loaders (e.g. a JCB Fastrac type vehicle towing a low loader trailer, see Chapter 18 Transport for further details). Such vehicles have large turning circles and would require large accesses to enter the working areas. It is considered to be preferable to have the low-loaders remain on the existing road network in order to avoid enlarging existing accesses and removing vegetation. Temporary traffic measures are assessed in Chapters 14 (Community Amenity and Land Use), Chapter 15 (Socio-economics) and Chapter 18 (Transport).

151. If it is determined by the Department that temporary traffic measures are not to be used, existing accesses could be temporarily enlarged to accommodate the larger types of construction vehicles. In this case, the low-loaders could enter the proposed sites and make deliveries off the public road network without requiring road or lane closures. The area required for temporarily enlarging the existing accesses has been identified and included within the planning application boundary. Where the accesses are required to be widened to accommodate construction machinery, vegetation will be cleared and any affected services and drainage will be amended to ensure normal operation during the construction phase. After construction the access will be reinstated to its original condition.

152. Should the temporary enlargement of existing accesses be required, hedgerows and trees will be cleared (see Section 5.6.5.6). Replacement vegetation will be planted after the construction phase along with stock proof fencing, where required.

153. All work will be assessed for traffic management requirements (see Chapter 18 Transport).

154. Appointed contractors will undertake traffic management activities and method statements, risk assessments and drawings produced for each location.

5.6.5.5 Existing NIE and BT Lines

155. Existing lower voltage overhead lines that cross the route of the proposed overhead line have all been assessed to calculate the dimensional clearance between these existing lines and the position of the proposed 400kV conductors associated with the proposed overhead line. In circumstances where this clearance has been deemed sufficient to permit both overhead lines to operate safely together then these lines will be switched off during construction and then re-energised afterwards. Other overhead lines will be undergrounded at the crossing points. A total of 18 existing electricity lines will be modified to avoid the proposed overhead line (see Figure 5.8). The affected section will be undergrounded in a 0.5m wide x 1m deep trench. In order to minimise the construction impacts, thrust boring will be used under watercourses. This process will not involve an open trench as it will be done by micro-tunnelling and so will avoid any likely significant effects.

156. There are 17 roadside locations where the proposed overhead line crosses existing BT lines. The BT lines will be undergrounded by BT and placed under public roads before the 400kV overhead line construction takes place. These works will likely result in temporary lane or road closures and will be scheduled to be undertaken in advance of the Proposed Development construction phase. The affected sections are located where the overhead line crosses the following public roads:

- Culkeeran Road;
- Gorestown Road;
- Benburb Road;
- Drumlee Road;
- Tullydowey Road;
- Artasooly Road;
- Battleford Road (two crossings);
- Navan Fort Road;
- Cormeen Road;
- Brootally Road;
- Dernalea Road;
- Monaghan Road;
- Maddan Road;
- Cavanagarvan Road;
- Sheetrim Road; and,
- Fergort Road.

157. It is considered that there will not be any likely significant effects as a result of the BT works and the subject has been scoped out of the ES. The lower voltage overhead line works have been assessed in the relevant assessment chapters of this ES.

5.6.5.6 Vegetation Clearance

158. The overhead line and towers will result in temporary and permanent impacts to existing vegetation. This will be in the form of removal and trimming because of different aspects of the design. The types of impacts are described below and the areas of impact have been calculated. It should be noted that a worst case calculation has been assumed at this stage and the construction of the overhead line and towers will seek to minimise the impacts as far as possible. The impacts to vegetation as calculated below have been assessed in the relevant assessment chapters of this ES (there will be no Tree Preservation Orders affected by the Proposed Development).

159. The Proposed Development will have the following impacts on vegetation:

- Temporary Access Widening and Visibility Splays – if it is determined by the Department that temporary traffic measures are not to be used, existing accesses would be temporarily enlarged to accommodate the larger types of construction vehicles. Should this occur, it would result in the temporary loss of 701m of hedgerow and 36 individual trees (over the 34,000m line route), which will be replanted post construction. The visibility splays for the associated accesses would require that potentially 945m of hedgerow be trimmed so that the height does not exceed 2m. The majority of that length of hedgerow is currently maintained by the landowners at less than 2m so the length to be trimmed is likely to be much less;
- Temporary Low Voltage crossings – there are 18 existing electricity lines to be undergrounded, which will be undertaken by open trench and (where necessary) by thrust boring as described above. This will result in an impact to 89m of hedgerows and treelines, and the hedgerows will be reinstated post construction;
- Temporary Tower Working Areas – an area of $1225m^2$ is required for the construction of each tower. The working areas have been designed to avoid hedgerows and trees as far as possible. However there will be a temporary impact with the removal of 826m of hedgerows and treelines and 9 individual trees (over the 34,000m line route). The hedgerows will be replaced with comparable fresh planting post construction;
- Permanent Tower Bases – the permanently affected area required for the towers is smaller than the required construction area. Of the area affected by construction, roughly 66% will be replanted post construction. It is possible for vegetation including hedgerows to grow under each of the proposed towers; however as worst case it has been calculated that 296m of hedgerows and treelines and 3 trees will be permanently removed;
- Permanent area under the overhead line – all vegetation under the conductors (a 20m swathe, 34.3km in length) will be trimmed so that the height does not exceed 2m. This is to ensure safety clearances are maintained and will form part of the ongoing maintenance of the proposed overhead line. This is standard practice and is done for all existing overhead lines. There are 8.9km of hedgerows and treelines to be maintained in this way and 34 individual trees. The majority of that length of hedgerow is currently maintained by the landowners at less than 2m so the length to be trimmed is likely to be much less; and,
- Permanent area adjacent to the overhead line – all vegetation adjacent to the conductors with the potential to fall onto the conductors will be trimmed to ensure safety clearances. This will form part of the ongoing maintenance of the proposed overhead line. This is standard practice and is done for all existing overhead lines. Less trimming will be required further from the conductors as there will be less potential for falling vegetation onto the overhead line. The trimming regime will involve a scalloping or profiling effect which will minimise the effect on vegetation. It is assumed that an area adjacent to the line and up to 30m from the position below the conductors (on either side) will be required to be examined for falling hazards. The level of trimming required will be directly related to the distance from the overhead line and the height of the vegetation – i.e. the further from the overhead line, the less vegetation that is required to be trimmed. Table 5.3 outlines the height of vegetation to be trimmed based on the distance from the conductors. The vast majority of this vegetation within the 30m zone will be unaffected because of its height and distance from the overhead line but for safety reasons, any branches, etc with the potential to fall on the overhead line will be trimmed. Hedgerows within the 30m zone are currently regularly maintained by landowners to an approximate height of between 1m and 3m and so will not require further trimming. It will be mature trees that will require trimming based on height and distance from the conductors as shown in Table 5.3.

Table 5.3: Vegetation Safety Clearance Heights

Horizontal Distance from the Conductor (m)	Height of Vegetation to be trimmed
5	Above 5.4m
10	Above 8.5m
15	Above 12.6m
20	Above 17.0m
25	Above 21.6m
30	Above 26.4m

5.6.5.7 Field Drainage

160. Where existing drainage is present at the location of a tower foundation, this drainage will be removed from the tower foundation construction area. New drainage arrangements will be installed to pass the tower foundations on one or as many sides of the foundations as required, or alternatively a number of drains can be replaced by a larger single drain which bisects the tower foundation.

161. There are a number of ephemeral ditches (that flow only seasonally during wetter periods or when groundwater levels are higher or only for a short period following a storm event) that will be directly impacted by the proposed towers (Towers 20, 21, 33, 44, 48, 68, 78, 81, and 87). The affected ditches will be diverted during construction and a permanent diversion formed post-construction around the tower foundations to match their current conditions.

5.6.6 Stage 2 – Tower Foundations

5.6.6.1 Foundation Approach

162. The first stage in the construction of the overhead line, after preparatory works, is to construct a foundation for each tower. The foundations will mainly be of a concrete pad and chimney or pyramid type. However, depending on particular geological conditions, there may be the requirement to use (i) piled, (ii) auger or (iii) rock foundations:

(i) A mini-piled foundation consists of an array of raked piles (piles driven in at an angle), tied together in a pile cap;

(ii) An auger foundation consists of a single, vertical bored pile or pier. Typically, an auger foundation will be 0.7m to 1.5m in diameter and up to 10m deep; and,

(iii) A rock anchor foundation consists of an array of vertical rock anchors drilled into the rock, which are then tied into a concrete cap.

163. The minimum and maximum foundation sizes have been determined and are shown in detail in Appendix 5C. Full details of the foundation types and dimensions are shown in the planning application.

164. The working area for construction of a tower is 1,225m^2. The working area for tower sites will be fenced off prior to excavation to ensure the safety of the public and livestock and also to prevent intrusion into environmentally sensitive areas.

165. Excavations will be undertaken for each leg on the tower. The dimensions of the excavation will vary depending on the tower type to be constructed and the ground conditions encountered. Some rock breaking could be required to achieve the required depths for the tower foundations, which will be done by mechanical means.

166. Construction of each foundation takes up to 6 days. Tower erection can commence within 21 days after foundation installation, when the concrete will have cured sufficiently.

167. Once the excavations are formed, the tower leg will then be fixed in accordance with the foundation design using a template before assembling the 'pyramid' formwork around the stub. The foundation will then be concreted.

168. Concrete will be delivered via the proposed access tracks to the tower position by a ready-mix lorry. Following the delivery of concrete, the wash-out of vehicles on site within the working areas will be restricted to the concrete chute only, with the residue being directed into a suitable container for disposal at a suitably licensed facility after it has settled (see Chapter 18 Transport for further details).

169. After a minimum of 24 hours (to allow the concrete to partially cure), the formwork[120] will be removed and the excavation backfilled using the original materials (which will be stored in layers) and compacted. Any surplus material will be removed from site and disposed of in an appropriate landfill site. After the excavation is backfilled the site is levelled, leaving just the four legs of the tower protruding approximately one metre from ground level.

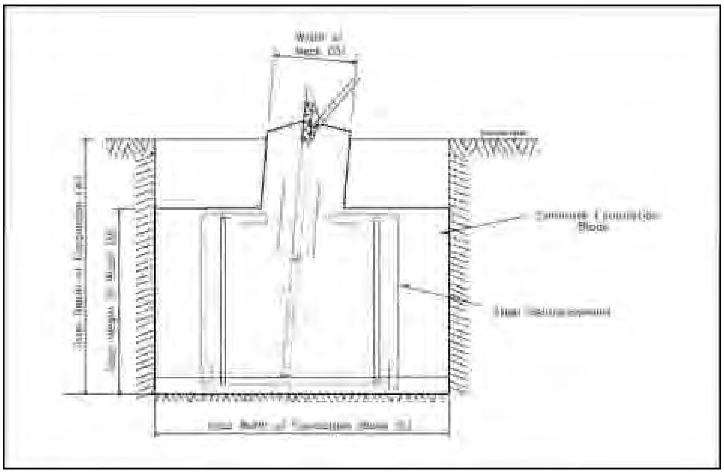
170. A standard suite of foundation designs have been developed for each tower to cater for a variety of soil conditions which may be encountered along the overhead line route.

5.6.6.2 Standard foundation installation

171. The foundations will be excavated using a rubber tyred or tracked excavator. Depending on the location a wheeled or tracked dumper may deliver the readymix concrete to the excavation. The tower stubs (lower part of tower leg) will be concreted into the ground. Each of the four corners of the tower will be separately anchored below ground in a block of concrete as shown in Illustration 5.5 above.

172. This practice has two principal advantages; firstly it allows two stage construction and secondly it assists the crew in their compliance with health and safety legislation with regard to depth of excavation. In the first pour concrete is placed between the bank of the excavation and the outside of the concrete pipe. The second stage of the foundation installation is the concreting of the tower leg into the pipe. The tower legs are concreted into place using either a setting template or the tower base (lower section of tower up to base horizontal).

Illustration 5.5: Pad and Chimney Foundation



[120] Formwork is the material used to create the structured shape of the tower legs below ground and which hold the concrete in place prior to it curing. It can be made of steel or wood and is removed once concrete sets.

5.6.6.3 Augured Foundations

Foundation Installation

173. The foundation of the tower is the means by which the loads are transmitted from the structure into the surrounding soil. The foundation is designed to withstand the maximum uplift, compression; transverse shear; and, longitudinal shear loads imposed by the tower as derived from the tower design. The foundation must be stable enough to prevent any movement of the tower under the maximum load conditions.

174. In locations where the soil investigation shows that the ground conditions do not conform to the bearing and/or ground conditions catered for by the range of generic pad and chimney foundations, either a piled, or rock augured site specific foundation will be required. To limit the use of stone it will be engineering preference to use existing excavator with an attachable hydraulic hammer to install the piles. This will remove the requirement for any larger plant. The use of piled or rock foundation may require the drilling or 'auguring' of several holes for each leg of the tower. In the case of piled foundations there will be two options. The holes are drilled and then reinforced with steel and concreted or grouted, or the contractor will use precast concrete piles and drive these into the ground. The piles form a stable base at ground level, upon which a typical foundation will be installed. In the case of rock foundation, a site specific rock anchor foundation will be designed. Rock anchors of a specified length are drilled and grouted into the bedrock.

5.6.6.4 Piled foundations

175. Piled foundations can either comprise a single pile or a group of piles connected at or just below ground level by a reinforced concrete cap, i.e. a piled foundation. Piles may be classified as 'driven' (displacement) where the soil is moved radially as the pile enters the ground, or 'bored' (non-displacement) when little disturbance is caused to the soil as the pile is installed. Driven displacement piles may comprise a totally preformed section from steel, pre-cast concrete or timber. Alternatively, where hollow steel or pre-cast concrete sections are used these are normally subsequently filled with concrete, or for steel H-sections post grouted. Non-displacement piles are cast-in-situ using either concrete or grout; the pile section is formed by boring or drilling. Illustrations 5.6 and 5.7 below show typical methods for forming the pile caps. Piles are used to provide a suitable bearing platform, upon which a typical tower foundation will be constructed. The quantity of concrete used will be no greater than the worst case quantity for that of a generic Pad and Chimney foundation for the particular tower location.

5.6.6.5 Dewatering of Foundations

176. It is anticipated that at certain locations, especially in the lower-lying areas, the groundwater table is shallow. There also is potential for perched water (isolated pockets of groundwater, usually at a shallow depth, above the level of the main groundwater table). Accordingly, groundwater controls may be necessary to manage shallow groundwater. In these areas it will be necessary to depress the groundwater level by pumping to maintain a dry operational area for construction of the foundations. Pumping to allow the construction of the tower footings typically will continue for a short period of approximately 3 to 6 days. As the maximum depth of the foundations for the majority of the towers will be approximately 3.5m, the maximum drawdown required to provide a dry working area will be less than 3.5m.

177. The water pumped from the excavation would need to be discharged following treatment. All water pumped from excavations would be passed through a filtration system to facilitate the settlement of suspended solids before it is discharged. Measures for the prevention of water pollution from plant and machinery and other potentially hazardous substances are discussed in Chapter 8 (Water Environment) of this ES. An assessment of the potential dewatering impacts is presented in Chapter 9 (Geology, Soils and Groundwater).

5.6.7 Stage 3 – Tower Assembly and Erection

178. The steel for the remainder of the tower is delivered to the site by lorry and various sections of the tower, depending on weight and method of construction of the tower, are pre assembled on the ground beside the tower. The tower will be built using a derrick pole (see Illustration 5.1).

179. The working area for construction (assembly and erection) of an overhead line tower is 35m x 35m (1,225m^2) or an area equivalent to 1,225 m^2, where the area has been offset to avoid constraints (see Figure 5.8).

180. The working area for the following 40 towers will be temporarily stoned (which will arrive to site pre-washed): 2 4 6 8 13 14 17 18 19 23 26 28 33 34 36 37 39 42 43 45 47 49 52 57 58 62 63 68 71 76 78 82 83 85 89 92 93 97 101 102.

181. Steelwork for each tower will be delivered directly to site from the Carn depot.

182. The Carn Depot is adjacent to the M12 Carn roundabout and 15 miles from the northern extremity of the proposed overhead line. Carn is NIE's main regional depot in the southern half of Northern Ireland.

183. Each tower consists of approximately 12.5 tonnes of steelwork bars that are delivered to site, individually bundled up, on a low loader lorry. These bars are then unloaded by a crane enabled lorry and then assembled.

184. With the steelwork on site, the tower is then part assembled at ground level into box sections of approximately 10m high, adjacent to the tower foundation.

185. The steelwork will be assembled and erected by a team of approximately eight operatives over a 3-4 day period.

5.6.8 Stage 4 – Conductor/ Insulator Installation

5.6.8.1 Overview

186. Stringing of overhead lines refers to the installation of phase conductions and shieldwires on the proposed towers. The entire job is usually referred to as “Stringing Operation” and includes all guarding of roads and the River Blackwater. The proposed overhead line will be strung using full tension stringing which ensures that the conductor is sufficiently tensioned during installation. The stringing operation is undertaken between angle towers in a straight line between the two towers (e.g. between Tower 1 and Tower 2, between Tower 2 and 4, etc.)

187. There are three key aspects of stringing:

- Stringing Locations – where the stringing machinery is located;
- Guarding Locations – the protection of road and river crossings; and,
- Stringing Procedure – how the overhead line is actually strung.

5.6.8.2 Stringing Locations

188. Two stringing locations are provided at each angle towers (see Figure 5.8 and Illustration 5.8) – one on each side in the direction of the next angle tower. These locations are 20 x 20m in area and will contain the necessary stringing machinery. The stringing locations are generally set back 100m in a straight line from an angle tower. The positions of some of the stringing locations have been adjusted (e.g. the stringing locations at Tower 28 have been repositioned to avoid an adjacent orchard and Tower 29 is a 30^o angle tower but will not require stringing locations because of the angle and length of stringing required).

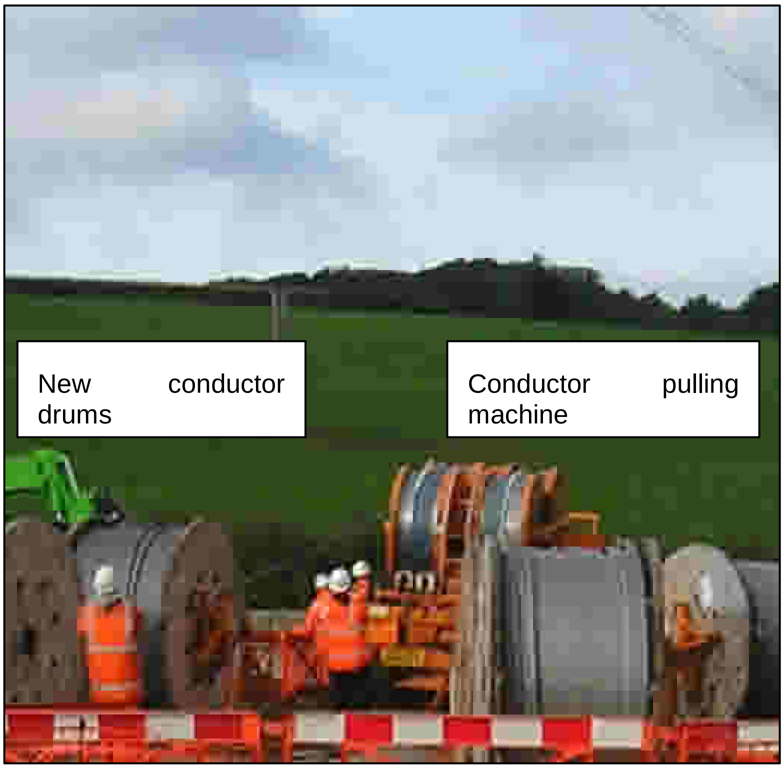
189. The stringing locations will be accessed as shown on Figure 5.8. Initially the insulators and running out equipment necessary for stringing and the conductors will be taken to site using a 4x4 crane enabled

lorry along the identified access tracks. The remaining plant and equipment including tractors, winches and tensioners, pilot reels and conductor drums required for stringing will be taken to site along the same routes using a mixture of low-loaders and four wheel or six wheel drive crane enabled lorries.

190. A winch will be positioned and set up at an angle tower at one end of the section, with the tensioner set up similarly at the other angle tower at the other end of the section.

191. Access to the stringing locations has been carefully determined. Generally access is directly from the proposed tower to the stringing location, where the two points are in the same fields and there are no obstructions. Where obstructions (e.g. a hedgerow) occur between the points, a separate access track has been designed and shown on Figure 5.8.

Illustration 5.6: Conductor Pulling Machine



5.6.8.3 Guarding Locations

192. Where the conductor is to be strung over roads and the River Blackwater, protection will be erected prior to the commencement of stringing. These positions are shown on Figure 5.8 and the protection will be in the form of guard poles, scaffolding or a telescopic handler. The protection measures will be positioned on 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 or the River Blackwater.

5.6.8.4 Stringing Procedure

193. When a sufficient number of sequential sections are completed, with all towers erected, stringing of the conductor can commence. As its name suggests tension stringing refers to the installation of conductors under tension. The conductor is kept clear of all obstacles along the straight by applying sufficient tension. This method requires the pulling of a light pilot line (nylon rope) into the stringing wheels.

194. The nylon pilot line will be walked between angle towers along the route of the proposed overhead line. The nylon pilot line will generally be laid over the ground and then over guarding locations to avoid roads and the River Blackwater. The nylon pilot line will be passed over the top of hedgerows and minor watercourses and plastic sheets will be laid over vegetation to ensure it does not become entangled.

195. The walking of the nylon pilot line will take approximately one day for longer sections between angle towers and less for closer angle towers. Once established and under close inspection the nylon pilot line will be pulled taut and off the ground. It will then be used to pull a steel pilot line to be pulled between the angle towers.

196. The steel pilot line will be placed in blocks on the suspension and tension towers and connected around the winch and tensioner at either end. See Illustration 5.7.

Illustration 5.7: Pulley Blocks Hung from each suspension tower

197. The steel pilot line is then used to pull in the conductors from the drum stands using specifically designed “puller – tensioner” machines. The main advantages with this method are (a) the conductor is protected from surface damage and (b) major obstacles such as roads can be crossed over without the need for significant disruption.

198. Using the winch to pull the steel pilot line, the conductor will be drawn through the section, under constant tension using the tensioner, allowing the conductor to be controlled without touching the ground.

Illustration 5.8: Winching machine for stringing operation.

Illustration 5.9: Stringing location during operation.

199. Once the conductor is pulled out through the section it is secured at the required sag at each end to the insulators on the tower, and then attached permanently to all the suspension tower insulators, and the pulley blocks are removed.

200. The conductor is installed by a team of approximately 25 operatives. The proposed route alignments longest section consists of 9 towers in total, 2 angle towers and 7 intermediate towers. It is estimated that it would take approximately 10 to 15 days to install the conductor on this section. This section will require approximately 8 drums of conductor.

5.6.9 Stage 5 – Reinstatement of Land

201. Once all works are complete, the access route and the construction areas around the tower are restored to their original condition. Generally this work is carried out by a specialised agricultural contractor and is carried out with in consultation with each landowner.

5.6.10 Maintenance of the Overhead Line and Towers

202. The normal maintenance of the proposed overhead line will generally involve general inspections by helicopters and ground inspections. Access will be undertaken using suitable off road vehicles for routine inspections once every two years. These vehicles will use existing accesses.

203. Helicopter inspections are normal practice for overhead lines in Northern Ireland and this line will be flown once every year or less frequently by one helicopter on each occasion. The flights will typically last no more than one day per inspection for the entire overhead line. Consultations will be undertaken in advance of any flights with affected landowners to minimise impacts. This will supplemented with a publicity campaign to inform the general public.

204. The area adjacent to and under the conductors will be trimmed once every five years in order to maintain safety clearances from any vegetation (as detailed in Section 5.6). This will be done with typical agricultural machinery as currently used in the area.

205. Other types of maintenance will include repainting of the towers (once every 18 years), replacement of conductors (once every 40 years) and replacement of fittings (as required).

206. The replacement of conductors will be a similar process to the stringing operation as described in Section 5.6.8.4. The process will involve using the existing conductor to pull into place the new conductor. Stoned accesses would not be required because of the nature of the vehicles and machinery involved and existing access points will be of sufficient width.

207. The overhead line will become permanent as part of NIE's major infrastructure. This will be achieved by routine maintenance, refurbishment, replacement of redundant equipment and upgraded designs to ensure a permanent transmission route. Accordingly, NIE have no plans for the decommissioning of the overhead line.

5.7 Excavated Material

208. As in common with any construction project, there will be excavated material during the construction of the proposed substation and towers that will be found surplus to requirements. This material will be soil and stones and it has been assessed that there is unlikely to be any contaminated material.

209. Under the guidance of The Waste Regulations (Northern Ireland) 2011, a number of measures to meet the conditions of the waste hierarchy in relation to excavated material have been identified:

<u>Waste Prevention:</u>

- All top soil extracted in the construction of all tower sites, the substation and associated access tracks will be reinstated onto the site of extraction;
- Tower foundation requirement volumes of sub soil material to be excavated have been calculated for each tower site;
- A reinstatement volume of excavated sub soil material to be returned to each site of extraction has been calculated;
- Where practical, excavated subsoil will be used for all associated and relevant project construction and landscaping purposes;

- The tower building construction phase will generate approximately 15,340m^3 of excavated material in the form of top soil, sub soils and stones. Of this, 5,610m^3 (37%) will be reused/reinstated at the tower sites and within the redline application of the Interconnector associated works application. The remainder of the material (9,730m^3 or 63%) will be disposed of to landfill; and,
- The site of the substation will generate approximately 250,000m^3 of excavated material. Of this there is the potential to reuse 156,000m^3 (62%) within the redline application boundary of the substation site. The remaining 94,000m^3 (38%) will be disposed of to landfill.

<u>Waste Disposal and Re-use</u>

210. The construction of the proposed substation and the towers will generate approximately 103,730m^3 of surplus material which will need to be reused, recycled or disposed of offsite. It is proposed that the excavated material will be sent to landfills. The location of the assessed landfills is in Chapter 18 Transport.

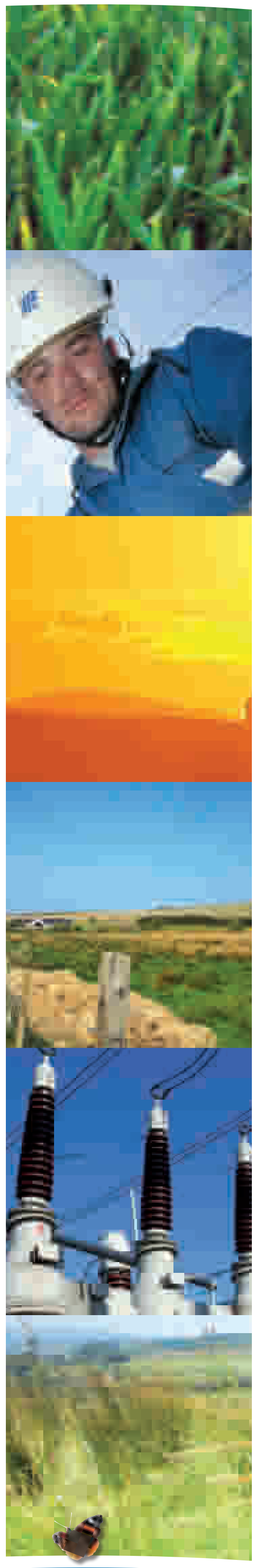
211. Given that the waste material is going to landfill, the options for its reuse are inevitably limited. However it could be used beneficially for capping, aftercare and restoration in the landfills concerned.

5.8 Construction Mitigation Measures

212. This ES has been prepared, inter alia, in order to outline the proposed mitigation measures which will be used to eliminate or minimise the impacts of the Proposed Development. The construction and operational phase for the substation, towers, overhead line and associated works has been assessed within the assessment chapters of the ES and mitigation measures proposed. These measures have been included in the Outline Construction Environmental Management Plan (OCEMP – see Appendix 5A).

213. This Outline CEMP will be a key part of the construction contract to ensure that all mitigation measures which are considered necessary to protect the environment, prior to construction, during construction and/or during operation of the Proposed Development, are fulfilled. NIE will be responsible for ensuring that the contractor manages the construction activities in accordance with the Outline CEMP including the mitigation measures that are set out within that document. The contractor will prepare a CEMP which is in accordance with the Outline CEMP to ensure that construction delivers the mitigation measures set out within this Environmental Statement.

Tyrone - Cavan Interconnector



Chapter 6

Scoping and Consultation

Consolidated Environmental Statement

Volume 2

Part funded by
EU TEN-E Initiative

Northern Ireland Electricity

6 Scoping and Consultation

6.1 Introduction

1. This Chapter reviews the environmental scoping process undertaken for this EIA in line with the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 1999, as amended and also the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2012 (referred to hereafter as the EIA Regulations).

2. This Chapter also contains a summary of the consultation process undertaken by NIE in respect of the Proposed Development at the pre-planning stage up to the publication of this Consolidated ES in 2013.

6.2 Environmental Scoping

3. The EIA Regulations require an ES to provide such information as is reasonably required to assess the environmental effects of the development and which the applicant can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile, including:

> *"A description of the likely significant effects, direct and indirect, on the environment of the development, explained by reference to its possible impact on, population, flora, fauna, soil, water, air, climatic factors, material assets including architectural and archaeological heritage, landscape and the inter-relationship of any of the above factors."*

4. The ES must also include "a description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment."

5. As part of the EIA a review of all environmental aspects was undertaken by NIE's team of specialist advisors and those aspects for which impacts are not anticipated to be significant were "scoped out" of the EIA, that is, not included, or dealt with at a high level. The scoping process was confirmed by the Planning Service under Regulation 6 (1) (b) of the EIA regulations, wherein it provided an opinion as to the information to be provided in the ES (correspondence dated 7 September 2006, Appendix 6A). Direct consultations with stakeholders were also undertaken in this regard (see Appendix 6A).

6. Although the associated works application is a new application for planning purposes, the works/development it relates to were considered when this scoping opinion was provided.

6.2.1 Environmental Aspects Scoped Out

6.2.1.1 Air Quality

<u>Construction Phase</u>

7. During construction the potential will exist for adverse impacts to air, primarily due to the generation and dispersion of dust, but also due to additional emissions from construction vehicles and plant. Impacts to air from construction activities and vehicles are considered to be non-significant.

8. The construction traffic associated with the Proposed Development is outlined in Chapter 5 (Proposed Development) and detailed in Chapter 18 (Transport). Such traffic will be limited to the construction phase and will be temporary in nature.

9. In terms of scoping likely significant air quality effects, the following criteria are considered to be a robust determination of the need for an air quality assessment. An air quality assessment may be required if:

- Road alignment will change by 5m or more; or
- Daily traffic flows will change by 1000 AADT or more; or
- Heavy Duty Vehicles (HGV) flows will change by 200 AADT or more;
- Daily average speed will change by 10km/hr or more; or
- Peak hour speed will change by 20km/hr or more

10. The nature of the Proposed Development means that there will be no changes in road alignments, no changes in Annual Average Daily Traffic flows of more than 1000 or HGV changes of 200 (the maximum is 48) and there will be no change to the daily average or peak hour speeds.

11. Construction traffic will use local roads to access the working areas. It is predicted that there will be relatively large percentage increases of traffic flow on some local roads, although this is predominantly due to the very low existing flow volumes (see Chapter 18 Transport). Furthermore, according to the EPUK document 'Development Control: Planning For Air Quality' (EPUK, 2010), an air quality assessment is required for 'large, long term construction sites that would generate HGV flows of more than 200 movements per day over a period of a year of more'. Therefore, as the numbers of construction vehicles are considered to be low and temporary in nature, it is considered that there will be no likely significant air quality effects.

12. In terms of sensitive receptors, the Proposed Development is not located in any existing Air Quality Management Areas (AQMAs), nor within 200m of any ecological designated sites. The proposed haul routes (see Chapter 18 Transport) associated with the Proposed Development will pass through two AQMA areas and within 200m of ecological designated sites. These are:

- Moy AQMA (In the Dungannon Council area);
- Armagh AQMA – A29/A3 (In the Armagh Council area);
- Lough Neagh and Lough Beg Ramsar and Special Protection Area (SPA); and,
- Drumcarn Area of Special Scientific Interest (ASSI).

13. It is considered that because the construction traffic does not meet any of the criteria for an air quality assessment and the traffic impacts will be temporary in nature, there are no likely significant air quality effects to the AQMA and designated ecological sites and the assessment has therefore been scoped out.

Operation and Maintenance

14. The operation and maintenance of the Proposed Development will not result in any significant impact on air quality impacts and has been scoped out of the assessment. There will be no emissions from the towers or overhead line and any associated maintenance traffic will be very low – one vehicle trip to the tower locations every two years, and vehicles associated with the vegetation clearance 5-year cycle (see Chapter 5 Proposed Development and Transport18Transport for further details).

15. During its operation, the proposed substation will use sulphur hexafluoride (SF6) gas in sealed circuits as a gas insulator. The gas will be sealed and therefore there will be negligible emissions to the atmosphere. NIE has in place a policy which provides guidance on the recording, handling, storage, recovery, monitoring and disposal of SF6 gas in accordance with the F-gas regulations (Main Regulation: (EC) No 842/2006 of 17th May 2006).

Climatic Factors

16. The Proposed Development is not expected to have an effect on the climate.

17. SF6 gas is a greenhouse gas. However, its use will not cause any significant quantities of greenhouse gas to be emitted and thus insignificant negative impacts to climatic factors are anticipated.

18. In terms of positive climatic effects, please see Chapter 2 (Need) for further discussion.

6.2.2 Property Values

19. In the absence of any robust evidence indicating that the Proposed Development is likely to have significant effects on property values, the issue of suggested property devaluation has been scoped out.

6.2.3 Summary of Environmental Aspects Included

20. It was concluded that the following impacts should be included in the ES:

- Population, as assessed in the following Chapters: EMF; Noise; Landscape and Visual; Community Amenity and Land Use, and Socio-Economics;
- Flora and Fauna, as assessed in the Ecology Chapter;
- Landscape, as assessed in Landscape and Visual Chapter;
- Material Assets, as assessed in the Cultural Heritage, Landscape and Visual, and Telecommunications and Aviation Assets Chapter;
- Soil, as assessed in the Geology, Soils and Groundwater and Community Amenity and Land Use Chapter; and,
- Water as assessed in the Water Environment, Geology, Soils and Groundwater, Ecology and Flood Risk Chapters.

21. The same impacts are assessed in this Consolidated ES, having regard to the submission of the associated works application.

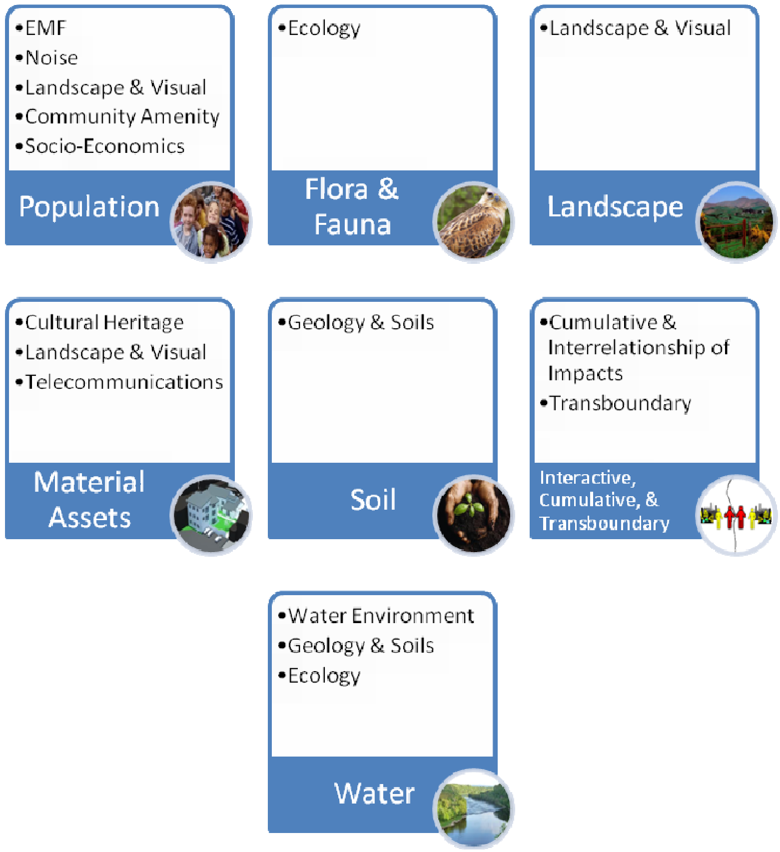
22. Interactive, cumulative and transboundary impacts are considered. These are contained in the individual assessments and summarised in the Cumulative and Interrelationship of Impacts Chapter and in the Transboundary Impacts Chapter.

23. Additionally, the ES includes consideration of any direct, indirect, secondary, short, medium and long-term, permanent and temporary, positive and negative indirect impacts.

24. The Proposed Development is permanent and thus no assessment of deconstruction or decommissioning has been undertaken.

25. Mitigation measures proposed to remedy environmental impacts are summarised in the Mitigation and Conclusions Chapter, Chapter 21 of this Consolidated ES. Further detail is contained in the Outline Construction Environmental Management Plan, in Appendix 5A.

Illustration 6.1 Environmental Aspects Included in the EIA



6.2.4 First ES Addendum Scoping (January 2011)

26. Following consultations on the planning application by the Northern Ireland Planning Service, a request was made under Regulation 15 of The Planning Environmental Impact Assessment Regulations (Northern Ireland) 1999, as amended, for further information to be submitted on four matters.

27. The request for further information was outlined in a letter sent by the Northern Ireland Planning Service, Special Studies Unit in October 2010. The request for further information is set out below:

"The following issues should be addressed within the Addendum:

(1) Landscape Impact - The portion of line between the international border and Tower 89 has a significant visual impact as it traverses elevated ground and is visible from scenic views in Co Monaghan more than 5km from the proposed route. The extent of Zone of Theoretical Visibility needs extended to 7Km. The submitted photomontages are inadequate and there is insufficient assessment of impact on landscape character in Co Monaghan, as well as, inadequate assessment of archaeological impact.

(2) Natural Heritage – Please submit the following missing Target Notes in Appendix D1 of Volume 3 of the ES: TN 1-5, 9, 10,16-21, 23-28, 30, 33-37, 40-42 and 48-52. The badger survey does not provide a map outlining the location of recorded setts within the site. A further Badger Report is required and should be presented in the following format:

The date/time of survey and qualifications of surveyor should be included in the report;

The survey should establish whether or not Badgers have established sett(s) (active or inactive) or use the area for foraging. All evidence of use by Badgers found, for example latrines, hair caught on wire or bedding should be included;

The information should be presented in a written report and must include large scale maps at 1:500 scale for those areas in the line route study where badger setts were recorded;

Results of the bat survey should also be provided.

(3) Historic Buildings – There is insufficient detail of the relationship between the following 6 Listed Buildings and the proposed sub-station/towers: 164 Trew Mount Road (HB13/08/070A), 166 Trew Mount Road (HB13/08/070B), 142 Moy Road (HB13/08/077), Gate Lodge for Tullydowey House (HB13/11/039), Tullydowey House & Gardens (HB13/11/040), Mullyloughan House/Glenaul House Tullydowey House (HB15/12/012). Three dimensional perspective/sections are required to demonstrate this relationship;

(4) Contaminated Land – Chapter 9 (Geology and Soils) of the ES refers to potentially contaminated land sites within the vicinity of towers 49 and 72. Full details of desk top studies and preliminary risk assessments for these areas are required."

28. Subsequently, all of these issues were addressed within the First ES Addendum published in January 2011, and are now included within this Consolidated ES.

6.2.5 Second ES Addendum Scoping (October 2011)

29. In October 2011, a Second ES Addendum was published in order to report on additional environmental surveys undertaken since the publication of the ES and First ES Addendum respectively.

30. The scope of the Second ES Addendum centred on providing further information to clarify some of the assessment work previously included in the ES and First ES Addendum in light of the issues raised during the consultation process. All of this information is included within this Consolidated ES.

6.3 Difficulties Encountered During the EIA

6.3.1 Introduction

31. The EIA regulations state that the ES must include "*An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant in compiling the required information*." Below is a summary of difficulties that arose during the study. Further topic specific issues are highlighted in the assessment chapters of this ES.

6.3.2 Housing in the Countryside

32. The ongoing demand for housing in the countryside was a constantly changing constraint on the design of the line route, as planning applications were monitored to maximise distances between the Proposed Development and any proposed houses. Despite the substantial task involved in monitoring the number of houses proposed in the vicinity, this was undertaken and resulted in numerous revisions to project design, which added cost and time to the assessment. The difficulty was addressed via design changes and there are not deemed to be any implications for the conclusions of the EIA.

6.3.3 Lands Access

33. Eight landowners refused permission for access to their properties in 2012, which meant that field surveys were not possible on these lands (see Figures 10.1 and 10.2). This accounted for 3% of the total ecological survey area. However, the Phase 1 habitat survey methodology required by NIEA permits surveillance from a distance where habitat types can be reliably identified. As a result, only 0.4% of the area of lands for which habitat survey were proposed could not be described.

34. Badger surveys were proposed within the site boundary and a further 250m outside of the Proposed Development; this included land with restricted access. Restricted access limited the area available to carry out badger surveys resulting in 3% of the proposed badger survey area not being available to survey. However, the majority of this area was more than 100m from the proposed line route, substation site and access tracks and was therefore not significant in terms of potential impacts on badgers and any associated setts.

35. It is considered that the refusal of land access to these limited areas does not affect the findings of this ES.

6.3.4 Contractor Procurement

36. The design of the Proposed Development has been refined to a stage appropriate for a full planning application and EIA. This was done in consultation with the DOE Planning Service as part of the PAD process.

37. Mitigation measures have been developed which will be implemented at the next stages of the Proposed Development (pre-construction, construction, and operational phases).

38. NIE intends to procure a contractor for the Proposed Development at a later stage. The work carried out by the selected contractor will be based on an Outline Construction Environmental Management Plan which incorporates mitigation measures described within this ES (See Appendix 5A). The work will be required by NIE to comply with a final CEMP itself required to be in compliance with the Outline CEMP. This will be contractually enforced with the contractor.

6.4 Consultation

39. The following is an overview of the public and statutory consultation process undertaken by NIE and its consultants from September 2006 to the beginning of 2013. This includes consultations carried out post ES publication in December 2009 including those associated with the First and Second Addendums respectively.

40. All statutory and stakeholder EIA consultation responses are available in Appendix 6.1.

6.4.1 Consultation Strategy

41. There were two distinct consultation strategies developed for the EIA. Community/Public consultations and statutory and stakeholder consultations.

42. Community and public representative consultations were facilitated by NIE with the statutory and stakeholder consultations carried out by AECOM as advisors to NIE. These consultations were progressed in parallel, and information and comments received were distributed throughout the project team.

43. Planning application consultations for the ES were conducted in 2009/10 by the Department of the Environment, Northern Ireland Planning Service, Special Studies Unit.

44. First ES and Second ES Addendum consultations were also conducted by the Department of the Environment, Northern Ireland Planning Service, Special Studies Unit in 2011.

Illustration 6.2: Consultation Strategy

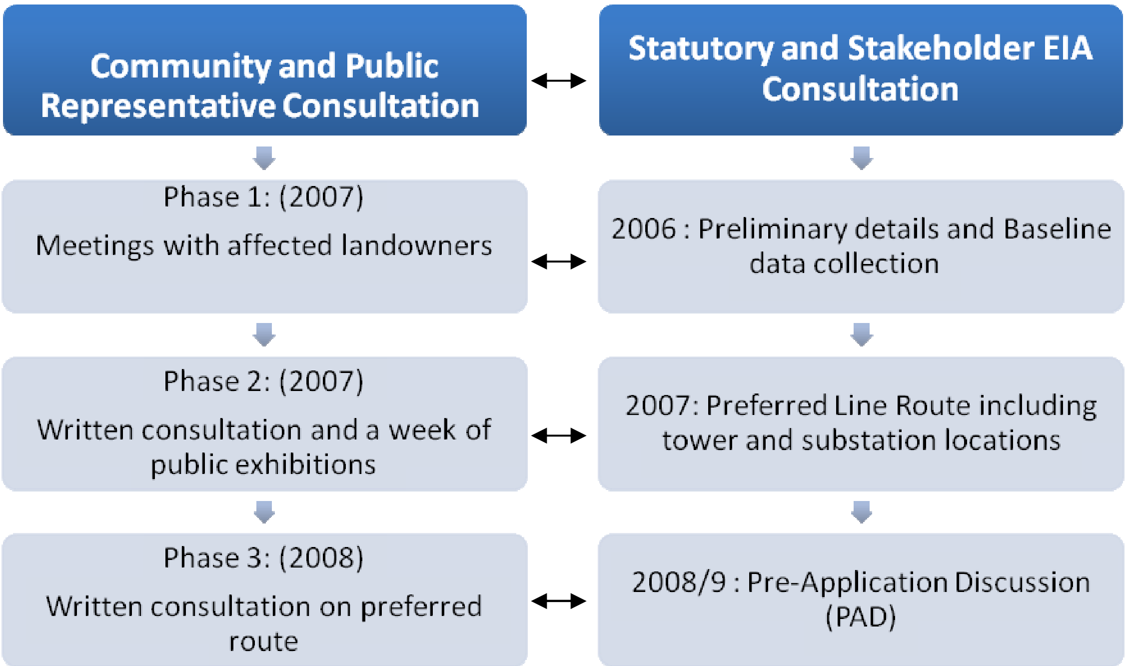
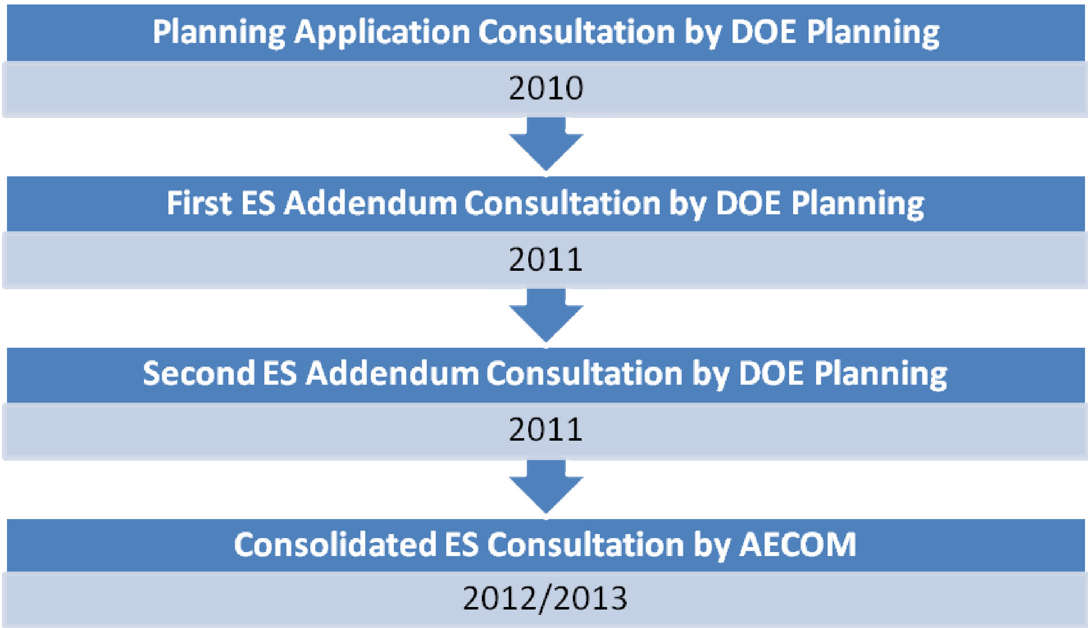


Illustration 6.3: Additional Statutory and Stakeholder Consultations Post ES December 2009



45. Consultation was carried out with:

- Statutory EIA consultees;
- Non-statutory bodies and interested parties;
- Public representatives;
- Local authorities (Dungannon District Council, Armagh District Council, Monaghan Council);
- Land holders; and
- Members of the general public.

46. Consultations were undertaken at all stages of the process to allow a wide variety of stakeholders to engage in the development of the Proposed Development from an early stage. All views were incorporated into the EIA with a view to informing the route design, mitigation and other aspects of the Proposed Development.

6.4.2 Community and Public Representative Consultation

47. This consultation was conducted by NIE through a three phased approach from March 2007 to December 2008. These consultations were supplemented by ongoing consultation with public representatives such as MLAs and MPs.

48. Over the course of the pre-consent stage of the Proposed Development, NIE has made use of multiple methods of public consultation. There has been ongoing consultation between NIE and members of the local community in relation to the development.

6.4.2.1 First Phase

49. All affected landowners were contacted in March 2007 and using land registry maps, those affected were identified and invited by letter to a meeting where details and maps of the Proposed Development were available.

50. Three separate landowner meetings were scheduled for different sections of the proposed overhead line route. These meetings were regional and landowners nearest to each local meeting place were invited to attend a local meeting. Approximately 50 landowners were invited to each meeting.

Table 6.2 First Phase of Community and Public Representative Consultation

Meeting 1	Meeting 2	Meeting 3
Moy, Co Tyrone 26 March 2007 3pm-9pm Church of Ireland Church Hall	Killylea, Co Armagh 1 May 2007 3pm-9pm St Marks Church Hall	Derrynoose, Co Armagh 18 June 2007 3pm-9pm Derrynoose Community Centre

51. As a result of the local media broadcasting a general invitation, meeting number 3 was cancelled since, owing to the large numbers expected to attend, NIE could not anticipate a meaningful dialogue with the relevant directly affected landowners. Instead, individual meetings were later arranged with the landowners concerned.

6.4.2.2 Second Phase

52. The Second Phase of the Community and Public Representative Consultation commenced with information packs being delivered to every house within a 1,000 metre corridor either side of the proposed line route in September 2007. The information packs included a booklet on EMF, Frequently Asked Questions, Tower Type Comparison, an A3 route map, three A4 maps showing the proposed route in further detail, and a letter inviting people to attend an information week.

53. A public exhibition took place from Monday 8 October to Friday 12 October 2007 from 10.00am to 8.00pm and on Saturday morning 13 October 2007 from 10.00am until 1.00pm at The Market Place Theatre and Arts Centre, Market Street, Armagh. There were approximately 150 attendees. During the same week, NIE met with a group of concerned landowners facilitated by a local MLA.

6.4.2.3 Third Phase

54. In December 2008, a third phase of consultation was undertaken and which involved sending out letters and maps of the preferred route. These were sent to the following recipients:

- MLAs / Councillors;
- Landowners;
- Individuals who were known to be living within a 1,000 metre corridor either side of the line route; and,
- Individuals who were known to have lodged planning applications within 300m each side of the line route.

6.4.2.4 Public Representatives

55. NIE also met with Councils, Councillors, MLAs, and other stakeholders throughout the development process. This was conducted in parallel with the phased public meetings.

6.4.3 Statutory and Stakeholder Group Consultation (2006 – 2011)

56. The objective of the statutory and stakeholder consultation has been to obtain baseline information and obtain comments on environmental aspects of the Proposed Development. Statutory and Stakeholder consultation has been undertaken from 2006 to 2013. This section highlights the consultations undertaken from 2006 to 2011 - this period covers the 2009 ES, First and Second ES Addenda. Copies of the correspondence are provides in Appendix 6.1 along with summary tables to highlight the key issues.

57. DOE Planning Service, Special Studies Unit was first made aware of the Proposed Development during a meeting on 22 February 2006. On 7 September 2006 the DOE Planning Service provided a scoping opinion as to the information to be provided in the ES to be submitted with the EIA planning application. This information was based on consultations conducted by the DOE Planning Service with various statutory consultees.

58. In 2006 AECOM contacted consultees by letter to obtain baseline data directly from consultees based on preliminary details of the Proposed Development.

59. In 2007 AECOM once again contacted consultees regarding the preferred line route, including tower locations and proposed location of the substation.

60. As part of the PAD process, statutory consultees were consulted again between December 2008 and November 2009 by DOE Planning Service and in some cases also by AECOM or NIE.

61. In 2010, consultations were issued by Planning Service in respect of the 2009 ES.

62. In January 2011, the First Addendum were issued and consultations undertaken by DOE Planning Service.

63. In October 2011, consultations were also carried out in by the DOE Planning Service.

64. A full list of organisations contacted from 2006 to 2011 is outlined in Table 6.3 below, with further details in Appendix 6.1.

Table 6.3 List of Consultees and Dates Contacted[121]

		Date Consulted					
Organisation	**Department**	**First Consultation**	**Second Consultation**	**Third Consultation**	**ES**	**First ES Addendum**	**Second Addendum**
Armagh City and District Council	Chief Executive	July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
Armagh City and District Council	Environmental Health and Recreation Directorate	July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
Belfast International Airport	Belfast Flying Club Ltd		November 2007		January 2010	January 2011	October 2011
British Broadcasting Corporation (BBC)	Reception Advice	July 2006	November 2007		Not specifically contacted but documents were publically available for comment.		
British Trust for Ornithology (BTO)			November 2007		Not specifically contacted but documents were publically available for comment		
Civil Aviation Authority (CAA)	Director of Airspace Policies	July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
Council for Nature Conservation and the Countryside (CNCC)		July 2006	November 2007		January 2010	January 2011	October 2011
Crown Estates		July 2006	November 2007		January 2010	January 2011	October 2011
Department of Agricultural and Rural Development (DARD)	Agri – Environmental Schemes Management Branch		November 2007		January 2010	January 2011	October 2011
DARD	Countryside Management Branch		November 2007	December 2008	January 2010	January 2011	October 2011
DARD	County Agricultural Office		November 2007		January 2010	January 2011	October 2011
DARD	Fisheries and Rural Policy Division		November 2007	December 2008	January 2010	January 2011	October 2011
DARD	Forest Service		November 2007	December 2008	January 2010	January 2011	October 2011
DARD	Quality Assurance		November 2007		January 2010	January 2011	October 2011
DARD	Rivers Agency	July 2006	November 2007	December 2008	January	January	October

[121] Blank entries in Table 6.2 indicate that the consultee was not contacted. Consultee lists were developed and evolved overtime as part of an interactive process.

		Date Consulted					
Organisation	**Department**	**First Consultation**	**Second Consultation**	**Third Consultation**	**ES**	**First ES Addendum**	**Second Addendum**
					2010	2011	2011
DARD	The EIA Team, Environmental Policy Division	July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
Department of Culture Arts and Leisure (DCAL)	Inland Fisheries and Inland Waterways	July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
Department for Energy Trade and Investment (DETI)	Invest Northern Ireland		November 2007		January 2010	January 2011	October 2011
DETI	Energy Branch	July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
DETI	Geological Survey of Northern Ireland (GSNI)	July 2006	November 2007		January 2010	January 2011	October 2011
Department of Environment (DOE) Northern Ireland Environment Agency (NIEA) [Previously Environment and Heritage Service (EHS)	Air and Environmental Quality	July 2006			January 2010	January 2011	October 2011
DOE NIEA	Built Heritage Unit	July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
DOE NIEA	Conservation Designation and Protection		November 2007		January 2010	January 2011	October 2011
DOE NIEA	Countryside and Coast	July 2006	November 2007		January 2010	January 2011	October 2011
DOE NIEA	Environmental Policy Group, Air and Environmental Quality Unit		November 2007		January 2010	January 2011	October 2011
DOE NIEA	Environmental Protection Division	July 2006	November 2007		January 2010	January 2011	October 2011
DOE NIEA	Historic Monuments Unit			December 2008	January 2010	January 2011	October 2011
DOE NIEA	Land and Resource Management	July 2006	November 2007	December 2008	January 2010	January 2011	October 2011

		Date Consulted					
Organisation	**Department**	**First Consultation**	**Second Consultation**	**Third Consultation**	**ES**	**First ES Addendum**	**Second Addendum**
DOE NIEA	Natural Heritage	July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
DOE NIEA	Waste Management and Contaminated Land		November 2007		January 2010	January 2011	October 2011
DOE NIEA	Water Management Unit		November 2007		January 2010	January 2011	October 2011
DOE Planning Service	Armagh Area Plan Team			December 2008	January 2010	January 2011	October 2011
DOE Planning Service	Craigavon Divisional Planning Office		November 2007		January 2010	January 2011	October 2011
DOE Planning Service	Dungannon Area Plan Team			February 2009	January 2010	January 2011	October 2011
DoE Planning Service	Landscape Architect Branch	July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
DOE Planning Service	Special Studies Unit	July 2006	November 2007	December 2008 to October 2009	January 2010	January 2011	October 2011
Department for Regional Development (DRD)	Roads Service - Development Control (Western Division)	July 2006			January 2010	January 2011	October 2011
DRD	Roads Service Armagh Section Office		November 2007	December 2008	January 2010	January 2011	October 2011
DRD	Roads Service Moygashel Depot		November 2007		January 2010	January 2011	October 2011
DRD	Roads Service Omagh Section Office		November 2007	December 2008	January 2010	January 2011	October 2011
DRD	Roads Service Forward Planning Section		November 2007		January 2010	January 2011	October 2011
DRD	Roads Service - Development Control	July 2006		December 2008	January 2010	January 2011	October 2011
Department of the Environment Heritage and Local Government (RoI)	Environmental Assessment Section	July 2006	November 2007		January 2010	January 2011	October 2011
Dungannon and South Tyrone	Chief Executive	July 2006		December 2008	January 2010	January 2011	October 2011

		Date Consulted					
Organisation	**Department**	**First Consultation**	**Second Consultation**	**Third Consultation**	**ES**	**First ES Addendum**	**Second Addendum**
Borough Council							
Dungannon and South Tyrone Borough Council	Environmental Health Department	July 2006		December 2008	January 2010	January 2011	October 2011
Fisheries Conservancy Board (FCB)		July 2006	November 2007	December 2008	Not specifically contacted but documents were publically available for comment		
Health and Safety Executive (HSE)		July 2006	November 2007		Not specifically contacted but documents were publically available for comment		
Helicopter Training and Hire Ltd			November 2007		Not specifically contacted but documents were publically available for comment		
Historic Monuments Council			November 2007		Not specifically contacted but documents were publically available for comment		
Irish Whooper Swan Study Group		July 2006	November 2007		Not specifically contacted but documents were publically available for comment		
Ministry of Defence (MOD)	Defence Estates	July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
National Air Traffic Services (NATS)	Corporate and Technical Centre	July 2006	November 2007		January 2010	January 2011	October 2011
NATS	NATS Safeguarding Office	July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
National Grid Wireless	Transmitting Section		November 2007		January 2010	January 2011	October 2011
National Museums Northern Ireland	Centre for Environmental Data and Recording (CEDaR)		November 2007		Not specifically contacted but documents were publically available for comment		
National Trust	Regional Office	July 2006	November 2007		Not specifically contacted but documents were publically available for comment		
Newry and Mourne District Council	Chief Executive		November 2007		January 2010	January 2011	October 2011
Northern Ireland Authority for Utility Regulation (the Utility Regulator) [Previously OFREG]			November 2007	December 2008	January 2010	January 2011	October 2011
Northern Ireland Bat	c/o National Museums Northern		November 2007	December 2008	Not specifically contacted but documents were publically available for comment		

		Date Consulted					
Organisation	**Department**	**First Consultation**	**Second Consultation**	**Third Consultation**	**ES**	**First ES Addendum**	**Second Addendum**
Group	Ireland						
Northern Ireland Tourist Board (NITB)		July 2006	November 2007		January 2010	January 2011	October 2011
Northern Ireland Water (Previously DRD Water Service)		July 2006	November 2007		January 2010	January 2011	October 2011
Ofcom	Television Planning and Licensing (Information)	July 2006			January 2010	January 2011	October 2011
Police Service Northern Ireland (PSNI)	Armagh District Command Unit	July 2006	November 2007		January 2010	January 2011	October 2011
PSNI	Dungannon District Commander		November 2007		January 2010	January 2011	October 2011
PSNI	Information and Communication Services			December 2008	January 2010	January 2011	October 2011
PSNI	Traffic Management		November 2007		January 2010	January 2011	October 2011
Public Health Agency (formally the Department of Health, Social Services and Public Safety (DHSSPS)		July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
Royal Air Force			November 2007		Not specifically contacted but documents were publically available for comment		
Royal Society for the Protection of Birds (RSPB)		July 2006	November 2007		January 2010	January 2011	October 2011
Southern Education and Library Board	The Property Manager		November 2007		January 2010	January 2011	October 2011
Southern Group Environmental Health Committee		July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
Southern Health & Social Services Board			November 2007	December 2008	January 2010	January 2011	October 2011

		Date Consulted					
Organisation	**Department**	**First Consultation**	**Second Consultation**	**Third Consultation**	**ES**	**First ES Addendum**	**Second Addendum**
Spectrum Planning (Buildings and Wind Farms)	Arqiva	July 2006		December 2008	January 2010	January 2011	October 2011
Spectrum Planning (Buildings and Wind Farms)	Crown Castle Limited		November 2007	December 2008	January 2010	January 2011	October 2011
Spectrum Planning (Buildings and Wind Farms)	National Grid Wireless UK Ltd.	July 2006	November 2007	December 2008	January 2010	January 2011	October 2011
Spectrum Planning (Buildings and Wind Farms)	NTL	July 2006			January 2010	January 2011	October 2011
Sports Council for Northern Ireland			November 2007		Not specifically contacted but documents were publically available for comment		
The Countryside Access and Activities Network (Now Outdoor Recreation NI)			November 2007		Not specifically contacted but documents were publically available for comment		
The Wildfowl and Wetlands Trust			November 2007		Not specifically contacted but documents were publically available for comment		
The Woodland Trust			November 2007		Not specifically contacted but documents were publically available for comment		
Translink		July 2006	November 2007		Not specifically contacted but documents were publically available for comment		
Ulster Farmers Union			November 2007		Not specifically contacted but documents were publically available for comment		
Ulster Flying Club Ltd	Newtownards Airfield		November 2007		Not specifically contacted but documents were publically available for comment		
Ulster Wildlife Trust			November 2007		Not specifically contacted but documents were publically available for comment		

6.4.4 Statutory and Stakeholder Group Consultation (2012 – 2013)

65. In November 2012, in anticipation of publication of this Consolidated ES in 2013, an additional consultation was carried out by AECOM. This consultation was carried out with previous consultees and any additional statutory and stakeholder groups were included.

66. A summary of the responses received for this consultation are outlined below in Table 6.4.

Table 6.4 Details of Consolidated ES Responses

Organisation	Department	Comment
Armagh City and District Council and Dungannon and South Tyrone Borough Councils	Joint Response	Armagh City Council and Dungannon District Council issued a joint response. It was the Council's view that the Proposed Development should be undergrounded. They referred to the Planning Appeals Commission and its comments on the application. The Councils understand that views in the local community with regard to the Proposed Development can be summarised in a number of broad headings which are summarised below: The Councils outlined what they expect a new planning application to contain. The Councils outlined a list of sufficient information to understand as a minimum.
Armagh City and District Council	Environmental Health	As above.
Arqiva	Spectrum Planning	No Reply.
BBC	Spectrum Planning	No Reply.
Belfast Flying Club	Belfast International Airport	No Reply.
British Telecom		No Reply.
British Trust for Ornithology		No Reply.
Council for Nature Conservation and the Countryside (CNCC)		No Reply.
Civil Aviation Authority (CAA)		Required clarification of Proposed Development. Previous correspondence was issued.
Crown Estates		No Reply.
DARD	Agri-Environment Schemes Countryside Management	No Reply.
DARD	Armagh County Agricultural Office	No Reply.
DARD	Forest Service	No Reply.
DARD	DARD Environmental Policy Branch	No Reply.
DARD	EIA Team	No Reply.
DARD	DARD Quality Assurance Branch	No Reply.
DARD	Armagh Divisional Veterinary Office	No Reply.
DARD	Rivers Agency HQ	No Reply.

Organisation	Department	Comment
DARD	Rivers Agency Armagh Office	DARD Rivers Agency Armagh acknowledged receipt of letter and stated they would reply in due course.
DARD	Fisheries and Climate Change Division, Room 420	No Reply.
Department of Health, Social Services and Public Safety		No Reply.
Department for Social Development		No Reply.
Department for the Environment, Community and Local Government	Environmental Assessment Department	No Reply.
DETI	Energy Branch	DETI Energy Branch had no additional comments to make.
DETI	Geological Survey of Northern Ireland	GSNI stated they have no additional comment to make regarding the application. GSNI pointed towards the use of geological archive of maps which may be of use.
DETI	Invest NI	No Reply.
DCAL	Fisheries Operations and Technical Support	No Reply.
DCAL	Inland Waterways and Fisheries	No Reply.
DOE	Central Management Unit	No Reply.
DOE	Air and Environmental Quality, Planning and Environmental Policy Group	DOE Air and Environmental Quality refer to consultation with local councils and make reference to noise guidelines.
DOE	Environmental Policy Division	No Reply.
DOE	Historic Monuments Council	No Reply.
DOE	Historic Buildings Council	No Reply.
DOE NIEA	Contaminated Land	No Reply.
DOE NIEA	Land and Resource Management, Environmental Protection	No Reply.
DOE NIEA	Water Management Unit, Environmental Protection	In response to a request from AECOM relating to watercourses, DOE NIEA supplied information relating to abstractions, pollution incidents, consented industrial discharges, consented agricultural discharges and NIW Discharges. They also supplied information relating to the status of watercourses in study area and Water Framework Directive Action Plans.
DOE NIEA	Countryside and Coast	No Reply.
DOE NIEA	Natural Heritage	No Reply.
DOE NIEA	Historic Buildings Unit	No Reply.
DOE NIEA	Historic Monuments Unit	No Reply.
DOE NIEA	Biodiversity	No Reply.
DOE NIEA	Conservation Designation and Protection	No Reply.

Organisation	Department	Comment
DOE Planning Service	Minerals Unit	No Reply.
DOE Planning Service	Landscapes Architect Branch	No Reply.
DOE Planning Service	Craigavon Area Planning Office, Marlborough House	No Reply.
DOE Planning Service	Western Area Planning Office, County Hall	The Western Planning Office noted that in the last consultation in October 2011 they had stated they were aware that the proposed line route runs near Moy and Benburb but does not encroach on them. Other than this they had no further comments to make.
DOE Planning Service	Special Studies Unit	No Reply.
DOE Planning Service	Orchard House, Tree Preservation Orders	No Reply.
DRD Roads Service	Development Control	No Reply.
DRD Roads Service	Western Division, Omagh Office	DRD Roads Service Western Division refers to response issued to Southern Division. Letter was forwarded to Acting Divisional Roads Service manager for Craigavon for possible comment.
DRD Roads Service	Southern Division, Craigavon	DRD Roads Service confirmed they will facilitate a meeting in order to discuss potential issues in relation to the Proposed Development.
DRD Roads Service	Western Division, Dungannon Office	No Reply.
DRD Roads Service	Southern Division, Armagh Office	No Reply.
DRD Roads Service	Transportation and Engineering Policy Unit	No Reply.
DSD Regional Development Division	Western Team	No Reply.
DSD Regional Development Division	Southern Team	No Reply.
Driver Vehicle Agency		No Reply.
Eircom (NI) Ltd		No Reply.
Enniskillen Airport		No Reply.
Health and Safety Executive	Headquarters	No Reply.
Helicopter and Training Hire Ltd		No Reply.
Irish Whooper Swan Study Group		No Reply.
Loughs Agency (Foyle, Carlingford & Irish Lights Commission)	Headquarters	No Reply.
Ministry of Defence (MOD)	Defence Estates	No Reply.
National Trust	Headquarters	No Reply.
National Trust	The Argory	No Reply.
Navan Centre Armagh		No Reply.
National Air Traffic	Safeguarding Office	No Reply.

Organisation	Department	Comment
Services (NATS)		
National Air Traffic Services (NATS)	Corporate and Technical Centre	No Reply.
Newry and Mourne District Council		No Reply.
Northern Ireland Bat Group		No Reply.
Northern Ireland Fire and Rescue Service (NIFRS)	Headquarters	No Reply.
Northern Ireland Fire and Rescue Service (NIFRS)	Western Area	No Reply.
Northern Ireland Fire and Rescue Service (NIFRS)	Southern Area	No Reply.
Northern Ireland Tourist Board (NITB)		No Reply.
Northern Ireland Water (NIW)		No Reply.
Ofcom		No Reply.
Outdoor Recreation Northern Ireland		No Reply.
Public Health Agency		The Public Health Agency acknowledged previous correspondence and had no further comments to make.
Phoenix Natural Gas		Phoenix Natural Gas replied to state they have no mains or services in the area and do not intend to build there in the near future.
Police Service of Northern Ireland (PSNI)	E District	No Reply.
Police Service of Northern Ireland (PSNI)	F District	PSNI stated they have no additional comments to make.
Royal Air Force (RAF)	Air Historical Branch	No Reply.
Royal Society for the Protection of Birds (RSPB)	Northern Ireland Headquarters	RSPB made reference to their previous responses. RSPB welcomed additional surveys in 2011/2012. RSPB referred to Barn Owl Surveys and recommended that responsibility for appropriate surveys at a pre–works stage, in suitable nesting habitat such as at Artasooly Wood, is placed with the ecological clerk of works. RSPB also referred to potential collision risks for birds and they recommended mitigation for Whooper Swans be considered. They also refer to Planning Policy Statements being taken into consideration.
Southern Health and Social Care Trust	Southern College of Nursing	No Reply.
Southern Education and Library Board (SELB)		No Reply.
Southern Group Environmental Health Committee (SGEHC)		No Reply.
Sustrans Northern Ireland		No Reply.

Organisation	Department	Comment
Sport Northern Ireland		No Reply.
Translink	Infrastructure Executive	No Reply.
Ulster Flying Club		No Reply.
Ulster Farmers Union		No Reply.
Ulster Wildlife Trust		No Reply.
Virgin Media, Plant Enquiries Team	Plant Enquiries Team	No Reply.
Woodland Trust		No Reply.
Wildfowl and Wetlands Trust		No Reply.
WWF Northern Ireland		No Reply.

67. In addition, representations made on the application and to the Public Inquiry adjourned March 2012, were taken into account.

68. In addition to the above consultation mail out, letters were also sent to those consultees who required additional information or further clarification on issues relating to the Proposed Development.

69. Monaghan County Council and Cavan County Council were subsequently contacted in order to seek their views on the Proposed Development.

70. A list of those organisations contacted and the reasons for their inclusion in the on-going consultation process are outlined below in Table 6.4.

Table 6.4: Details of Additional Organisations Contacted

Organisation	Department	Date Contacted	Reason for Contact	Comment
Cavan County Council	County Manager and Environmental Management Department	13.12.12	Views sought from ROI Councils.	No Reply.
Monaghan County Council	Chief Executive, Senior Planner and Environmental Health Department	13.12.12 15.01.13	Views sought from ROI Councils and Senior Planner contacted in response to clarification of Proposed Development.	No Reply.
CEDaR		19.11.12	CEDaR species lists for Consolidated ES.	CEDaR list received 04.12.12
CAA		14.02.13	Confirmation of Tower Heights for Consolidated ES.	The CAA confirmed that the overhead line and supporting structures would not constitute aviation en-route obstructions for civil aviation purposes. CAA stated that they have few associated observations other than to highlight that the need for planning deliberations to take into account any relevant aerodrome specific safeguarding issues.
DARD Rivers Agency	Armagh Office	20.11.12	Clarification on Watercourses for Consolidated ES.	Information provided.
Raptor Study Group		10.01.13	To Inform the Ecology Chapter of Consolidated ES.	Received data list of species on 05.03.13.

6.4.5 Consultation Conclusions

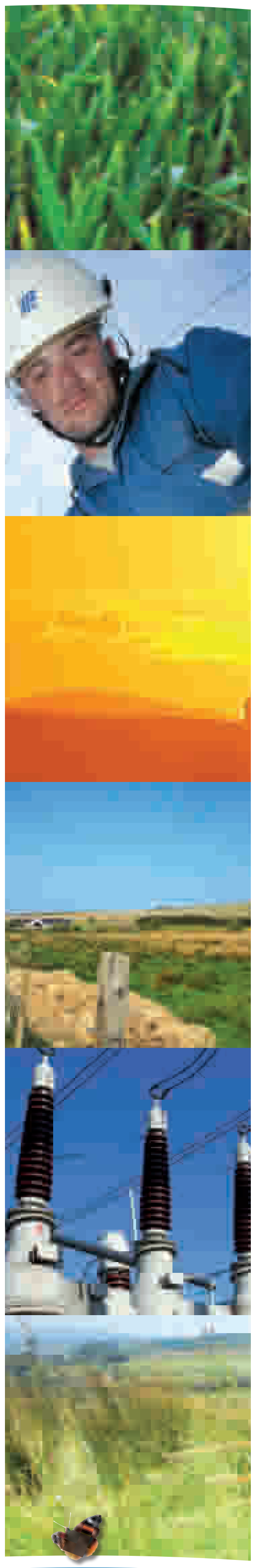
71. NIE's consultation was undertaken over an extended period of time from 2006 to 2013 inclusive. The consultations conducted by NIE took the format of public exhibitions, mail outs and meetings with public representatives and meetings with Statutory EIA Stakeholders. The DOE Planning Service's PAD process was engaged and environmental consultees have had the opportunity to comment on the ES methods, contents, and conclusions.

72. Consultations took place throughout the evolution of the Proposed Development to allow comment to be made on any significant issues. These views informed the preparation of the ES. Consultations also provided input into the route design options and mitigation measures outlined from publication of the ES to this Consolidated ES in 2013.

Tyrone - Cavan Interconnector

Chapter 7

Electric and Magnetic Fields



Consolidated Environmental Statement

Volume 2

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Northern Ireland Electricity

7 EMF

Chapter Executive Summary

The Proposed Development will fully comply with the Government policy on exposure of the general public to EMFs, which is based on numerical exposure guidelines. The exposure guidelines in place in the UK as a result of Government policy, formulated in 2004 and reiterated in 2009, are those published in 1998 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), applied in the terms of the 1999 European Union Recommendation. These guidelines take account of all the relevant scientific evidence.

Such compliance meets UK Government policy for providing the appropriate level of protection for the public. Government policy, based on the scientific advice of the NRPB/HPA, gives no reason on grounds of a health hazard as to why the Proposed Development should not be constructed and operated, given that it complies with the relevant exposure guidelines.

The proposed overhead line complies with the public exposure limits at all places underneath it, not just beyond some specified minimum distance. A person standing directly under the overhead line would be within the exposure guidelines. The fields fall with distance to the sides of the line, and the closest residential property, and all other residential properties, will be within EMF exposure guidelines by a large margin. No interference is expected with implanted medical devices.

7.1 Introduction

7.1.1 Scope Of This Chapter

1. This chapter presents an assessment of the Proposed Development (as detailed in Chapter 5 Proposed Development of this ES) in relation to electric and magnetic fields (EMFs).

2. There are no significant EMFs produced by the construction of the Proposed Development, so this chapter is principally concerned with the operational phase. Cumulative effects are dealt with in Chapter 19 Cumulative and Interactions of Impacts.

7.1.2 Introduction To Electric And Magnetic Fields

3. Electric and magnetic fields (EMFs, also sometimes referred to as electromagnetic fields) and the electromagnetic forces they represent are an essential part of the physical world. Their sources are the charged fundamental particles of matter (principally electrons and protons). Electromagnetic forces are partly responsible for the cohesion of material substances and they mediate all the processes of chemistry, including those of life itself. Electric and magnetic fields occur naturally within the body in association with nerve and muscle activity. People also experience the natural magnetic field of the Earth (to which a magnetic compass responds) and natural electric fields in the atmosphere.

4. The basic elements for describing all types of electrical activity are voltage and current. “Voltage” is a measure of intensity, and is often described as being similar to pressure within gases or liquids. Voltages are measured in volts, with the symbol “V”, and often with a prefix used to indicate either very small or very large measurements, for example, mV indicating one thousandth of a volt or kV indicating one thousand volts. Electrical “current” relates to the quantity or rate of electricity flowing through an electrical conductor, and is measured in amperes (symbol “A”). Current measurements are also often qualified with a relevant prefix letter for very small or very large measurements. “Magnetism” is a complex interaction between voltage and current, and is a fundamental element of all electrical activity.

5. An "electric field" is created in any space between points that are at different levels of voltage. It describes the pattern of changing voltage between these points, since the voltage must change from one level to the other level across the space. The intensity of the field is dependent upon the voltage difference, and upon the size and nature of the space. "Magnetic fields" are created whenever current flows through a conductor. The intensity of a magnetic field is dependent upon the amount of current flowing in the conductor and upon distance away from the conductor. In air spaces, magnetic fields fall in intensity as the distance from the source increases.

6. Electric-field strengths are measured in volts per metre (V/m or Vm^{-1}) or kilovolts per metre (kV/m or kVm^{-1}). The atmospheric electric field at ground level is normally about 100V/m in fine weather and may rise to many thousands of volts per metre during thunderstorms.

7. Magnetic fields are usually measured in microteslas (µT) or nanoteslas (nT). One nanotesla is one thousandth of a microtesla. Microteslas are used throughout this chapter. The Earth has a natural magnetic field, which is approximately 50µT in the island of Ireland.

8. The Earth's fields are normally in the same direction, varying in size only slowly over time, and are referred to as static or "DC" fields. Other fields alternate backwards and forwards and are referred to as alternating or "AC" fields.

9. Electric and magnetic fields occur in the natural world, and people have been exposed to them for the whole of human evolution. The advent of modern technology and the wider use of electricity and electrical devices have inevitably introduced changes to the naturally occurring EMF patterns. Energised high-voltage power-transmission equipment is a source of power-frequency or extremely-low-frequency ("ELF") alternating electric and magnetic fields, which add to (or modulate) the Earth's steady natural fields. The strength (or amplitude) of the electric-field modulation depends on the voltage of the equipment, which remains more or less constant as long as the equipment is energised. The strength of the magnetic-field modulation depends on the current (often referred to as the load) carried by the equipment, which varies according to the demand for power at any given time. Since field strengths are constantly varying, scientists usually describe them by reference to an averaging calculation known as the "root mean square" or RMS measurement. Future mention of field strengths in this chapter will mean the RMS amplitude of the power-frequency modulation of the total field, which is the conventional scientific way of expressing these quantities.

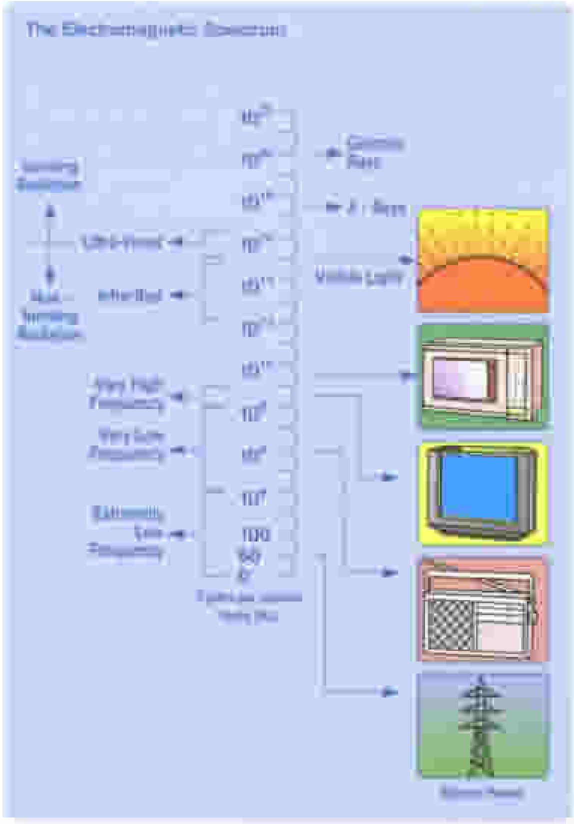
7.1.3 The Electromagnetic Spectrum

10. The frequency of the EMFs produced by the power system on the island of Ireland is 50 hertz (Hz) and this frequency falls under the "extremely low frequency" (ELF) category.

11. EMFs at much higher frequencies can, however, be generated by other devices, e.g. radio, television transmissions and microwaves. These higher frequencies interact with objects and people in a rather different way to electric power frequencies, for example by heating of the body, and it is important to make the distinction.

12. Illustration 7.1 shows what is known as the electromagnetic frequency spectrum. It stretches from ELF, which include power frequencies, through radio and microwaves, infrared, visible and ultra violet light to X-rays and gamma rays.

Illustration 7.1: The Electromagnetic Spectrum



13. For X-rays and gamma rays, the small discrete packets called photons, which carry the energy, are capable of ionising, that is, disrupting individual molecules or atoms. Such disruption can sometimes damage living material.

14. For visible light and all lower frequencies, this process of ionisation by individual photons cannot happen. Overhead lines produce fields only at frequencies well below those of visible light. The term "non ionising" radiation is often applied to these frequencies.

15. The word "radiation" usually relates to the effects of, for example, X-rays and nuclear waste, or the heating effects of microwave appliances, where a key characteristic is that the electric and magnetic fields are coupled together in a way that propagates through space. The ELF fields associated with high-voltage lines do not cause these effects or have these characteristics. They are referred to, technically, as "induction" or "near" fields, and not "radiated" or “far” fields. Thus, at power frequencies, even the term "radiation" is not appropriate since power is not radiated away.

7.1.4 Summary of Controls on EMFs

16. There are no statutory regulations in the UK that limit the exposure of people to power-frequency electric or magnetic fields. However, responsibility for implementing appropriate measures for the control of EMFs lies with Government, and Government has put in place a set of policies to this end, based on quantitative exposure guidelines.

17. NIE’s policy is that the Proposed Development must comply with Government policy on EMFs and in particular with the Government’s EMF exposure guidelines. NIE believes that compliance with Government policy on EMF exposure levels ensures the appropriate level of protection for the public from these fields. This is discussed in more detail in Section 7.3.2.5 below.

18. The policies that exist in the UK for the control of EMFs are described in detail in section 7.3.2.2. But in summary, in 2004, the National Radiological Protection Board (NRPB), which had statutory responsibility for advising Government on non-ionising radiation protection, including power-frequency fields, recommended to Government (NRPB 2004a) the adoption in the UK of guidelines published in 1998 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) (ICNIRP 1998). Government accepted this recommendation, stating in 2004 (DH 2004) that public exposures should be limited by the 1998 ICNIRP Guidelines in the terms of a 1999 EU Recommendation (EU 1999). This policy was restated and made more explicit in a 2009 Written Ministerial Statement (DH 2009), and the necessary details for the practical implementation of this policy were set out in a Code of Practice (DECC 2012a) first issued in 2011. The Northern Ireland Executive explicitly adopted this Code of Practice in 2012 at which point a revised version was issued to include Northern Ireland, and there is no separate policy in Northern Ireland relating to EMFs from overhead lines. The Code of Practice is included as Appendix 7A to this Chapter and the Northern Ireland Executive is included in the list of organisations agreeing to it in paragraph 3 on page 2.

19. Note that on 1 April 2005 the NRPB became part of the Health Protection Agency (HPA), forming the Radiation Protection Division (HPA-RPD). This ES continues to refer to NRPB for statements made prior to that date. Subsequent to any statements referred to in this ES, the HPA in turn became part of Public Health England in 2013.

20. In developing the Proposed Development, NIE has designed the proposed new 400kV overhead line to comply fully with the 1999 EU Recommendation, and also with the only other relevant Government policy, which relates to a concept called "phasing". This action complies with Government policy and with the specific advice of the HPA, who acts as the Government's independent scientific adviser in relation to EMFs.

21. The subject of compliance with the relevant exposure guidelines and other policies is discussed in detail in Section 7.3 below.

7.2 Baseline Information

22. Electric and magnetic fields both occur naturally. The Earth's magnetic field, which is caused mainly by currents circulating in the outer layer of the Earth's core, varies between about 30µT at the equator and about 60µT at the poles. This field may be distorted locally by ferrous minerals or by steelwork such as in buildings.

23. At the Earth's surface there is also a natural electric field, created by electric charges high up in the ionosphere, of about 100V/m in fine weather. Below a storm cloud containing large quantities of electric charge, the field may reach intensities up to 20kV/m over flat surfaces, while above hillocks or other irregularities or near the tops of objects such as trees, the field strength can be considerably higher. In mountains, for instance, the presence of these fields produces electrical discharges and crackling noises on sharp ridges and on the ends of ice picks. Sailors throughout the centuries have observed this same phenomenon, known as Saint Elmo's Fire, at the tops of the ships' masts. The cause of this effect is local ionisation of the air. Scientists describe this as the "corona discharge" effect, and the ions so created as "corona ions".

24. Such naturally occurring electric and magnetic fields generally point in the same direction over time and are referred to as static or DC fields. In the island of Ireland, the electric and magnetic fields produced wherever electric power is present vary at a power frequency of 50Hz (i.e. alternating back and forth 50 times each second). Such fields are referred to as alternating or AC fields.

25. Electric and magnetic fields are produced in everyday situations by electrical wiring and electrical appliances. In many cases domestic electrical appliances and tools can generate higher magnetic and electric fields in their close proximity than do transmission lines. However, typically such fields are experienced only for the relatively short duration that the appliance or tool is in use and close to the body.

7.3 Compliance With Exposure Guidelines And Other Policies

7.3.1 Magnitudes Of Fields

7.3.1.1 General Characteristics Of Fields

26. The magnetic field produced by a current in a conductor falls with distance from the conductor. Where there is more than one current forming part of one or more electrical circuits, there is also partial cancellation between the magnetic fields produced by the individual currents, and that cancellation generally becomes better at greater distances. Overall, the magnetic field is highest at the point of closest approach to the conductors and falls quite rapidly with distance. Similarly, there is partial cancellation between the electric fields produced by the voltages on individual conductors, and the electric field is usually highest at the point of closest approach to the conductors and falls quite rapidly with distance.

7.3.1.2 Fields Produced By The Proposed Overhead Line

27. Calculations are performed here for the proposed design of the overhead line for both electric fields and magnetic fields. Calculations are the best way of assessing fields in these circumstances and are acceptably accurate.

28. The calculations of fields presented here follow the provisions specified in the Code of Practice. In particular, the calculations of magnetic fields ignore zero-sequence currents, that is, they assume the currents in each circuit are perfectly balanced. This approximation makes little significant difference to the accuracy of the calculations of the larger fields at closer distances to the overhead line, but means that the smaller fields at larger distances are underestimated.

29. Calculations were performed using specialised computer software that has been validated against direct measurement (Swanson 1995).

30. Calculations are presented for the maximum fields the line is capable of producing under the conditions specified in the Code of Practice, that is, broadly, when the line is at design minimum clearance and is carrying the maximum possible continuous current. This gives the theoretical maximum fields, which are used for assessing compliance with exposure guidelines. However, fields this high would be encountered rarely if ever in practice, as in normal operations, the line carries lower currents, and the clearance is higher than the minimum. Calculations are therefore also presented for indicative typical conditions, using a current one third of the maximum.

31. The distance from the conductors is determined not only by the lateral distance away from the line but also by the height of the conductors overhead. For the 400kV overhead line proposed for the Proposed Development, the minimum conductor height above ground has been designed to be 9.0m (an increased minimum clearance from NIE Policy 06/025 of 7.6m).

32. However, the conductor clearance varies with the temperature of the conductors (the conductor sags more as the metal expands with increasing temperature). The temperature of the conductors in turn depends on what current they are carrying (which determines how rapidly heat is generated within them) and on weather conditions (which determines how rapidly heat is transferred away). This minimum clearance would occur only when the maximum possible current is flowing at the same time as there being an ambient air temperature of 25℃, in full sunshine and with no wind. These conditions are most unlikely to occur simultaneously in Ireland since maximum loads will almost always occur in the winter period. The minimum ground clearance at maximum sag under indicative typical conditions, as opposed to worst-case conditions, varies from span to span but is never less than 10.2m.

33. The fact that the ground clearance depends on the current in this way means that the calculated electric fields also indirectly vary with the current. If the sag of the conductors was fixed, electric fields would, of course, depend only on the voltage and not on the current.

34. Calculations were performed using the parameters given in Table 7.1.

Table 7.1 Parameters used for calculations of fields

Parameter	Value used for calculation for indicative typical conditions	Value used for calculation for theoretical maximum conditions
Voltage	400kV	400kV This is the "nominal voltage" as specified in the Code of Practice.
Load	500MW	1500MW This is the "highest rating that can be applied continuously in an intact system" specified in the Code of Practice. Equivalent to 2166A.
Ground clearance (minimum value at middle of span)	10.2m	9.0m

35. The EMF levels decrease sharply with distance from the line. This drop-off is illustrated graphically in Illustrations 7.2 and 7.3 which show the results of the EMF calculations of the fields that the proposed 400kV line would generate.

Illustration 7.2: Electric field strength underneath the proposed 400kV overhead line at indicative typical and theoretical maximum operating conditions

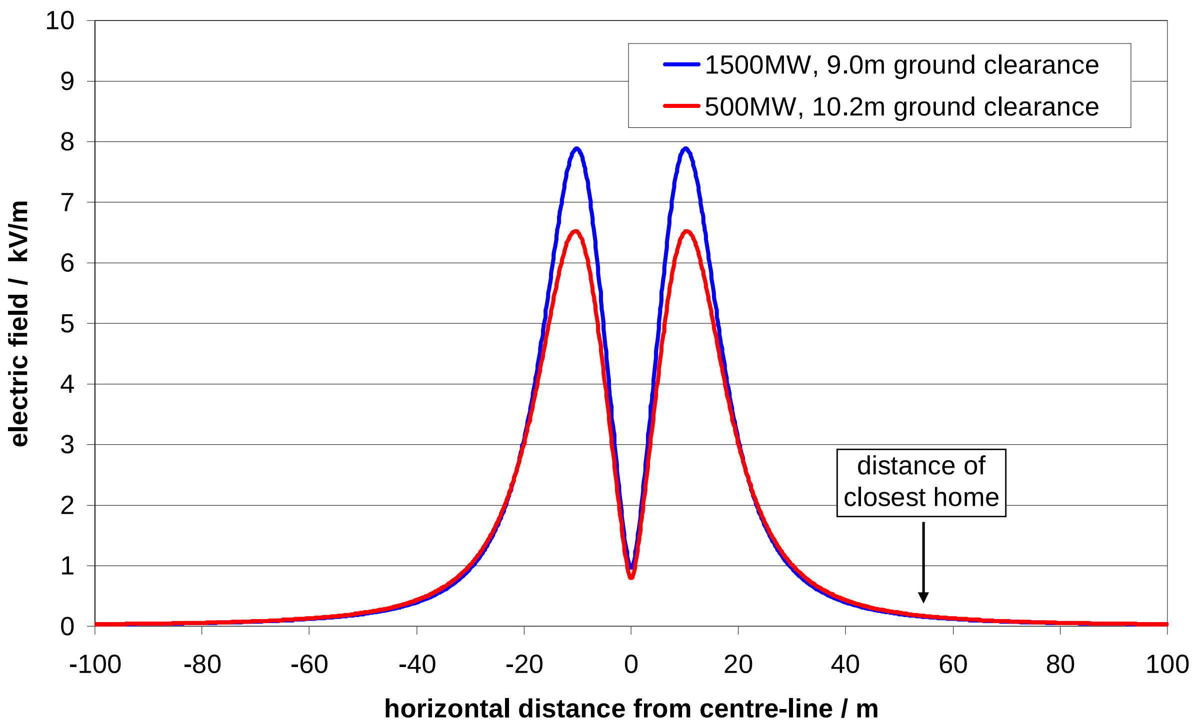
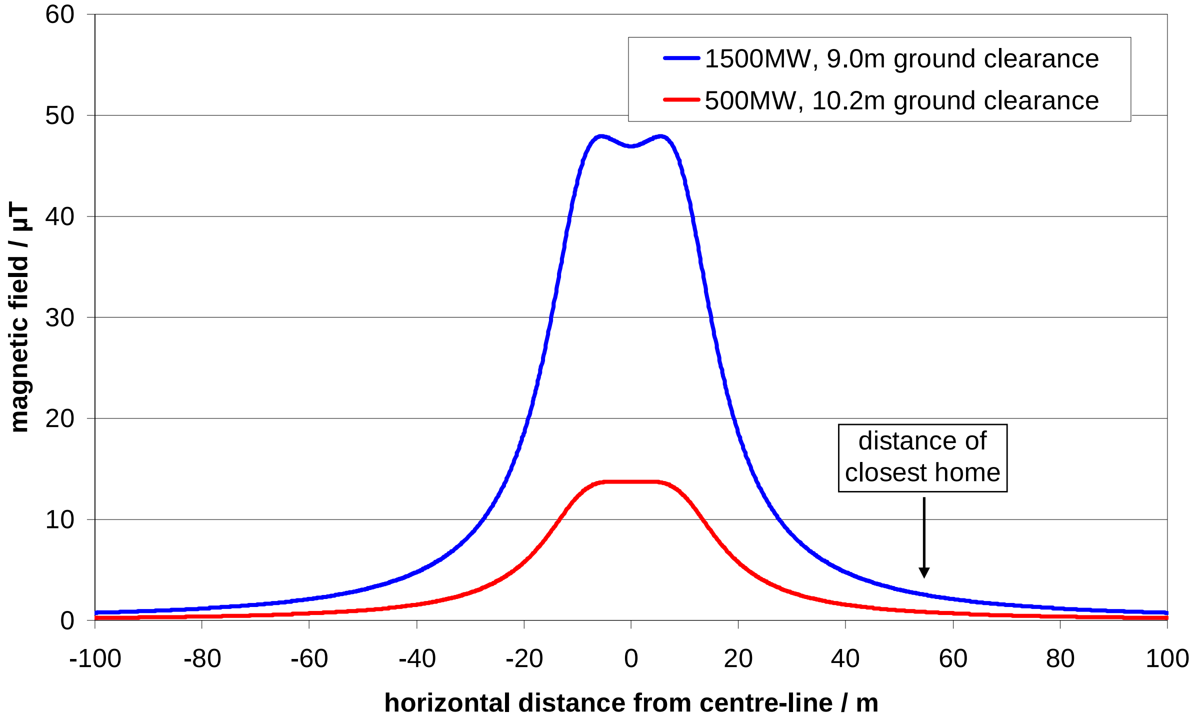


Illustration 7.3: Magnetic field strength underneath the proposed 400kV overhead line at indicative typical and theoretical maximum operating conditions



36. Table 7.2 shows the calculated electric and magnetic fields for the indicative typical and theoretical maximum operating conditions, each with the corresponding minimum ground clearance, directly under the centre of the line, at 25m, 50m and 100m lateral clearance from the centre of the line.

Table 7.2: Predicted EMF values from proposed 400kV line.

Exposure Characteristics		**Electric Field Strength kV/m**	**Magnetic Field Strength μT**
ICNIRP Exposure Guidelines (see Section 7.3.2.3 below)			
General Public effective limit for uniform fields		9	360
Proposed Overhead Line			
Peak value	1,500MW	7.9	47.9
Under the centre-line	1,500MW	1.0	47.0
Under the centre-line	500MW	0.8	13.7
25m from the centre-line	1,500MW	1.7	12.1
25m from the centre-line	500MW	1.7	3.9
50m from the centre-line	1,500MW	0.2	3.1
50m from the centre-line	500MW	0.2	1.0
100m from the centre-line	1,500MW	0.03	0.8
100m from the centre-line	500MW	0.03	0.3

37. The issue of compliance with the exposure guidelines is discussed in more detail in Section 7.3.3.1 below, but these results show that both the electric and magnetic field levels generated from this

Proposed Development comply with the EMF exposure guidelines summarised in Section 7.1.4 above and discussed in more detail in Section 7.3.2 below.

7.3.1.3 Fields Produced By The Proposed Substation

38. Due to the complex physical arrangement of electrical equipment, the EMFs produced by an electrical substation are not readily calculable; however, the highest field levels at and outside the perimeter of a substation are usually those produced by the overhead lines entering the substation. The fields produced by equipment within the substation are generally smaller and decrease with distance more quickly than fields generated by overhead lines.

7.3.2 Applicable National Policy

7.3.2.1 Policy Of Compliance With Exposure Guidelines

39. As discussed in Section 7.1.4 above, NIE's policy is that the Proposed Development must comply with Government policy on EMFs and in particular with the Government's EMF exposure guidelines.

7.3.2.2 EMF Exposure Guidelines In The UK

40. Section 7.1.4 above summarised the controls in the UK on public exposure to EMFs. This section gives more detail.

41. In March 2004 the NRPB provided advice to Government (NRPB 2004a), replacing previous advice from 1993, and recommending the adoption in the UK of guidelines published in 1998 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) (ICNIRP 1998).

42. Government formally responded to these new recommendations from the NRPB on 22 July 2004, in the form of a letter from the Minister for Public Health to the Chairman of the NRPB (DH 2004). The Annex to this letter states, in part:

> *"7 For all other sources [other than mobile telephony, and therefore including power lines] the Government expects the NRPB guidelines to be implemented in line with the terms of the EU Recommendation, that is, taking account of the risks and benefits of action. Preliminary discussions have already taken place to identify what reasonable actions might be taken."*

43. In October 2009, a Written Ministerial Statement (DH 2009) re-endorsed the use of the ICNIRP exposure guidelines in the terms of the EU Recommendation:

> *"40. In the absence of any practical precautionary low-cost measures for reducing the exposure to ELF EMF associated with high voltage overhead lines, the Government believes that the 1998 ICNIRP Guidelines on exposure to EMFs in the terms of the 1999 EU Recommendation, as recommended by the Health Protection Agency and in line with the view of the World Health Organization, remain relevant.*
>
> *41. While we recognise that these guidelines on the restriction of public exposures relate particularly to the avoidance of the known acute effects of exposures to ELF fields, we note that the EU recommendation suggests that ICNIRP guidelines remain relevant where the exposure is potentially for a significant period of time. We are therefore of the view that protection of the members of the public from the possible risks of long term exposure should be based on compliance with the ICNIRP guidelines."*

44. The EU Recommendation of 1999 (EU 1999), in line with the terms of which the Government expects the NRPB recommendations to be implemented, states, in part:

> *"Member States, in order to provide for a high level of health protection against exposure to electromagnetic fields, should:*
>
> *adopt a framework of basic restrictions and reference levels using Annex I.B as the basis;*

> *implement measures according to this framework, in respect of sources or practices giving rise to electromagnetic exposure of the general public when the time of exposure is significant …[with exceptions for medical purposes]*
>
> *aim to achieve respect of the basic restrictions given in Annex II for public exposure."*

45. Government policy is therefore that overhead lines should comply with the ICNIRP guidelines:

- when the time of exposure is "significant";
- taking account of the risks and benefits of achieving compliance; and,
- where the actions required to achieve compliance are "pragmatic" and "reasonable".

46. The Written Ministerial Statement of October 2009 defines "significant" as follows:

> *"42. ... In this regard, the UK Government considers that exposure for potentially significant periods of time might reasonably be regarded as referring to residential properties, and to properties where members of the public spend an appreciable proportion of their time."*

47. The overarching statement of Government policy on EMFs remains the Written Ministerial Statement of October 2009. Three further documents have appeared since, which provide further detail of the practical implementation of that policy: two Codes of Practice first published in February 2011, and a National Policy Statement approved by Parliament in July 2011.

48. Code of Practice "Power Lines: Demonstrating compliance with EMF public exposure guidelines" (DECC 2012 as provided in Appendix 7A of this ES). This describes its function under the heading "What are the electricity industry and Government agreeing?" as follows:

> *"The Electricity Industry agrees that whenever evidence is required of compliance with EMF exposure limits, it will provide evidence according to this Code of Practice. Government agrees that such evidence will be regarded as sufficient to demonstrate compliance. Situations where the need for evidence of compliance with exposure limits may arise include applications for development consent for overhead power lines under the Planning Act 2008 and relevant planning legislation in Scotland and under Section 37 of the Electricity Act 1989, for compulsory purchase under schedule 3 to that Act, for necessary wayleaves under schedule 4 to that Act, and for planning permission for electricity equipment." (p2)*

49. Code of Practice "*Optimum Phasing of high voltage double-circuit Power Lines*" (DECC 2012b): This sets out what is and is not required under the policy on optimum phasing established by the Written Ministerial Statement. The policy relating to phasing is discussed in Section 7.3.6.1 below.

50. The two Codes of Practice were revised in 2012 to include the Northern Ireland Executive in the list of organisations agreeing to them.

51. *National Policy Statement EN-5* (DECC 2011). This sets out the policies to be followed in considering whether to grant consent for major infrastructure projects, which includes 400kV overhead lines. As far as EMFs are concerned, it reiterates the position established by the Written Ministerial Statement and the Codes of Practice.

52. NIE has committed itself to the provisions of the two Codes of Practice through its membership of the Energy Networks Association, and following the 2012 revision, these Codes of Practice explicitly apply in Northern Ireland and therefore to the Proposed Development. National Policy Statement (NPS) EN-5 was created in the context of the planning system as it exists only in England and Wales, but the principles it sets out are of relevance to the whole UK, and in the absence of any Northern Ireland planning policy addressing EMF issues, NIE has regard to the policies in NPS EN-5.

53. The Code of Practice on compliance also provides details of how the provision in the EU Recommendation that the limits should be applied "*when the time of exposure is significant*" will be implemented in the UK. The approach adopted is to define certain land uses, essentially residential

and other long-term uses, as constituting exposure for a significant period of time and thus where the public exposure limits apply, and to define all other land uses as not constituting exposure for a significant period of time, even if they are publically accessible, and thus where the public exposure limits do not apply and the higher occupational limits apply instead.

54. The actual wording in the Code of Practice is:

> *"In order to provide precision for the network companies, local planning officers and the public, in terms of assessing which guidelines apply it is appropriate to look across to any readily available tools in the planning system. All regions of the UK are covered in planning by a "Use Classes" regime which extends development control to changes in use of buildings or land. It would therefore be appropriate to draw on the classification used there to provide clarity.*
>
> *The thrust of concern where public guidelines should apply is to residential uses. This would embrace use classes variously described as "dwellinghouses", "houses", "houses in multiple occupation" and "residential institutions". It should sensibly be taken more broadly as also embracing other residential properties which may not fall within a particular use class e.g. flats or hostels. A less clear cut case exists for extending it to schools but given the health concern is very much orientated towards childhood sickness it would seem prudent to behave in a precautionary manner and include non-residential uses such as schools, crèches and day nurseries.*
>
> *In each case, for practical application of the guidelines the definition should also be taken to include the curtilage of the building concerned."*

7.3.2.3 Numerical Values Of Exposure Guidelines

55. This section concerns the values of the exposure limits at 50Hz.

56. The ICNIRP guidelines recommend that the general public are not exposed to levels of EMFs able to cause a current intensity of more than two thousandths of an ampere per square metre ($2mA/m^2$) within the human central nervous system. This recommendation is described as "the basic restriction". The external fields that have to be applied to the body to cause this current density have to be calculated by numerical dosimetry.

57. The ICNIRP guidelines also contain values of the external fields called "reference levels". The reference level for an electric field is 5kV/m, and the reference level for a magnetic field is 100µT.

58. The 1999 EU Recommendation uses the same values as ICNIRP.

59. In the ICNIRP guidelines and the EU Recommendation, the actual limit is the basic restriction. The reference levels are not limits, but are guides to when detailed investigation of compliance with the actual limit, the basic restriction, is required. If the reference level is not exceeded, the basic restriction cannot be exceeded and no further investigation is needed. If the reference level is exceeded, the basic restriction may or may not be exceeded.

60. This is spelled out explicitly by the NRPB. In its recommendations to Government of March 2004 (NRPB 2004a), it states, in part:

> *"Recommendations*
>
> *The ICNIRP basic restrictions on induced current density should be used for restricting occupational and general public exposure to electric and magnetic fields of frequencies less than 100 kHz (see the appendix).*
>
> *The ICNIRP reference levels should be used at the initial stage of assessing compliance with basic restrictions on exposure.*
>
> *Further investigations of compliance, that are indicated by exceeding these reference levels, should use the most up to date dosimetry methods."*

61. Similarly, in a separate Information Sheet published in 2005 (HPA 2005), HPA states:

“Where compliance assessment includes the need for measurement and/or calculation of the external fields, RPD suggests the following structured approach based on three stages of increasing complexity.

First stage

The external fields to which people may be exposed should be evaluated and compared with the ICNIRP reference levels. If the results are at or below the reference levels, then compliance should be assumed. Otherwise, assessment should proceed to the second stage.

Second stage

The results of the evaluation should be compared with the values of external fields required to produce the basic restrictions in the body. Such values can be derived from calculations using anatomically realistic models of the body and examples are given in figures 1-4 of the published NRPB Advice (NRPB, 2004b). The associated values are tabulated in the peer-reviewed publications by Dimbylow (1998, 2000). The latest dosimetry from Dimbylow (2005) concerning the development of a female voxel phantom includes further calculations of induced current density and internal electric fields in the frequency range from 50 Hz to 10 MHz.

These calculations indicate that for occupational exposure an electric field strength of approximately 46 kV m^{-1} and a magnetic flux density of approximately 1800 µT correspond to an induced current density of 10 mA m^{-2}. Corresponding values for the general public equivalent to 2 mA m^{-2} are approximately 9 kV m^{-1} and approximately 360 µT.”

62. The third stage concerns non-uniform exposures. The fields produced by overhead lines are essentially uniform close to the ground and therefore this third stage is not relevant.

63. The Code of Practice endorses these values, stating:

“The 1998 ICNIRP exposure guidelines specify a basic restriction for the public which is that the induced current density in the central nervous system should not exceed 2 mA m^{-2}. The Health Protection Agency specify that this induced current density equates to uniform unperturbed fields of 360 µT for magnetic fields and 9.0 kV m^{-1} for electric fields. Where the field is not uniform, more detailed investigation is needed. Accordingly, these are the field levels with which overhead power lines (which produce essentially uniform fields near ground level) shall comply where necessary. For other equipment, such as underground cables, which produce non-uniform fields, the equivalent figures will never be lower but may be higher and will need establishing on a case-by-case basis in accordance with the procedures specified by HPA. Further explanation of basic restrictions, reference levels etc is given by the Health Protection Agency.”

64. Therefore, if the fields produced by an overhead line are lower than 9kV/m and 360µT, the fields required to produce the ICNIRP basic restriction, it is compliant with the ICNIRP guidelines and hence with HPA recommendations and Government policy. If the fields are greater than these values, it is still compliant with Government policy if the land use falls outside the residential and other uses specified in the Code of Practice.

7.3.2.4 Additional Precautionary Measures

65. As explained above, EMF policy in the UK is based on compliance with quantitative exposure guidelines. But EMF policy also takes account of the need to consider possible precautionary measures in addition to the exposure guidelines.

66. In its March 2004 recommendations to Government (NRPB 2004a), the NRPB states:

“60 NRPB concludes that the results of epidemiological studies, taken individually or as collectively reviewed by expert groups, cannot currently be used as a basis for restrictions on exposure to EMFs.”

67. However, it also stated:

"Recommendation

139 The Government should consider the need for further precautionary measures in respect of exposure of people to EMFs. In doing so, it should note that the overall evidence for adverse effects of EMFs on health at levels of exposure normally experienced by the general public is weak. The least weak evidence is for the exposure of children to power frequency magnetic fields and childhood leukaemia."

68. In the Minister for Public Health's response to the NRPB's recommendations (DH 2005), she stated:

"[previous stakeholder discussions] have generated the proposal that the Department of Health lead this process forward through wider stakeholder discussions. In this way, it is hoped that collective approach can be owned by a range of participants including EMF public concern groups and industrial interests on the need for a precautionary policy and what that might entail."

69. This led to the creation of the Stakeholder Advisory Group on ELF EMFs (SAGE). SAGE published its First Interim Assessment in April 2007 (SAGE 2007) (and subsequently a Second Interim Assessment, SAGE 2010, which is however not directly relevant to overhead lines). It made a number of recommendations for relatively low-cost precautionary measures that it considered to be in the best interests of society as a whole. It considered, but did not recommend, the option of introducing "corridors" round overhead lines whereby no new overhead lines would be permitted within specified distances of existing homes and no new homes would be permitted within the same specified distance of existing overhead lines. On 15 October 2007 the HPA provided a detailed response (HPA 2007) to the SAGE Assessment to Government, broadly endorsing the SAGE recommendations. On 16 October 2009, the Government gave its response to the SAGE recommendations in a Written Ministerial Statement (DH 2009).

70. In summary, Government decided that one precautionary measure would apply to high-voltage overhead lines, a measure relating to a design feature of some lines called "optimum phasing", but that other precautionary measures, notably "corridors" or minimum separations of overhead lines from properties, were not appropriate and would not apply. Phasing is considered in detail in Section 7.3.6.1 below, and separations between overhead lines and homes in Section 7.3.6.1 below.

71. For clarity, it is worth noting that Government's decisions about which precautionary measures to adopt and which not was based on consideration of childhood leukaemia only. This correctly reflected the authoritative scientific advice, e.g. the Health Protection Agency, advising the Government on SAGE's First Interim Assessment (HPA 2007), stated:

"The scientific evidence, as reviewed by HPA, supports the view that precautionary measures should address solely the possible association with childhood leukaemia and not other more speculative health effects."

7.3.2.5 Conclusions On EMF Guidelines In The UK

72. There is now a suite of documents (the Written Ministerial Statement; the two Codes of Practice; and the National Policy Statement) that sets out clearly Government policy on EMFs, including, specifically, as it affects new overhead lines. The policy applies to the whole UK including Northern Ireland. The policy is based on sound scientific advice, primarily from the body with the legal responsibility for giving such advice in the UK, the Health Protection Agency, but taking account of other scientific advice as well. As is discussed in Section 7.3.6 below, the policy takes full account of the acknowledged lack of certainty in the science; it explicitly encompasses application of the precautionary principle and is consistent with the European Commission Communication on the Precautionary Principle (EU 2000); it includes those precautionary measures that have been judged appropriate (in the context of overhead lines, optimum phasing), and excludes those that have been judged not appropriate (in the context of

overhead lines, minimum distances between homes and overhead lines, or undergrounding solely on EMF grounds). It is completely in line with the recommendations of the World Health Organization (WHO 2007). And it sets out what will be regarded as appropriate evidence of compliance with the policy when such evidence is required.

73. NIE considers that the policy of compliance with internationally set exposure limits plus any precautionary measures that are judged proportionate to the scientific evidence, is in fact the correct one. Any decision as to whether it is acceptable to build overhead lines or not has to be made in the overall interests of society, so cannot be made by any one party, be that industry or people living near a proposed route. The decision has to be made by Government acting democratically and accountably on behalf of the whole of society. That is exactly what has happened in the UK through the process of setting exposure limits and deciding on additional precautionary measures.

74. However, regardless of whether NIE agreed with the policy or not, the fact that the policy has been set means that the appropriate test for any proposed new overhead line is simply whether it complies with the policy or not.

75. The Department of Health, Social Services and Public Safety endorsed the approach taken, advising that recent policy developments had been reflected in the EMF section of the 2009 Environmental Statement. The Public Health Agency commented on the 2009 Environmental Statement (see Chapter 6 of this ES and Appendix 6A):

> *"Upon review, the document does appear to provide a balanced review of the presently known information and evidence regarding electric fields. I particularly note the statement in chapter 7, paragraph 1 that "the Proposed Development will comply with ICNIRP&EU guidelines on exposure of the general public" (electromagnetic fields)".*

7.3.2.6 Comparison Of UK Policy With Policy In Other Countries

76. Across the world, countries have a variety of EMF policies. Compilations of EMF policies in various countries are maintained by the electricity industry[122] and by the WHO[123].

77. Many countries appear to set no exposure limits. Some base their limits, as the UK does, on ICNIRP 1998. Some have adopted additional precautionary policies, as the UK has. A few have adopted quantitative limits significantly lower than ICNIRP 1998.

78. NIE is satisfied that the UK's policies remain based on current scientific advice. No country that has adopted more onerous limits or policies has done so because of new scientific evidence that has not been taken account of in the UK. If any significant new scientific evidence emerged, NIE is confident that this would be recognised by HPA or its successors and other scientific advisory bodies, who would draw it to the attention of the UK Government.

79. However, every country sets its own policy in the light of its own circumstances and priorities. In those few countries that have adopted markedly different EMF policies, there may be legitimate factors at play in those specific countries that have led them to do this. The correct policy for NIE to follow is the UK policy, not the policy in any other country.

80. The European Parliament (EU 2009a) and the Council of Europe (2011) have both passed resolutions concerning EMFs, broadly calling for more precautionary approaches. Also of relevance is the European Commission response (EU 2009b) to the Parliament resolution, broadly justifying the present approach.

81. There is a process in Europe for setting policy for public exposure to EMFs. It culminates in adopting a Recommendation. UK policy on EMFs, with which this overhead line complies, is set so as to implement the current (1999) Recommendation. If, as a result of processes involving the Parliament, the Commission, and the Council, and any other European institutions, that Recommendation changes,

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[122] http://www.emfs.info/Related+Issues/limits/world/other/

[123] http://www.who.int/docstore/peh-emf/EMFStandards/who-0102/Worldmap5.htm

then no doubt the UK Government will reflect that change. Unless and until that happens, it is appropriate to follow current policy, not aspirations by one party or another to change that policy, which may or may not result in any change.

7.3.3 Assessment Of Compliance With Guidelines

7.3.3.1 Compliance Of The Overhead Line

82. The peak electric field of 7.9kV/m in Illustration 7.2 and Table 7.2 occurs underneath the Tyrone - Cavan 400kV line. Although this is more than the ICNIRP reference level, therefore triggering the second stage of investigation of compliance as specified by the HPA, it is less than the field corresponding to the basic restriction, 9kV/m. Therefore the electric fields produced by this line comply with the ICNIRP guidelines and hence with Government policy. At 50m from the line centre the electric field is 0.20kV/m which is approximately 2% of the field corresponding to the ICNIRP basic restriction of 9kV/m or 4% of the reference level of 5kV/m.

83. The theoretical maximum magnetic field underneath the 400kV line is 47.9µT (Illustration 7.3 and Table 7.2). This is less than the ICNIRP reference level and less than 15% of the field corresponding to the basic restriction and therefore the magnetic field complies with the ICNIRP guidelines and with Government policy. It is also less than the magnetic fields encountered close to some common household electrical appliances. At 50m from the line centre the magnetic field is 3.05µT, which is approximately 1% of the field corresponding to the ICNIRP basic restriction of 360µT or 3% of the reference level of 100µT, and is comparable with the levels produced by everyday office and domestic electrical appliances.

84. As explained in Section 7.3.2.2 above, the public exposure limits apply only to certain land uses. But in fact, the fields produced by the 400kV overhead line are compliant with the guidelines regardless of land use. This is discussed further in Section 7.3.5.3 below.

7.3.3.2 Compliance Of The Substation

85. Section 7.3.1.3 above concluded that the fields from the proposed substation were likely to be smaller than those from the overhead line. Therefore, as the overhead line is compliant, the substation will also be compliant with the guideline levels.

86. The Code of Practice on Compliance (DECC 2012a) confirms this, spelling out explicitly that there are certain classes of equipment which inherently produce fields below the guideline levels, and can therefore be assumed to comply without producing case-by-case specific assessments of the field. Substations are one such type of equipment:

> *“The Energy Networks Association will maintain a publicly-available list on its website of types of equipment where the design is such that it is not capable of exceeding the ICNIRP exposure guidelines, with evidence as to why this is the case. Such types of equipment are likely to include:*
>
> *• overhead power lines at voltages up to and including 132kV*
>
> *• underground cables at voltages up to and including 132kV*
>
> *• substations at and beyond the publicly accessible perimeter*
>
> *Compliance with exposure guidelines for such equipment will be assumed unless evidence is brought to the contrary in specific cases.”*

87. The publicly available list referred to can be found on the EMFS.info site[124]. This confirms that the substation (which does not contain a static var compensator) is within the class of equipment which are regarded as inherently compliant without the need for case-by-case specific assessments.

7.3.4 Changes From Previous Environmental Statement

88. The previous Environmental Statement included calculations of the electric and magnetic fields for, broadly speaking, the conditions that could be applied continuously that give rise to the highest fields, that is, the conditions that are most onerous for compliance. Specifically, the electric field was assessed, not for the nominal voltage 400kV, but for the maximum permitted continuous voltage, 5% higher, 420kV. Subsequently, the Code of Practice has specified that the assessment of compliance should be performed for the nominal voltage, 400kV. Thus, in this respect, the original Environmental Statement performed a more onerous test of compliance than is actually required, and the Proposed Development was still compliant using this more onerous test.

89. The calculations in the previous Environmental Statement used clearances of 9.17m for the minimum clearance and 10.48m for the indicative typical clearance. To allow for tolerances and location-specific adjustments, NIE has decided it would be more cautious to assess compliance for slightly lower values of 9m and 10.2m respectively. Using these values gives slightly higher maximum fields, and, as demonstrated in Section 7.3.3.1 above, these maximum fields are still compliant with the relevant exposure guidelines.

7.3.5 Other Issues Relating To Quantitative Exposure Guidelines

7.3.5.1 Nearby Properties

90. Section 7.3.3.1 above shows that the proposed line is compliant with the relevant exposure guidelines, even directly under the line. There is no minimum lateral distance from the line required in order to achieve compliance. In principle, subject to maintaining the relevant high-voltage safety clearance distances (which principally relate to the vertical clearance of the line above the ground), a home could be constructed directly underneath the line and it would be compliant with the guidelines.

91. The assessment of compliance is not dependent on the exact location of the nearest existing residential property to the line, or the nearest putative property already granted planning permission, or the nearest property that might in future be granted planning permission, because the field from the line is compliant everywhere, not just compliant outside some specified distance.

92. Section 7.3.1.2 includes assessments of the field at various distances to the side of the line. That is provided by way of useful illustration of how rapidly fields fall with distance from the overhead line, but does not form part of the demonstration of compliance. This is spelled out in the Code of Practice on Compliance (DECC 2012a), which specifies:

> *"…the following will be provided:*
>
> *• A calculation or measurement of the maximum fields (i.e. directly under the line, or directly above the cable)*
>
> *If this maximum value is less than the ICNIRP guideline levels, it may be assumed that all fields and exposures from that source will be compliant. If this maximum value exceeds the ICNIRP guideline levels, then it is also necessary to provide:*
>
> *• A calculation or measurement of the field at the location of the closest property at which the public exposure guidelines apply" (p5)*

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124 http://www.emfs.info/Related+Issues/limits/UK/Compliance/ and links from it e.g. http://www.emfs.info/Related+Issues/limits/UK/Compliance/substations.htm

7.3.5.2 Occupational Exposure

93. The ICNIRP guidelines for occupational exposure are higher than the guidelines for public exposure, by, broadly, a factor of five. Therefore all occupational activities will also be compliant with the relevant guidelines.

94. The occupational guidelines do not yet have a clear paper trail of implementation in the way that the public exposure guidelines do. It is anticipated that occupational limits (based on ICNIRP 2010 rather than ICNIRP 1998, see section 7.3.5.6 below) will acquire legal force through an EU Directive expected to be adopted in Europe in 2013 and subsequently brought into force in the UK by Regulation. The present situation is that they have force through the Health and Safety Executive's endorsement of them.

95. Employers have a duty of care. Employers discharge that duty of care in relation to EMFs by complying with the relevant exposure limits. As long as the employer complies with the exposure limits, there should be no grounds for any action against an employer. All exposures from the Proposed Development will be compliant with the occupational exposure limits; an employer need take no additional action in order to comply.

7.3.5.3 Transient Exposure

96. It is likely that people might pass under the overhead line, or spend time for example at chapel or chapel, school or playing sports in the vicinity of the overhead line, potentially many times each day.

97. This draws attention to the fact that most exposure to the fields closest to the line will be transient rather than continuous. As the fields from the line are everywhere below the fields specified in the exposure guidelines, such transient exposure is still compliant. In fact, however, the 1999 EU Recommendation specifies that the exposure limits for the general public should apply where the time of exposure is significant. The Code of Practice on Compliance provides a definition for the concept of "significant time", in terms of Use Classes as used for development control.

98. In all other areas, the occupational guidelines apply. Therefore, although transient exposure whilst passing under the overhead line is in fact compliant with the general public limits, it is only required to be compliant with the higher occupational limits.

99. Having established that all exposures from the overhead line are compliant with the exposure guidelines, regardless of distance from the line, it is of course true that most people receive the majority of their exposure in their homes. Transient exposure, passing under the overhead lines, even daily or several times per day, will very rarely be for sufficient duration to make a substantial difference to the average exposure of the person. The majority of exposure will occur in homes well to the sides of the line, where the fields are lower. This provides extra reassurance, as noted by the Public Health Agency (see Appendix 6A):

> *"I also note that the proposed route will, at its closest point, be at least 75 metres from the nearest dwelling. Assuming the Interconnector is appropriately maintained and serviced, field strength levels at these nearest dwellings should be considerably less than the internationally acknowledged reference levels (i.e. less than 1%). Based on upon the available information and evidence at our disposal this provides considerable reassurance in terms of safeguarding public health."*

100. Note that this statement refers to the distance of the closest dwelling identified in the first Environmental Statement, 75m from the centreline. The closest dwelling now identified is slightly closer, at 54 m from the centreline. The exposures at this dwelling remain compliant. This change does not alter the conclusion that the fields at the nearest dwelling are "considerably less than" the reference levels. As explained in section 7.3.3.1 above, the fields at 50m are just a few percent of the guideline levels.

7.3.5.4 Exposure Limits In Relation To Sensitive Subgroups Of The Population

101. The exposure guidelines are not intended to cover any effects of EMFs on Active Implanted Medical Devices. This issue is considered separately in Section 7.4.5 below.

102. It is worth noting that it is the occupational exposure limits rather than the public limits that are set at a level considered appropriate to provide protection for the population in general. The reason the public exposure limits are then set an additional factor of five lower is in part because the general public may include individuals with greater sensitivities, for example because they have epilepsy or are taking certain medications (ICNIRP (1998) p508 bottom of first column, NRPB (2004a) para 93). Thus the public exposure limits incorporate a considerable degree of caution. The EU Recommendation 1999 states:

> *"However, since there are safety factors of about 50 between the threshold values for acute effects and the basis restrictions, this recommendation implicitly covers possible long-term effects in the whole frequency range."*

103. There is understandable concern about whether some people, perhaps with existing medical conditions or pregnant women or unborn children, might be more sensitive to any effects of EMFs. However, none of the authoritative review bodies have identified evidence that shows that there is any condition that creates any sensitivity to effects of EMFs at levels below the guideline levels, with the possible exception as already mentioned of people with Active Implanted Medical Devices. The bodies setting exposure guidelines have already built in what, in their expert judgement and study of the scientific literature, is the appropriate level of protection for the general public, taking account of individuals with greater sensitivities where there is scientific evidence to support that.

7.3.5.5 Future Uprating Of The Proposed Overhead Line

104. Compliance with the exposure guidelines has been assessed on the basis of the maximum continuous rating of the line, 1500MVA, in accordance with the Code of Practice. This represents the maximum capacity of the conductors that can be installed as part of the Proposed Development.

7.3.5.6 New ICNIRP Guidelines

105. As discussed, current Government policy is based on the limits from the 1998 ICNIRP Guidelines, as set out in the 1999 EU Recommendation. In 2010, ICNIRP published new exposure guidelines (ICNIRP 2010) for the range of frequencies including power frequencies (the original Environmental Statement referred to a draft version of these guidelines in 7.4.2). These new guidelines do not apply in the UK unless and until Government decide to adopt them. This is spelled out in the Code of Practice:

> *"Current Government policy on electric and magnetic fields (EMFs) is that power lines should comply with the 1998 ICNIRP Guidelines on exposure to EMFs in the terms of the 1999 EU Recommendation, and this Code of Practice implements this policy. As and when either ICNIRP issue new Guidelines or the EU revise the Recommendation, it will be for Government to consider those changes and to decide whether to adopt them or not. If Government policy changes, this Code of Practice will also be changed accordingly, but until that happens, the present policy as reflected in this Code of Practice remains in force."*

106. In fact, ICNIRP's intention in its new guidelines does not appear to be to make the guidelines either more or less onerous. It takes account of the most recent scientific developments. But having done so, the key scientific effects used as the basis for the guideline levels are essentially unchanged, and the safety margins applied are broadly unchanged. The detailed values derived as basic restrictions and reference levels have changed, but this is principally a consequence of a different method of derivation, without representing any change in scientific thinking about the appropriate level of protection.

107. To apply the ICNIRP guidelines in practice, it is necessary to use numerical dosimetric modelling, that is, to create a mathematical model of the body and to use it to perform quite complicated theoretical calculations of the size of the fields or currents induced in the various tissues by the externally applied fields. For the 1998 Guidelines, HPA's advice, which was accepted by Government and incorporated in the Code of Practice, was that the correct modelling to use was that of Dimbylow (1998-2005), along with certain basic assumptions. Applying the same modelling and the same assumptions to the ICNIRP 2010 Guidelines, those Guidelines correspond to fields of 9.9kV/m and 606µT (though by analogy with their treatment of ICNIRP 1998, HPA or its successors might decide to round these values down). Thus, although ICNIRP 2010 does not apply in the UK, NIE's assessment is that the overhead line would in fact be compliant with those Guidelines were they ever to be introduced.

108. More generally, the acceptability of the Proposed Development can be decided only on the basis of the present policy position as set out in the exposure limits and other policies, not on the basis of any speculation as to what future policy may be.

7.3.6 Compliance With Precautionary Policies

7.3.6.1 Compliance With Policy On Phasing

109. The Written Ministerial Statement of 2009 (DH 2009) introduced a policy of optimum phasing of overhead lines. This was subsequently given practical implementation through the Code of Practice (DECC 2012b).

110. Optimum phasing applies only to double-circuit overhead lines, not to single circuit overhead lines, the type of line proposed here. The Code of Practice states:

> *"This Voluntary Code of Practice sets out key principles for the electricity industry to undertake optimum phasing (defined in more detail below) of all new high voltage (132 kV and above) double-circuit power lines…" (p2)*
>
> *"Many power lines carry two separate electrical circuits, one each side of the tower (some power lines have only a single circuit and phasing is not relevant for these lines)." (p3)*

111. The Code of Practice also states:

> *"…the electricity industry will agree to … design and construct new high voltage power lines to include optimum phasing, unless this is unreasonable" (p5)*

112. It goes on to specify tests for what is "reasonable" and "unreasonable", stating that it is normally reasonable to achieve optimum phasing where this can be done solely by reconfiguring the order of connecting wires, but it is normally unreasonable where it requires new structures. It also offers a cost-benefit test for reasonableness if required.

113. The requirement for this Interconnection circuit could be met either by a single-circuit 400kV line, or by a double-circuit 275kV line. Designs for both were considered at the design stage. The single-circuit 400kV design was chosen because it has a lower visual impact and lower cost. To construct the overhead line as a double-circuit line instead of a single-circuit line, solely in order to be able to construct it with optimum phasing, would require every support structure to be significantly higher in order to accommodate the additional circuits and would therefore entail a markedly increased visual impact and a greater cost. It would clearly not be "reasonable" in the context of the SAGE Recommendation and is therefore not required by the policy on optimum phasing. The proposed line is therefore compliant with that policy.

114. It is correct that the fields from the line will fall off not quite as rapidly with distance as they would do if it were a double-circuit line with optimum phasing. However, the fields in either case are completely compliant with the exposure guidelines.

7.3.6.2 Suggestions Of Various Distances To Be Maintained From Overhead Lines

115. As discussed in Section 7.3.2.4 above, the question of possible precautionary measures in addition to the quantitative exposure guidelines was addressed through the Stakeholder Advisory Group on ELF EMFs (SAGE). SAGE published its First Interim Assessment in April 2007 (SAGE 2007). It made a number of recommendations for relatively low-cost precautionary measures that it considered to be in the best interests of society as a whole. It considered, but did not recommend, the option of introducing "corridors" round overhead lines whereby no new overhead lines would be permitted within specified distances of existing homes and no new homes would be permitted within the same specified distance of existing overhead lines. On 15 October 2007 the HPA provided a detailed response (HPA 2007) to the SAGE Assessment to Government, broadly endorsing the SAGE recommendations. On 16 October 2009, the Government gave its response to the SAGE recommendations in a Written Ministerial Statement (DH 2009).

116. This made clear that "corridors" are not appropriate in the UK:

> *"4. However SAGE's cost benefit analysis does not support the option of creating corridors around power lines on health grounds. The Government therefore considers this additional option to be disproportionate in the light of the evidence base on the potential health risks arising from exposure to ELF/EMF and has no plans to take forward this action."*

117. Having established that "corridors" are not part of national policy, the Statement also makes it clear that they should not be introduced locally either:

> *"37. The Government has considered the HPA's advice on this matter, and acknowledge that the public, local planning authorities and the electricity industry need clarity and assurance about how electric and magnetic fields should be dealt with when new power lines or development near existing power lines is proposed.*
>
> *38. It is central Government's responsibility (rather than individual local authorities) to determine what national measures are necessary to protect public health. In the absence of established scientific advice on how to address these issues, Government will consider how to encourage decision makers to take a consistent approach in relation to ELF EMF issues when assessing planning applications for residential development near to power lines. "*

118. Discussions of EMFs sometimes refer to particular distances from overhead lines which, it is suggested, correspond to safety limits, or to restrictions on developments.

119. It is not always clear where a particular figure comes from. However, NIE assumes the following origins:

- 60m was a figure used by SAGE, derived as the average distance for the magnetic field from 275kV and 400kV overhead lines in England and Wales to fall to 0.4µT;
- 200m was an intermediate cutpoint used in the analysis of a scientific study Draper et al 2005 (see Section 7.4.3.7 below);
- 200m and 400m are distances used in part of Austria and in relation to specific overhead lines in Germany (see links to documents at http://www.emfs.info/Related+Issues/limits/world/source.htm) as a trigger for placing the line underground, though this is not, as far as NIE is aware, on EMF grounds;
- 500m has been mentioned but NIE is not aware of any obvious source for this figure; and
- 600m was the furthest cutpoint used in the analysis of Draper et al 2005 (it was derived as the furthest distance at which the field from an overhead line could plausibly fall to 0.1µT, 400m, plus an arbitrary margin of 200 m).

120. Regardless of the origin of each figure, none of these have any basis in relation to setting restrictions on overhead lines in the UK. SAGE considered the option of setting a distance restriction between overhead lines and homes. It did not recommend any such restriction, but did offer it to Government as an option for consideration, and suggested that the appropriate distance, were a restriction to be introduced, would be 60m for 275kV and 400kV lines. Government rejected that option in the Written Ministerial Statement. The only EMF restriction relevant to homes close to overhead lines is compliance with the exposure guidelines, and as already explained, the proposed overhead line will be compliant everywhere, not just beyond some certain distance.

7.3.7 EMFs In Relation To Alternative Options

7.3.7.1 Undergrounding

121. Underground cables produce no external electric field, but they do still produce magnetic fields. With an underground cable, the conductors are closer together than for an overhead line, leading to greater cancellation of the fields produced by each conductor, and, distance for distance, a lower resultant field. However, underground cables are usually buried around 1m below ground, whereas the proposed overhead line has its lowest conductors 9m or more above ground. This means it is possible to approach the conductors of the underground cable more closely, resulting in a larger field. The overall result of these two factors is that in many circumstances, directly above the route at 1m above ground level, the magnetic field from an underground cable will be higher than from the equivalent overhead line, but it falls more rapidly with distance and is lower to the sides of the route.

122. This is true for typical installations. If, however, the underground cable is buried more deeply, or its conductors placed even more closely together than is normal, or the load split between more than one group of cables separated horizontally, then the field directly above the underground cable may not be as high as that from the overhead line. Conversely, if the cable is not buried as deeply, or the assessment is, contrary to the Code of Practice, performed for a height lower than 1m above ground, the field from the cable would tend to come out as significantly higher than the overhead line. In any event, well to the sides of the route, the underground cable always produces lower magnetic fields than the equivalent overhead line.

123. The ASKON Report (2008) presents graphs showing a situation where the magnetic field from the underground cable, even directly above the route, is less than that from the overhead line. NIE considers that this is because the underground cable is buried slightly more deeply than would be standard, and the load is split between two groups of conductors horizontally separated.

124. NIE does not consider that there is any special significance in whether the maximum field is higher from the underground cable or the overhead line, given that both comply with the exposure guidelines. (NIE notes that the ASKON report asserts or implies that the appropriate limits are 5kV/m and 100µT, which is not correct, and implies that the Swiss 1µT limit has validity in the UK, which is also not correct.)

125. For an underground cable, just as for an overhead line, the actual magnetic field produced depends on the detailed geometry of the conductors, depth of burial (equivalent to the height above ground for an overhead line), etc. It is not possible to calculate the actual magnetic field that would be produced by an underground cable until these details are fixed. However, the electricity industry maintains generic calculations for typical underground cables on its website[125].

126. Just as for overhead lines, any proposal for the installation of underground cables would ensure that the fields they produce would be completely compliant with the Government policy, including specifically with the relevant exposure guidelines.

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[125] http://www.emfs.info/Sources+of+EMFs/Underground/, including various links to other pages, specifically http://www.emfs.info/Sources+of+EMFs/Overhead+power+lines/specific/400+kV+underground+magnetic.htm

127. SAGE considered undergrounding as a precautionary measure to reduce EMFs but did not recommend it. The National Policy Statement EN-5 (DECC 2011) states:

> *"2.10.12 Undergrounding of a line would reduce the level of EMFs experienced, but high magnetic field levels may still occur immediately above the cable. It is not the Government's policy that power lines should be undergrounded solely for the purpose of reducing exposure to EMFs. Although there may be circumstances where the costs of undergrounding are justified for a particular development, this is unlikely to be on the basis of EMF exposure alone, for which there are likely to be more cost-efficient mitigation measures."*

7.3.7.2 Other Mitigation Options

128. The WHO EMF Task Group which published an Environmental Health Criteria (EHC) monograph in June 2007 (WHO 2007) commented on the costs of precautionary approaches to limiting ELF EMF exposure. The Task Group noted that:

> *"electric power brings obvious health, social and economic benefits, and precautionary approaches should not compromise these benefits. Furthermore, given both the weakness of the evidence for a link between exposure to ELF magnetic fields and childhood leukaemia, and the limited impact on public health if there is a link, the benefits of exposure reduction on health are unclear. Thus the costs of precautionary measures should be very low."*

129. The WHO EMF EHC stated that:

> *"…it is not recommended that the limit values in exposure guidelines be reduced to some arbitrary level in the name of precaution. Such practice undermines the scientific foundation on which the limits are based..."*

130. The WHO EMF EHC recommended that the

> *"best source of guidance for both exposure levels and the principles of scientific review are the international guidelines."*

131. The Written Ministerial Statement of October 2009 (DH 2009), giving the Government's response to the recommendations of SAGE, provides the definitive verdict on the application of precautionary measures in the UK. As discussed above, the UK policy for overhead lines consists of compliance with the 1998 ICNIRP exposure guidelines in the terms of the 1999 EU Recommendation; optimum phasing of certain overhead lines in specified circumstances (which does not apply to this line); but no other precautionary measures, and specifically no introduction of "corridors" round overhead lines.

132. NIE's standard route planning criteria, which comply with all authoritative international and national guidelines for ELF EMF exposure, generally seek to avoid heavily populated areas on visual and amenity grounds and the proposed line is routed as far from existing homes as is reasonably possible. The nearest existing residence is more than 50m from the centre of the proposed line.

133. The outcome of the SAGE process, culminating in the Written Ministerial Statement and the subsequent Codes of Practice, is a clear decision by Government as to what measures to limit EMFs are proportionate, and therefore adopted in the UK (compliance with exposure guidelines, and optimum phasing), and which are not proportionate and therefore are not adopted in the UK (all other measures, including, specifically, minimum distances between overhead lines and homes).

134. It is worth noting that SAGE considered a comprehensive range of possible measures:

- Restrictions on building of lines and homes in proximity to each other;
- Restrictions on use of buildings near overhead lines (e.g. restrictive covenants);
- Changing the routeing of overhead lines;
- Placing the overhead line underground;
- Building the overhead line higher;
- Building a compact overhead line that produces lower fields;
- Changing the phasing of an overhead line;
- Improving the balance between loads on a two-circuit overhead line;
- Screening the field where it is produced by the overhead line;
- Screening the field at the home; and,
- Radical changes to the nature of the electricity system such as local generation or direct-current transmission.

135. SAGE analysed the pros and cons of all these options and then conducted a type of analysis known as a dominance analysis. This looks at whether one option is more favourable than another; if it is, a decision can be made about the merits of the more favourable option, and if this option is rejected, then other, less favourable, options are unlikely to be adopted.

136. It was using this analysis process that SAGE identified restrictions on building lines and homes in proximity to each other as the "best available option" for reducing exposures further. SAGE did not recommend this option, but offered it to Government as an option. Government decided against adopting this option, as it was judged not to be in the overall interests of society. Therefore, by extension, all the other mitigation options, which are even less favourable than this option, are also rejected. (As explained in Section 7.3.7.1 above, undergrounding solely on EMF grounds has also been rejected explicitly.)

7.4 Scientific Evidence On EMFs

7.4.1 Summary Of The Current Scientific Position

7.4.1.1 Established Or "Acute" Effects

137. A power-frequency magnetic field induces a small current in a person exposed to it. In a magnetic field of strength 100µT, the total induced current could reach approximately 30 microamperes (µA). By contrast, the current required to light a typical small torch bulb is 100,000µA, and the smallest current which most people can perceive is around 500µA. Magnetic fields have no directly perceptible effects on the body.

138. A person standing in the electric field beneath a 400kV overhead line would have an alternating surface charge induced on their body and an associated alternating current induced within the body. The induced surface charge could interact with the electric field to cause vibration of body hair, although the vibration would generally be too feeble to notice. In a power-frequency electric field of about 9kV/m, the induced current in the body could reach approximately 120µA.

139. In certain circumstances, a person exposed to a high electric field could experience small spark discharges (microshocks) on touching other objects, producing a prickling sensation similar to that caused by the static discharges commonly experienced in dry atmospheric conditions after frictional

contact with a nylon carpet or car seat. Normally, any sensation is confined to the momentary spark discharge as contact is made or broken.

140. In its 2005 Information Sheet (HPA 2005), HPA state:

> *"…on the basis of the available evidence, the direct effects of microshocks on the body are not considered capable of producing lasting harm. The response to some extent will depend on the sensitivity of the individual. Although the possibility of microshocks cannot be ruled out, in field strengths up to about 5 kV m^{-1} they are unlikely to be painful to the majority of people."*

141. The Code of Practice on Compliance states:

> *"While indirect effects are more tangible [than direct effects] due to effects such as microshocks, they have historically given rise to less concerns than direct effects. For indirect effects, while the Guidelines give a cautionary reference level of 5 kV m^{-1} for the general public as a trigger to fuller assessment of compliance with the exposure guidelines, using that as a limit is not the most appropriate way of dealing with indirect effects. Rather, there is a suite of measures that may be called upon in particular situations, including provision of information, earthing, and screening, alongside limiting the field which should be used to reduce the risk to the public of indirect effects. In some situations, there may be no reasonable way of eliminating indirect effects, for instance where erecting screening would obstruct the intended use of the land. The approach to addressing indirect effects of electric fields will be the subject of a separate voluntary Code of Practice to be developed between the industry and the Health Protection Agency."*

142. The separate Code of Practice on Indirect Effects referred to has been drafted and, at the date of publication of this ES, was going through an approvals process within Government. Assuming it does not change significantly, it reinforces the message on indirect effects from the Code of Practice on Compliance quoted above, principally by expanding on the *"suite of measures that may be called upon in particular situations*", but does not significantly alter it.

7.4.1.2 Evidence For Effects At Lower Fields

143. Over the past 30 years it has been suggested that exposure to power-frequency magnetic or electric fields of the magnitude encountered in the environment could be linked with various health problems, ranging from headaches to Alzheimer's disease. The most persistent of these suggestions relates to childhood leukaemia.

144. A number of epidemiological studies, particularly in the United States and in Scandinavia, have suggested an association between the incidence of childhood cancers and the proximity of homes to power transmission and distribution wires or power-frequency magnetic-field strengths in the homes. Other studies, notably the world's largest ever study of its type, conducted in the UK during the 1990s and published in 1999, have failed to confirm such associations. No causal link has been established between cancer including childhood leukaemia, or any other disease and magnetic or electric fields and indeed there is no established mechanism by which these fields could cause or promote the disease.

7.4.2 Reviews Of The Science By Authoritative Bodies

7.4.2.1 The Nature And Relevance Of Scientific Reviews

145. The question of possible health effects of environmental power-frequency fields has been thoroughly reviewed in recent years by a number of national and international bodies. The principal such bodies that have authoritative relevance in the UK are the National Radiological Protection Board/Heath Protection Agency, the International Agency for Research on Cancer and the World Health Organization, and the official scientific advisory committee for the EU, SCENIHR, the Scientific Committee on Emerging and Newly Identified Health Risks.

146. In setting their guidelines, ICNIRP also performs its own reviews of the science. When Government forms EMF policy for the UK, it takes into account all relevant reviews of the science.

147. When assessing the scientific evidence on EMFs, it is essential to consider all the evidence and to perform an overall assessment of the evidence, weighting each strand of evidence and each individual study as appropriate to its strengths and weaknesses. No single study can ever be conclusive (in either direction).

148. Such reviews have been performed by the authoritative expert bodies, and it is those bodies that provide the most reliable conclusions, and on whose conclusions Government policy is based.

149. Some commentators present numbers of papers which it is suggested either do find or do not find health effects. Proper scientific judgements, as formed by the authoritative review bodies, certainly take account of numbers of papers, but are not based on simple counts. Rather, they take account of the weight to be attached to the various papers as well. That weight is best judged by a panel of expert scientists, from across a relevant range of disciplines, bringing their critical judgement to bear, informed by their collective experience of scientific research.

150. Concerns are sometimes expressed about specific individual health effects, and whether these are adequately taken account of. Health effects that are typically mentioned in this context include Alzheimer's disease, cancer in general, childhood leukaemia, adult leukaemia, breast cancer and thyroid cancer in particular, cystic fibrosis, depression, miscarriage, motor neurone disease, Parkinson's disease, sleep disturbance, and suicide (and also stress caused by concern about health effects, which is considered separately in Section 7.4.3.9 below), along with effects on DNA and the immune system that might influence multiple health outcomes. Other health effects have been investigated in the scientific literature. However, all of these (except possibly cystic fibrosis, presumably because no evidence was identified linking it to EMFs), and all other relevant health effects, have in fact been considered by the authoritative review bodies, and therefore taken account of in setting the present guidelines.

151. WHO, as an example of one of the authoritative review bodies that have conducted a comprehensive assessment, concluded (extracts from Chapter 1, Summary, of WHO 2007):

> *"A number of other diseases have been investigated for possible association with ELF magnetic field exposure. These include cancers in both children and adults, depression, suicide, reproductive dysfunction, developmental disorders, immunological modifications and neurological disease. The scientific evidence supporting a linkage between ELF magnetic fields and any of these diseases is much weaker than for childhood leukaemia and in some cases (for example, for cardiovascular disease or breast cancer) the evidence is sufficient to give confidence that magnetic fields do not cause the disease."*

152. The authoritative review bodies are tasked with reaching a conclusion as to whether there are health effects or not. To do this they select the literature they consider relevant to examine. If there is relevant scientific evidence about a specific health effect, it will have been weighed by the review bodies. If the review bodies have not weighed a specific piece of scientific evidence, that can be taken as evidence that it is not sufficiently relevant.

153. One of the problems faced by scientists reviewing EMFs is that over the years, there have been a large number of studies that have reported finding that EMFs do cause effects, but which have then failed to stand up to replication. This has led to a quite correct reluctance to accept any single study as establishing health effects. Normal scientific process, which progresses by building up a solid and reproducible body of evidence, would lead to this conclusion anyway; the history of EMF research, with its unusually large number of studies that are not reproducible, makes it even more pertinent.

7.4.2.2 The NRPB and HPA

154. In a major review of the evidence for a possible association between exposure to power-frequency electric and magnetic fields and the incidence of cancer published in March 2001, the NRPB Advisory Group on Non-Ionising Radiation concluded (NRPB 2001a):

> *"Laboratory experiments have provided no good evidence that extremely low frequency electromagnetic fields are capable of producing cancer, nor do human epidemiological studies suggest that they cause cancer in general. There is, however, some epidemiological evidence that prolonged exposure to higher levels of power frequency magnetic fields is associated with a small risk of leukaemia in children. In practice, such levels of exposure are seldom encountered by the general public in the UK. In the absence of clear evidence of a carcinogenic effect in adults, or of a plausible explanation from experiments on animals or isolated cells, the epidemiological evidence is currently not strong enough to justify a firm conclusion that such fields cause leukaemia in children. Unless, however, further research indicates that the finding is due to chance or some currently unrecognised artefact, the possibility remains that intense and prolonged exposures to magnetic fields can increase the risk of leukaemia in children."*

155. The context of the report makes clear that "prolonged exposure to higher levels of power frequency magnetic fields" and "intense and prolonged exposures to magnetic fields" refer to magnetic fields, in the home and often specifically in the child's bedroom, assessed in epidemiological studies as having average values over 24 hours or longer of 0.4µT or greater. The figure of 0.4µT arises because it is a cutpoint that has been used in certain analyses of epidemiological studies. However, it would be wrong to regard 0.4µT as a precise threshold above which there is a possibility of a risk and below which there is no possibility of a risk.

156. In November 2001 the NRPB's Advisory Group published a further report on electromagnetic fields and neurodegenerative disease (NRPB 2001b). The conclusion was:

> *"There is no good ground for thinking that exposure to extremely low frequency electromagnetic fields can cause Parkinson's disease and only very weak evidence to suggest it could cause Alzheimer's disease. The evidence that people employed in electrical occupations have an increased risk of developing amyotrophic lateral sclerosis is substantially stronger, but this could be because they run an increased risk of having an electric shock rather than any effect of long-term exposure to the fields per se."*

157. Although the various reports of the NRPB Advisory Group concentrate on cancer and neurodegenerative disease, the studies which the Board take into account when setting exposure guidelines include other suggested health effects.

158. In 2004 the NRPB published new "Advice on Limiting Exposure to Electromagnetic Fields (0-300GHz)" (NRPB 2004a) and accompanied it with a "Review of the Scientific Evidence for Limiting Exposure to Electromagnetic Fields (0-300GHz)" (NRPB 2004b). The former summarises epidemiological evidence as follows (p15):

> *54 "In the view of NRPB, the epidemiological evidence that time-weighted average exposure to power frequency magnetic fields above 0.4 µT is associated with a small absolute raised risk of leukaemia in children is, at present, an observation for which there is no sound scientific explanation. There is no clear evidence of a carcinogenic effect of ELF EMFs in adults and no plausible biological explanation of the association that can be obtained from experiments with animals or from cellular and molecular studies. Alternative explanations for this epidemiological association are possible: for example, potential bias in the selection of control children with whom leukaemia cases were in some studies and chance variations resulting from small numbers of individuals affected. Thus any judgements developed on the assumption that the association is causal would be subject to a very high level of uncertainty.*
>
> *55 "Studies of occupational exposure to ELF EMFs do not provide strong evidence of associations with neurodegenerative diseases…..*

56 “Studies of suicide and depressive illness have given inconsistent results in relation to ELF EMF exposure, and evidence for a link with cardiovascular disease is weak.

57 “The overall evidence from studies of maternal exposure to ELF EMFs in the workplace does not indicate an association with adverse pregnancy outcomes, while studies of maternal exposure in the home are difficult to interpret.

58 “Results from studies of male fertility and of birth outcome and childhood cancer in relation to parental occupational exposure to ELF EMFs have been inconsistent and unconvincing.

59 “All these conclusions are consistent with those of AGNIR (2001).

60 “NRPB concludes that the results of epidemiological studies, taken individually or as collectively reviewed by expert groups, cannot currently be used as a basis for restrictions on exposure to EMFs.”

7.4.2.3 IARC

159. The International Agency for Research on Cancer (IARC) is an agency of the World Health Organization. Its Unit of Carcinogen Identification and Evaluation has, since 1972, periodically published Monographs, which assess the evidence that various agents are carcinogenic and classify the agents accordingly. In June 2001, a Working Group met to consider static and extremely-low-frequency electric and magnetic fields (IARC 2002). Power-frequency magnetic fields were classified as “possibly carcinogenic”, on the basis of “limited” evidence from humans concerning childhood leukaemia, “inadequate” evidence from humans concerning all other cancer types, and “inadequate” evidence from animals. Power-frequency electric fields were judged “not classifiable” on the basis of “inadequate” evidence from both humans and animals. These classifications are consistent with the conclusions reached by the NRPB and its Advisory Group.

7.4.2.4 WHO

160. The World Health Organization published an Environmental Health Criteria Monograph in 2007 on ELF EMFs (WHO 2007), produced by a Task Group that met in 2005. This concluded, in part:

“Chronic effects”

Scientific evidence suggesting that everyday, chronic low-intensity (above 0.3-0.4µT) power-frequency magnetic field exposure poses a health risk is based on epidemiological studies demonstrating a consistent pattern of increased risk for childhood leukaemia. Uncertainties in the hazard assessment include the role that control selection bias and exposure misclassification might have on the observed relationship between magnetic fields and childhood leukaemia. In addition, virtually all of the laboratory evidence and the mechanistic evidence fail to support a relationship between low-level ELF magnetic fields and changes in biological function or disease status. Thus, on balance, the evidence is not strong enough to be considered causal, but sufficiently strong to remain a concern.

A number of other diseases have been investigated for possible association with ELF magnetic field exposure. These include cancers in both children and adults, depression, suicide, reproductive dysfunction, developmental disorders, immunological modifications and neurological disease.

The scientific evidence supporting a linkage between ELF magnetic fields and any of these diseases is much weaker than for childhood leukaemia and in some cases (for example, for cardiovascular disease or breast cancer) the evidence is sufficient to give confidence that magnetic fields do not cause the disease.”

7.4.2.5 SCENIHR

161. SCENIHR is the European Union's Scientific Committee on Emerging and Newly Identified Health Risks. On January 19 2009 SCENIHR published its most recent report on EMFs, "Health Effects of Exposure to EMF" (SCENIHR 2009) (NIE understands that SCENIHR’s next report is expected to be published during 2013). The section of the abstract concerned with ELF fields states:

> *"The few new epidemiological and animal studies that have addressed ELF exposure and cancer do not change the previous assessment that ELF magnetic fields are a possible carcinogen and might contribute to an increase in childhood leukaemia. At present, in vitro studies did not provide a mechanistic explanation of this epidemiological finding.*
>
> *No new studies support a causal relationship between ELF fields and self-reported symptoms.*
>
> *New epidemiological studies indicate a possible increase in Alzheimer's disease arising from exposure to ELF. Further epidemiological and laboratory investigations of this observation are needed.*
>
> *Recent animal studies provided an indication for effects on the nervous system at flux densities from 0.10-1.0 mT. However, there are still inconsistencies in the data, and no definite conclusions can be drawn concerning human health effects.*
>
> *Very few recent in vitro studies have investigated effects from ELF fields on diseases other than cancer and those available have very little relevance. There is a need for hypothesis-based in vitro studies to examine specific diseases.*
>
> *It is notable that in vivo and in vitro studies show effects at exposure levels (from 0.10 mT and above) to ELF fields that are considerably higher than the levels encountered in the epidemiological studies (µT-levels) which showed an association between exposure and diseases such as childhood leukaemia and Alzheimer's disease. This warrants further investigation."*

7.4.3 Other Issues Relating To The Science Of EMFs

7.4.3.1 Other Reviews Of The Science

162. In May 2002 the California Department of Health Services published a Risk Evaluation (California 2002) on EMFs written by three of its scientists, and in August 2007 an ad-hoc group of scientists, drawn together for the purpose, published the "Bioinitiative Report" (Bioinitiative 2007). In both cases the conclusions reached appear to be inconsistent with those reached by, for example, the NRPB, its Advisory Group, and IARC and WHO. The authoritative reviews of the science remain those by NRPB/HPA, IARC and WHO, and SCENIHR. The UK Government as advised by the HPA maintains the position that the ICNIRP guidelines in the terms of the EU Recommendation of 1999 remains the most appropriate for application within the UK.

163. In particular, both these reports had been published well before the Written Ministerial Statement of 2009, and therefore it was open to the Government to give whatever weight they wished to them; they appear not to have given them (or indeed any other alternative reviews of the science) any weight.

164. NIE understands that Bioinitiative has rebranded itself as the “International Commission on Electromagnetic Safety”, but this does not give it any greater status or authority.

7.4.3.2 Uncertainty In The Scientific Evidence

165. There is undoubtedly some uncertainty in the scientific evidence concerning EMFs. This is recognised by NIE along with all the authoritative review bodies. NIE, along with the rest of the UK electricity industry, supports high-quality, independent research aimed at reducing the uncertainty and finding out the truth about this issue.

166. To set the uncertainty in context, it is worth reiterating that the 2001 IARC classification of power-frequency magnetic fields, confirmed by WHO in 2007, was as “possibly carcinogenic”. This is a lower classification than either “is carcinogenic” or “probably carcinogenic”, though higher than “not classifiable” or “probably not carcinogenic”. That classification derives from the evidence on childhood leukaemia; WHO concluded that the evidence for any other health effects was “much weaker”.

167. It is precisely because there is some uncertainty in the science that it is important that an authoritative body robustly consider the appropriate policy response to it. That has been done in the UK through the SAGE process, which arose from initiatives taken by the UK electricity industry of which NIE was part, and which the electricity industry part-funded and supported throughout. This resulted in the clear UK policy of October 2009 and the subsequent Codes of Practice. The UK policy, which NIE is following, is set in the full recognition of the uncertainties in the science, as the appropriate response to those uncertainties. It already includes the appropriate precautionary measures.

7.4.3.3 Comparisons Of EMFs To Other Issues

168. In the past, other health issues have moved from a similar assessment to that currently applying to EMFs (“possibly” a health risk) to become established, and it is understandable if there is concern that the same thing could happen to EMFs.

169. One specific example is tobacco and lung cancer (and other diseases). But the situations are different. There has been intensive scientific research of the EMF issue for thirty years without establishing a risk. It is extremely unlikely that there could be a risk even approaching the size of the smoking risk and it should not have been discovered yet. The analogy would be valid if there had been intensive research, including animal tests and epidemiological studies, of, specifically, smoking and lung cancer, for thirty years without establishing any risk. That was not the case. Further, the rise in smoking was accompanied by an increase in lung-cancer rates. By contrast, western societies have been using electricity for well over a century with no corresponding increase in childhood leukaemia rates (Kheifets et al 2006).

7.4.3.4 Why The Evidence on Causation of Childhood Leukaemia Is Not Regarded As Conclusive

170. The epidemiological evidence suggesting a risk for childhood leukaemia is stronger than that for any other health effect. But the relevant authoritative review bodies do not regard the evidence even on childhood leukaemia as establishing causation. For the purposes of this ES, it is sufficient to note that fact; the reasons why are secondary.

171. However, NIE’s understanding of what lies behind this judgement is:

172. Firstly, however strong the epidemiology is or is not, it is unsupported by the laboratory evidence, which is largely negative, and no plausible mechanism has been identified; and

173. Secondly, in the expert judgement of epidemiologists who are very familiar with the workings of epidemiology, “bias” and “confounding” have not been excluded and remain credible possible explanations. Bias is when some aspect of the design of a study makes it systematically prone to producing a distorted result. Confounding is when the health effect detected by a study is real, but is not caused by the agent under investigation but by some other agent that happens to vary in the same way, so that people are exposed to both agents at once. There is in fact evidence that bias operates in at least some of the studies.

7.4.3.5 Taking Account Of New Scientific Studies

174. When new scientific studies are published, an assessment is made by authoritative bodies such as HPA, SCENIHR, and WHO as to the weight to be attached to it and how, if at all, it affects the overall assessment of EMFs. Often, that assessment of an individual paper is made when the body concerned next schedules a comprehensive review of the whole body of literature (as SCENIHR, for example, do roughly every two or three years). However, any of those bodies are able to respond straight away to

any paper they consider significant enough, as HPA in particular have done on several occasions. Thus, there is no realistic possibility of the scientific assessment of EMFs having changed significantly without that having been recognised by the authoritative bodies.

175. An example of developing scientific understanding is the subject of how some animals, birds and fish use the earth's static magnetic field for navigation. NIE understands that this is an area where considerable scientific progress is being made. However, none of the authoritative review bodies have considered this body of knowledge to be relevant to their assessments of the possible effects of alternating, power-frequency fields on humans. Presumably this is because the former relates to static fields and the latter to alternating fields, and in the expert judgement of the review groups, effects established for the one are not relevant to the other. If the understanding of navigation developed to the point where there was a cross-over from static to alternating fields, NIE is confident that the review bodies would recognise this. None has done so to date.

7.4.3.6 The "Huss et al" Study

176. An example of the treatment of a new scientific study is a study by Huss et al (2008) of mortality from Alzheimer's disease and overhead lines in Switzerland.

177. This study finds an association with proximity to overhead lines, which is a potentially significant finding. It has some strengths, notably its internal consistency. It also has some weaknesses, for example being based on mortality rather than incidence (the significance of this being that information recorded on cause of death does not always consistently identify the presence of Alzheimer's disease). Importantly, it is the first study of its type to find such an effect. HPA have not considered it significant enough to issue a specific commentary on it, let alone to change their advice as a result. SCENIHR, however, have considered it, concluding (SCENIHR 2009):

> *"Some new Swiss data that were published after the previous opinion seem to support the previous notion that Alzheimer's disease indeed might be linked to exposure to ELF."*

178. and

> *"New epidemiological studies indicate a possible increase in Alzheimer's disease arising from exposure to ELF. Further epidemiological and laboratory investigations of this observation are needed.".*

179. Thus, the authoritative view of this study is not that in itself it leads to a conclusion that overhead lines are a cause of Alzheimer's disease, or that in itself it justifies regulatory action, but that further epidemiological and laboratory investigations are needed. NIE recognises that studies such as this cause concern and must be taken seriously, and, as part of the UK electricity industry, is looking for ways to support further research into this issue.

7.4.3.7 The "Draper" Study

180. In June 2005, a new epidemiological study was published in the British Medical Journal, looking at childhood cancer in England and Wales in relation to proximity of birth domicile to transmission lines (Draper 2005). The study was conducted by the Childhood Cancer Research Group at the University of Oxford, with collaboration from the electricity industry through National Grid.

181. The study finds no increased risks for central nervous system, brain or "other" tumours, but does find an increase in childhood-leukaemia rates near overhead lines. The increase is approximately 70% within 200m of transmission lines and approximately 20% between 200m and 600m. At these distances, the magnetic fields produced by transmission lines are much lower than implicated in previous epidemiology studies, and the study raises the possibility that there is some effect operating other than EMFs, possibly some characteristic of the populations living near overhead lines.

182. The study concludes:-

> *"While few children in England and Wales have a birth domicile close to high-voltage power lines, there is a slight tendency for the birth domiciles of children with leukaemia to be closer to those lines than those of matched controls. An association between childhood leukaemia and power lines has been reported in a number of studies, but it is nevertheless surprising to find the effect extending as far from the lines as it does in this study. We have no satisfactory explanation for our results in terms either of causation by magnetic fields or association with other factors. Neither the association reported here nor previous findings relating to level of exposure to magnetic fields are supported by convincing laboratory data or any accepted biological mechanism".*

183. and

> *"We emphasise again the uncertainty about whether this statistical association represents a casual relation".*

184. Since the first publication in 2005, this study has produced further results (Kroll et al 2010), methodology (Swanson 2008), and discussion (Swanson et al 2006) papers, and discussion in the BMJ "Rapid Responses" (BMJ 2005), and work continues.

185. The importance of this study has been fully recognised. However, the uncertainty about whether this result reflects a causal relation, and if it does, exactly what it is due to, makes the implications far from obvious. The HPA response to this study states in part:

> *"By virtue of the longer time period covered, the new study provides more precise information on childhood cancer rates in the proximity of high-voltage power lines than does the UK Childhood Cancer Study. However, the absence of field measurements in homes and the lack of information on potential confounders make it difficult to know whether the raised risks reported for leukaemia represent a direct effect of electromagnetic field exposure….However, certain findings, such as the weaker evidence for a raised risk when an alternative set of controls is used and the raised risk reported more than 200 metres from the line, where the magnetic fields from lines are at or below background levels, would suggest that at least some of the increased leukaemia risk may be associated with factors other than electromagnetic fields."*

186. The Public Health Agency consider this study (see Appendix 6A):

> *"[the association with childhood leukaemia raised by a number of objectors] is largely related to the publication of a research paper in the British medical Journal in 2005 by Draper and colleagues which concluded that "there is an association between childhood leukaemia and proximity of home address at birth to high voltage power lines". However, it is important to stress that the finding of an association between two factors (in this case electromagnetic fields and leukaemia) does not imply that one is a direct cause of the other. Indeed Draper and colleagues go on to state "there is no accepted biological mechanism to explain the epidemiological results; indeed, the relation may be due to chance of confounding". An accompanying editorial in the same issue of the BMJ noted a number of issues in relation to the study including that "it did not include estimates or measures of the magnetic field from either the power lines or other sources" and concluded that the study "provides little evidence that the increasing risk closer to power lines is due to magnetic fields""*

187. The then Westminster Minister for Health gave a written answer on 7 June 2005 to a Parliamentary Question about the Draper study, with similar answers on other dates. This answer gives a short factual summary of the findings, and expresses no qualitative opinion on those findings. The electricity industry makes available a full list of Parliamentary Questions on EMFs[126]. NIE and its advisors are not

[126] http://www.emfs.info/The+Expert+View/UKGovernment/Q+and+A+complete.htm

aware that this or any other relevant Minister has expressed a view on the Draper study (or any other scientific study on EMFs) that is out of line with the authoritative view of the science described here.

188. The previous major epidemiological study of magnetic fields and childhood cancer (including childhood leukaemia) in the UK was the United Kingdom Childhood Cancer Study (UKCCS 1999). This study did not suggest that exposure to magnetic fields associated with the electricity supply or proximity to overhead lines in the UK increases risks for childhood cancer.

7.4.3.8 Work At Bristol University

189. In 1996 and in 1999, a group from the University of Bristol headed by Professor Henshaw published papers suggesting that the electric fields from high-voltage overhead lines might influence the behaviour of airborne particles (the main example given being radon daughter products) in such a way as to be harmful to human health (Henshaw et al 1996-1999). The NRPB's Advisory Group Report of 2001 contained the following statement (NRPB 2001a):

> *"The physical principles for enhanced aerosol deposition in large electric fields are well understood. However, it has not been demonstrated that any such enhanced deposition will increase human exposure in a way that will result in adverse health effects to the general public."*

190. Both the 1996 and the 1999 papers were considered by the IARC Working Group which decided the evidence that electric fields cause cancer was "inadequate" for both humans and animals, and that as a consequence electric fields were "not classifiable" with respect to carcinogenicity. The WHO Task Group was also aware of these papers.

191. The NRPB's Advisory Group on Non-Ionising Radiation established an Ad Hoc Group on Corona Ions to consider these suggestions further. It reported in 2004 (NRPB 2004c):

> *"The potential impact of corona ions on health will depend on the extent to which they increase the dose of relevant pollutants to target tissues in the body. It is not possible to estimate the impact precisely… However, it seems unlikely that corona ions would have more than a small effect on the long-term health risks associated with particulate air pollutants, even in the individuals who are most affected. In public health terms, the proportionate impact will be even lower because only a small fraction of the general population live or work close to sources of corona ions."*

192. and

> *"Any health risks from the deposition of environmental particulate air pollutants on the skin appear to be negligible."*

193. A different group at the University of Bristol headed by Dr Preece has been analysing the incidence of certain cancers in areas of Avon and the South West close to or downwind of overhead lines. Various preliminary results have been reported in the media and at scientific conferences, but the work is not yet finished, final results are not available, and the work has still not been published in the scientific literature, more than 10 years after those preliminary results were reported. It must be concluded that this study will never be completed or properly reported and therefore that no reliance can be placed on the earlier reports. There are various methodological issues raised by such work. Unless and until both the methods and the results are properly published it is not possible to assess the validity of the work or to place reliance on any results.

7.4.3.9 Concern About Health Effects

194. Fears and perceptions about the health effects of the Proposed Development can, of course, be material planning considerations, but the weight to be given to those considerations must depend on the extent to which they are objectively justified.

195. It is also possible in principle that concerns about living near an overhead line and the possibility of health effects could cause stress and detract from the person's health. NIE is not aware that any of the authoritative review bodies identified any studies establishing any indirect health effects of this nature, and no studies have been brought forward during the consultation. Those authoritative review bodies do not appear to have felt it appropriate to set much if any weight on this consideration.

196. In the case of power lines and health, concerns should be considerably assuaged by the fact that authoritative expert groups have examined the evidence and that appropriate protection measures are in place. Further, any distrust of pronouncements from "establishment" scientific bodies is countered by the role of SAGE, an inclusive stakeholder group. Therefore, overall, the remaining degree of concern that is objectively justified is limited, and the weight to be attached to this in the planning system is likewise limited.

197. Concern or fear, to the extent that it is unjustified by the scientific evidence, can be reduced by sensitive and appropriate communications, a point made by the Public Health Agency (see Appendix 6A):

> *"Although such anxiety can never be fully eliminated, I believe it is important for all bodies engaging in the debate to ensure that an evidence based approach is always taken and the potential health effects are neither minimised nor exaggerated."*

198. NIE considers that heightened levels of concern are natural when a development is first proposed. However, the process of public consultation about this overhead line, including this ES and the previous Statement and Further Environmental Information, and the start of the public inquiry in March 2012, is part of the important process of communication, allowing issues and concerns to be raised and then addressed by provision of factual information.

199. It is sometimes suggested that the presence of the overhead line would mean that children would be going outside for less than they normally would, and therefore not getting enough exercise. NIE understands that parents would naturally want to consider whether the presence of the overhead line should affect their children's lifestyle, but considers that it would be a response that went beyond the scientific evidence to restrict their behaviour in such a way. Similarly, NIE considers that an unwillingness to visit relatives living near the line would be a reaction that went beyond the scientific evidence.

7.4.3.10 Night-time Exposure

200. The suggestion that exposure specifically during the night might be relevant to childhood leukaemia originated principally in a study from Germany (Schuz et al 2001). A pooled analysis (Schuz et al 2007) designed to test this hypothesis failed to find differences between night-time and 24 hour exposure, and concluded in part:

> *"These results do not support the hypotheses that nighttime measures are more appropriate"*

201. SCENIHR considered this issue in their 2009 review, concluding:

> *"An extension of a pooled analysis of studies on magnetic fields and childhood leukaemia (Ahlbom et al. 2000) showed that focussing on exposure during the night time period gives basically the same results as for exposures over 24 hours (Schüz et al. 2007). This does not support assumptions that exposure during the night is of higher biological relevance or that the restriction to the night time period reduces exposure misclassification." (p1, abstract).*

7.4.4 Effect Of EMFs On Farming, Flora And Fauna

7.4.4.1 Scientific Evidence

202. Although the majority of scientific studies of the possible effects of EMFs have concerned effects on humans, there have also been a considerable number of studies into possible effects on animals, principally farm animals, and plants, principally agricultural crops. The electricity industry maintains a list of some of these studies on its EMF website[127], though this does not attempt to be a comprehensive list.

203. Whilst some studies do report minor changes possibly attributable to EMFs, there appears to be no single effect that can be regarded as established, and the preponderance of the evidence has failed to find any effects. This is reflected in the conclusions of those authoritative bodies that have examined this question.

204. SCENIHR (2009) included a section on “environmental effects” but concluded:

> *“The current database is inadequate for the purposes of the assessment of possible risks due to environmental exposure to RF, IF and ELF.” (p5)*

205. National Policy Statement EN-5 (DECC 2011) states:

> *“2.10.8 There is little evidence that exposure of crops, farm animals or natural ecosystems to transmission line EMFs has any agriculturally significant consequences.” (p20)*

206. The Veterinary Service has advised there are no animal health or welfare implications of the proposed overhead line (see Appendix 6A). The Northern Ireland Environment Agency has not expressed any concern about the impact of EMFs on flora and fauna and Department of Agriculture and Rural Development has not expressed any concern about the impact of EMFs on farming (see Appendix 6A).

207. Specifically:

208. NIE and its advisors are aware of no studies suggesting that bats, Whooper Swans or any protected species are affected by power-frequency EMFs.

209. There can be an effect on bees if the hive is in a strong electric field. The mechanism is either heating of the hive by induced currents or small shocks due to small induced charges. Both these effects are readily eliminated by screening the hive by means of a grounded metal cover. Bees have not been found to be sensitive to magnetic fields or to direct effects of electric fields.

210. There is a large body of literature about how various animals, birds or fish use the earth’s magnetic field as an aid to navigation, including suggestions that overhead lines might disrupt the ability of some animals to detect the earth’s field. The authoritative review bodies have clearly been aware of this literature, but have not concluded that it is a relevant consideration in their assessment of power-frequency EMFs, presumably because the fields that such species use are static fields, as opposed to the alternating fields produced by power systems.

211. NIE and its advisors are not aware of any evidence suggesting that EMFs would have any impact on human food produced by or from animals exposed to EMFs.

212. NIE and its advisors are not aware that it has been established that there is any effect on the laying rates of domestic birds.

213. Finally, large electric fields can cause corona discharges on the tips of pointed plants or trees, producing very localised damage, but this has no effect on the overall wellbeing of the plant.

[127] www.emfs.info/The+Science/Agriculture/

7.4.4.2 Consequences For Accreditation Schemes

214. NIE and its advisors are aware of no scheme for awarding accreditation or particular status to farms that would be jeopardised by the presence of an overhead line.

215. Specifically, neither the rules governing organic status (Defra 2006) nor those governing "Farm Quality Assurance" (Livestock and Meat Commission 2010) appear to make any mention of overhead lines or EMFs.

7.4.4.3 Legal Cases in France

216. In summary, a French court awarded damages of around 400,000 Euros against RTE, the French transmission company, to M. Marcouyoux, a farmer, for effects of a power line on this farm. But the decision was overturned on appeal. The following account is based on information from RTE.

217. In the initial decision, a French court, the Tribunal de Grande Instance de Tulle, in a judgment dated 28 October 2008, awarded damages to a farmer, M. Marcouyoux, against RTE (the French transmission company) for the effect of the power line on farming operations involving cows. The basis of the judgment was that the problems observed on the farm created a presumption of guilt, and that RTE had failed to produce evidence to counter this presumption. There was some dispute about whether the problems observed, if they were caused by anything, were caused by EMFs or by stray voltages (stemming from the distribution system rather than the high-voltage power line).

218. However, the Appeal Court, Cour d'Appel de Limoges, in a judgment dated 1 March 2010, overturned this decision. It held that it was up to the farmer to produce evidence to prove that the effects were attributable to the power line, and that the farmer had failed to do so. Further, the Appeal Court went on to consider the scientific evidence in its own right, and concluded that it did not establish any effects on farming operations.

219. Finally, the Cour de Cassation considered the matter in a judgment dated 18 May 2011, holding that the precautionary principle as incorporated in the French constitution does not overturn the normal burden of proof, and therefore upholding the Appeal Court decision in overturning the original decision.

7.4.5 Active Implanted Medical Devices

7.4.5.1 Introduction

220. "Active Implanted Medical Devices" (AIMD) encompasses a range of devices, e.g. defibrillators and cochlear implants, though the commonest device remains the pacemaker. Hearing aids are not strictly speaking "implanted" but are included here under the same general heading.

221. It is possible to cause interference with an AIMD by means of a large enough external electric or magnetic field. Sources of possible interference include mobile phones, electronic article surveillance systems (EAS), radiofrequency identification devices (RFIDs), diathermy (electrosurgery) and magnets, as well as power-frequency electric or magnetic fields produced by overhead lines.

222. The normal mode of interference for a pacemaker is that the electric or magnetic field induces voltages in the body. The pacemaker has sensing leads designed to detect the heart's natural rhythm, so that it can reinforce the heart's own beats. In the presence of interference produced by the induced voltage, the pacemaker is unable to detect the heart's own rhythm. The pacemaker then reverts to pacing the heart at a constant rhythm. Thus, even when interference occurs with a pacemaker, it does not stop the pacemaker from functioning. Older pacemakers tended to have a single sensing lead ("unipolar"); newer pacemakers tend to have two sensing leads ("bipolar"), which makes them much less sensitive to interference.

7.4.5.2 Different Types Of Implanted Cardiac Device

223. Interference from overhead lines or any other source of electromagnetic fields to an implanted device occurs through signals induced in the sensing leads. Implanted Cardioverter Defibrillators (ICDs) and implanted pacemakers have very similar sensing leads and very similar detection circuitry within the device. Where they principally differ is in the therapy delivered. Thus, they are expected to be very similar in their levels of immunity to interference, though the consequences of any interference could differ. This is confirmed in that the various CENELEC Standards on interference (see Section 7.4.5.4 below) make essentially the same provisions for ICDs and pacemakers, and the manufacturers generally group them together in a single category of "implanted heart device" when giving information about interference. Therefore, in terms of understanding the likelihood of interference, it is appropriate to treat the two devices as a single group.

7.4.5.3 Observations Of Immunity From Interference

224. National Policy Statement NPS EN5 (DECC 2011) states:

> *"2.10.7 The Department of Health's Medicines and Healthcare Products Regulatory Agency (MHRA) does not consider that transmission line EMFs constitute a significant hazard to the operation of pacemakers."*

225. When asked in correspondence with the electricity industry, the UK's Medicines and Healthcare products Regulatory Agency (MHRA) has stated not just that it does not consider that transmission line EMFs constitute a significant hazard, but that it is aware of no instance of a patient having their electronic implantable device, such as a pacemaker or ICD, interfered with by a high-voltage overhead line. MHRA operate a system where cardiologists are encouraged to voluntarily report instances of device interference or malfunction from any source to MHRA, and heart-device manufacturers are required by law to report incidents to MHRA which represent actual or potential serious injury to patients. It is therefore highly likely that if such instances did occur, MHRA would have heard about them, but this cannot be guaranteed.

226. In addition, National Grid, which operates the high-voltage electricity network in England and Wales, runs a helpline for the public to report concerns about overhead lines, and is aware of no instances of interference with correctly fitted devices. Furthermore, National Grid and other electricity companies have staff with implanted heart devices, some of whom are occupationally exposed to rather higher fields than can be experienced by the public underneath overhead lines, again with no instances of interference.

227. Thus there is considerable confidence in saying that based upon the absence of reported incidents, overhead lines do not appear to interfere with implanted heart devices.

228. Tests have also been performed in controlled laboratory conditions for interference from magnetic fields. For example, tests on over 200 people with pacemakers (Trigano et al 2005), exposing them to fields of 100µT (twice the theoretical maximum field and 7 times the indicative typical field this line could produce), and with the pacemakers set to maximum sensitivity mode, failed to find any instances of interference with bipolar sensing, and just three minor instances with unipolar sensing.

7.4.5.4 Theoretical Scope For Interference

229. Requirements for immunity from interference for implanted devices are set by the Active Implanted Devices Directive (EU 1990), implemented in the UK by Regulation (UK Government 2002), and fleshed out by various CENELEC Standards (CENELEC 1998-2011). The level of immunity for power-frequency fields set by these provisions is broadly that implanted devices should be immune from interference at levels of field up to the general public reference levels from the 1999 EU Recommendation, 100µT for magnetic fields and 5kV/m for electric fields. In fact, manufacturers of these devices often seem to state the immunity levels as 100µT and 6kV/m.

230. Specifically, the Active Implantable Medical Devices Directive (first established in 1990 with subsequent amendments, though the amendments do not affect the provisions relevant here) includes the following provision:

> *“ESSENTIAL REQUIREMENTS*
>
> *I. GENERAL REQUIREMENTS*
>
> *8.*
>
> *Devices must be designed and manufactured in such a way as to remove or minimize as far as possible:*
>
> *…*
>
> *risks connected with reasonably foreseeable environmental conditions such as magnetic fields, external electrical influences, electrostatic discharge, pressure or variations in pressure and acceleration”*

231. The European Directive is transposed into UK law by the Medical Devices Regulations 2002. These state (Part III 22 (1)):

> *"... no person shall place on the market or put into service a relevant device unless that device meets those essential requirements set out in Annex 1 [of the Directive, see paragraph 230 above] which apply to it."*

232. The way these are implemented by CENELEC can be summarised by the following extracts:

> *"The risk assessment is based on the approach that AIMDs are expected to work uninfluenced as long as the General Public Reference levels of 1999/519/EC (except for static fields) are not exceeded..." (BS EN 50527-1 2010 5.1.2)*

233. and

> *"Under normal circumstances, if the fields are below the reference levels then the voltage [induced at the sensing terminals of the AIMD] is low enough that there are no electromagnetic interference effects. For higher fields the voltage can cause electromagnetic interference effects but often this is not clinically significant (see also D.7) and transient exposure can be permitted." (BS EN 50527-1 2010 D.4.1)*

234. In practice, no UK overhead line ever produces magnetic fields of 100µT (though some domestic appliances can do so, and manufacturers warn against using some equipment close to the device). But high-voltage overhead lines can sometimes produce electric fields of 5 or 6kV/m, giving, in theory, scope for interference. In practice, this interference has not been observed to occur, and the reason seems to be a combination of two factors. Firstly, although manufacturers typically guarantee immunity only up to 6kV/m, in practice, it seems that immunity levels are usually somewhat higher. Secondly, although overhead lines can sometimes exceed 6kV/m, and the calculations of Section 7.3.1.2 above indicate this is true in principle for this proposed overhead line, the circumstances where they do so are not that common. It is not every span that can do so; even when a span can do so, it is only over a limited area towards the middle of the span; it may happen only for limited periods of time depending on the operation of the electricity system and other factors such as the weather; and additionally electric fields are very easily screened by most objects for example bushes and hedges, reducing the fields further.

7.4.5.5 Advice From Manufacturers

235. Manufacturers of potentially affected implanted devices often provide information on electromagnetic interference. This typically covers a range of sources. Advice often includes avoiding letting the implanted device get too close to certain sources of fields such as some household appliances, some

walkie-talkies and similar transmitting devices, etc. Some manufacturers' literature does not mention high-voltage overhead lines, some gives a fairly low-key warning. No manufacturer that NIE or its advisors are aware of appears to regard any hazard as sufficient to require a prohibition on approaching high-voltage overhead lines.

236. NIE is aware of an email from St Jude Medical (see Appendix 7B), a manufacturer of AIMDs, stating that the "upper limit of the magnetic field" (to be sure of avoiding interference) is 0.1µT. NIE understands that this was a mistake arising from a misunderstanding of which units certain quantities were being expressed in, and the correct figure was in fact 0.1mT (100µT, consistent with Section 7.4.5.4 above). NIE has seen an email from Niklas Lagstrom, St Jude Medical, on 23 Jan 2012 confirming that the correct figure is 0.1mT.

7.4.5.6 Consequences Of Any Interference

237. Although interference from overhead lines has not been observed, if it did occur, it could potentially be serious. There are three main possible consequences. A pacemaker, when it detects interference, normally reverts to asynchronous pacing mode (that is, instead of sensing what the heart is trying to do and reinforcing it, it makes the heart beat at a fixed constant rate). An ICD could be inhibited from delivering a defibrillating pulse when it is needed. Or an ICD could be falsely triggered to deliver a defibrillating pulse when one is not needed.

238. In all cases, manufacturers advise that any interference should be only temporary. The device should not be damaged in any way and should work correctly again as soon as the interference is removed.

239. Any interference with an implanted heart device must be treated as potentially a serious hazard, though it will not necessarily be so in any specific case. NIE is not able to assess the clinical significance of any potential interference for individual devices or patients, who, if they seek further information on their specific circumstances, should consult their own cardiologist, just as for any of the many other potential sources of interference in everyday life.

240. The relevant CENELEC standard (CENELEC 2010, BS EN 50527-1 2010 D.8) states:

> *"However, not all these responses will have clinical significance for the patient. The potential for the patient to be affected by the device response is dependent on several factors, such as (but not limited to):*
>
> - *duration of exposure;*
> - *proximity to the patient;*
> - *position of the patient;*
> - *patient characteristics: pacemaker dependency, susceptibility to asynchronous pacing, susceptibility to high pacing rate."*

7.4.5.7 Need For Advice Specific To Each Individual

241. In practice, interference with implanted heart devices from overhead lines does not appear to occur. MHRA does not regard overhead lines as a significant risk to the operation of implanted heart devices given the absence of any reports of interference occurring to date. However, there is, in principle, scope for interference in some circumstances. Some of the possible consequences if interference did occur would constitute a potentially serious hazard. Because the likelihood of interference may vary from individual to individual, for example depending on the installation of the leads and the sensitivity settings of the device, and because the clinical consequences of any interference would also vary from individual to individual, MHRA and NIE both recommend any patient with concerns to consult their own cardiologist.

7.4.5.8 Conclusion On AIMDs

242. There could in theory be hazards associated with the operation of pacemakers and ICDs as a consequence of interference with fields from overhead lines. However, the probability of that occurring is extremely small; in fact the relevant authorities are unaware of any cases in the UK where this has happened. Therefore, overhead lines are not regarded as a significant risk to implanted heart devices, a position endorsed in NPS EN-5 (DECC 2011), which states:

> *"2.10.7 The Department of Health's Medicines and Healthcare Products Regulatory Agency (MHRA) does not consider that transmission line EMFs constitute a significant hazard to the operation of pacemakers."*

7.4.6 Insurance

243. The European Commission, in its response to the European Parliament resolution (EU 2009b), stated:

> *"27. The point on exclusion of coverage for the risks associated with EMFs from the scope of liability insurance policies requires clarification. The crucial question for the insurance industry, is not the actual reality of the health risk, but how society will react to the uncertainty and the financial risk created by lawsuits. Therefore, the exclusion of coverage for the risks associated with EMFs from the scope of liability insurance policies is not an indication that insurance companies believe that there is a health risk." (unpaginated document)*

244. This makes the point that the availability or otherwise of insurance cannot be used to deduce anything about the reality of health effects.

7.5 Mitigation Measures

245. As the Proposed Development is compliant with Government policies for the control of EMFs, specifically with the relevant quantitative exposure guidelines, no additional mitigation measures are called for.

7.6 Conclusions

246. This chapter of the ES has explained the policy position on EMFs in the UK, including Northern Ireland. In essence, EMFs should comply with the relevant international exposure guidelines; one precautionary policy ("optimum phasing", a feature that can be incorporated into the design of some overhead lines) has been adopted; but other precautionary measures relating to overhead lines are not adopted. The proposed overhead line and substation are compliant with the UK policy.

247. The closest residential property to the route of the overhead line is over 50m away from the centreline of the overhead line. Exposures to EMFs from the overhead line at these distances are much lower than the maximum directly under the line, and a small fraction of the exposure guidelines. However, in fact all exposures from the overhead line are compliant with the guidelines, regardless of distance.

248. Underground cables eliminate the external electric field. The magnetic field from an underground cable directly over the line of the route is often higher than for the equivalent overhead line, but to the sides, the magnetic field from the cable is always lower. Government policy is that it is not justified to place overhead lines underground solely on grounds of EMFs.

249. The authoritative reviews of the science, e.g. by the Health Protection Agency and by the World Health Organization are the appropriate source of conclusions on the state of the scientific evidence on EMFs. There is some uncertainty in the science, but that uncertainty is already taken account of in the policies that have been set and which the Proposed Development complies with. NIE is confident that any new

scientific developments are taken account of as they arise, and that all relevant specific scientific concerns or studies are already taken into account in the formulation of scientific conclusions and of policy.

250. Concerns have been raised about the effects of EMFs on farming, flora and fauna. The authoritative view is that the evidence does not identify any such effects (with minor exceptions, e.g. an effect of electric fields on the structure of beehives, which is readily eliminated by simple mitigation methods).

251. Concerns have been raised about the effect of EMFs on pacemakers, other active implanted medical devices, and hearing aids. These devices are almost entirely immune from any interference at the levels of EMFs produced by the overhead line, and overhead lines are not regarded as a source of interference by the relevant regulatory body, who have no record of any patient ever coming to harm as a result of an overhead line.

7.7 References

Bioinitiative 2007, BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF), http://www.bioinitiative.org/

BMJ 2005, Rapid Responses to Draper et al 2005, http://www.bmj.com/content/330/7503/1290/reply

California 2002, California EMF Program "An evaluation of the possible risks from electric and magnetic fields (EMFs) from power lines, internal wiring, electrical occupations, and appliances" Final Report June 2002, prepared by R R Neutra, V DelPizzo, G M Lee.

CENELEC 1998-2011, BS EN 45502-1: 1998 Active implantable medical devices Part 1. General requirements for safety, marking and information to be provided by the manufacturer; BS EN 45502-2-1: 2003 Active implantable medical devices Part 2-1. Particular requirements for active implantable medical devices intended to treat bradyarrhythmia (cardiac pacemakers); BS EN 45502-2-2: 2008 Active implantable medical devices Part 2-2. Particular requirements for active implantable medical devices intended to treat tachyarrhythmia (includes implantable defibrillators); BS EN 50527-1:2010 Procedure for the assessment of the exposure to electromagnetic fields of workers bearing active implantable medical devices. General; BS EN 50527-2-1:2011 Procedure for the assessment of the exposure to electromagnetic fields of workers bearing active implantable medical devices -
Part 2-1: Specific assessment for workers with cardiac pacemakers. note: EN 45502 replaced an earlier EN 50061, known in the UK as BS 6902, which was withdrawn in 2004.

Council of Europe 2011, Resolution 1815 (2011)1 The potential dangers of electromagnetic fields and their effect on the environment
http://assembly.coe.int/Mainf.asp?link=/Documents/AdoptedText/ta11/eRES1815.htm

DECC 2011, National Policy Statement for Electricity Networks Infrastructure (EN-5), http://www.official-documents.gov.uk/document/other/9780108510816/9780108510816.pdf

DECC 2012a, Power Lines: Demonstrating compliance with EMF public exposure guidelines A voluntary Code of Practice, http://www.emfs.info/Related+Issues/limits/UK/Compliance/CoP.htm

DECC 2012b, Optimum Phasing of high voltage double-circuit Power Lines A voluntary Code of Practice http://www.emfs.info/Related+Issues/limits/UK/Compliance/CoP.htm

DEFRA 2006, Compendium of UK Organic Standards September 2006, http://archive.defra.gov.uk/foodfarm/growing/organic/standards/pdf/compendium.pdf

DH 2004, Letter dated 22 July 2004 from Minister for Public Health to Chairman of NRPB plus Annex

DH 2007, Letter from Professor Pat Troop to RT Hon Dawn Primarolo MP, Minister of State for Public Health, 15 October 2007, reproduced at
http://www.hpa.org.uk/radiation/understand/radiation_topics/emf/hpa_response_statement_sage.htm

DH 2009, Written Ministerial Statement recorded in Hansard at
http://www.publications.parliament.uk/pa/cm200809/cmhansrd/cm091016/wmstext/91016m0001.htm ,

which introduced Government response to the Stakeholder Advisory Group on extremely low frequency electric and magnetic fields (ELF EMFs) (SAGE) Recommendations, available at http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_107124 . Reference in this Environmental Statement to the Written Ministerial Statement encompass both documents.

Dimbylow 1998-2005, Phys Med Biol. 2005 Mar 21;50(6):1047-70. Development of the female voxel phantom, NAOMI, and its application to calculations of induced current densities and electric fields from applied low frequency magnetic and electric fields; Dimbylow P. Phys Med Biol. 2000 Apr;45(4):1013-22. Current densities in a 2 mm resolution anatomically realistic model of the body induced by low frequency electric fields; Dimbylow PJ. Phys Med Biol. 1998 Feb;43(2):221-30. Induced current densities from low-frequency magnetic fields in a 2 mm resolution, anatomically realistic model of the body. Dimbylow PJ.

Draper 2005, BMJ. 2005 Jun 4;330(7503):1290. Childhood cancer in relation to distance from high voltage power lines in England and Wales: a case-control study. Draper G, Vincent T, Kroll ME, Swanson J.

EU 1990, Active Implanted Medical Devices Directive 90/385/EEC, as amended, including annexes

EU 1999, Council Recommendation of 12 July 1999 (1999/519/EC) including Annexes

EU 2000, Communication From The Commission on the precautionary principle Brussels, 2.2.2000

COM(2000) 1 final http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2000:0001:FIN:EN:PDF

EU 2009a, Report 23 February 2009 on health concerns associated with electromagnetic fields (2008/2211(INI)), European Parliament Committee on the Environment, Public Health and Food Safety http://www.europarl.europa.eu/sides/getDoc.do?type=REPORT&mode=XML&reference=A6-2009-0089&language=EN

EU 2009b, Follow-up to the European Parliament resolution on health concerns associated with electromagnetic fields, adopted by the Commission on 2 July 2009, http://www.europarl.europa.eu/oeil/spdoc.do?i=16799&j=0&l=en

HPA 2005, Application of ICNIRP Exposure Guidelines for 50 Hz Power Frequency Fields, http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1195733805036?p=1158934607693

Henshaw et al 1996-1999, D. L. Henshaw, A. N. Ross, A. P. Fews and A. W. Preece, Enhanced deposition of radon daughter nuclei in the vicinity of power frequency electromagnetic fields. Int. J. Radiat. Biol. 69, 25–38 (1996); A. P. Fews, D. L. Henshaw, P. A. Keitch, J. J. Close and R. J. Wilding, Increased exposure to pollutant aerosols under high voltage power lines. Int. J. Radiat. Biol. 75, 1505–1521 (1999); A. P. Fews, D. L. Henshaw, R. J. Wilding and P. A. Keitch, Corona ions from powerlines and increased exposure to pollutant aerosols. Int. J. Radiat. Biol. 75, 1523–1531 (1999).

Huss et al 2008, Am J Epidemiol. 2008 Nov 5. Residence Near Power Lines and Mortality From Neurodegenerative Diseases: Longitudinal Study of the Swiss Population. Huss A, Spoerri A, Egger M, Röösli M; for the Swiss National Cohort Study.

IARC 2002, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Static and Extremely Low Frequency Electric and Magnetic Fields (Vol. 80)

ICNIRP 1998, Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz). Health Physics April 1998, Volume 74, Number 4:494-522.

ICNIRP 2010, Guidelines For Limiting Exposure To Time-Varying Electric And Magnetic Fields (1 Hz to 100 kHz), International Commission on Non-Ionizing Radiation Protection, www.icnirp.de/documents/LFgdl.pdf

Kheifets et al 2006, Bioelectromagnetics. 2006 May 24;27(7):545-552, Childhood leukaemia, electric and magnetic fields, and temporal trends, Kheifets L, Swanson J, Greenland S.

Kroll et al 2010, British Journal of Cancer (2010) 103, 1122 – 1127 Childhood cancer and magnetic fields from high-voltage power lines in England and Wales: a case–control study ME Kroll, J Swanson, TJ Vincent and GJ Draper

Livestock and Meat Commission 2010, The Product Standard of the Northern Ireland Beef & Lamb Farm Quality Assurance Scheme, http://www.lmcni.com/fqas/documentation/

NRPB 2001a, ELF Electromagnetic Fields and the Risk of Cancer, Documents of the NRPB, Vol 12, No 1, 2001

NRPB 2001b, ELF Electromagnetic Fields and Neurodegenerative Disease, Documents of the NRPB, Volume 12 No 4 2001.

NRPB 2004a, Advice on Limiting Exposure to Electromagnetic Fields (0-300 GHz), Documents of the NRPB Volume 15 No 2 2004.

NRPB 2004b, Review of the Scientific Evidence for Limiting Exposure to Electromagnetic Fields (0-300 GHz), Documents of the NRPB Volume 15 No 3 2004.

NRPB 2004c, Particle deposition in the vicinity of power lines and possible effects on health, Documents of the NRPB Volume 15 No 1 2004

SAGE 2007, Stakeholder Advisory Group on ELF EMFs (SAGE) Precautionary approaches to ELF EMFs First Interim Assessment: Power Lines and Property, Wiring in Homes, and Electrical Equipment in Homes plus Supporting Papers, http://www.emfs.info/Related+Issues/SAGE/SAGE+downloads.htm

SAGE 2009, Stakeholder Advisory Group on ELF EMFs (SAGE) Second Interim Assessment 2009 – 2010 Electricity Distribution (including low-voltage and intermediate-voltage circuits and substations) and Report on Discussions on Science
http://www.emfs.info/Related+Issues/SAGE/SAGE+downloads.htm

SCENIHR 2009, Scientific Committee on Emerging and Newly Identified Health Risks SCENIHR Health Effects of Exposure to EMF,
http://ec.europa.eu/health/ph_risk/committees/04_scenihr/docs/scenihr_o_022.pdf

Schuz et al 2001, Int J Cancer 2001 Mar 1;91(5):728-35 Residential magnetic fields as a risk factor for childhood acute leukaemia: results from a German population-based case-control study. Schuz J, Grigat JP, Brinkmann K, Michaelis J.

Schuz et al 2007, Am J Epidemiol.2007 May 7 Nighttime Exposure to Electromagnetic Fields and Childhood Leukaemia: An Extended Pooled Analysis Schuz J, Svendsen AL, Linet MS, McBride ML, Roman E, Feychting M, Kheifets L, Kheifets L, Lightfoot T, Mezei G, Simpson J, Ahlbom A.

Swanson 1995, Magnetic fields from transmission lines: comparison of calculations and measurements, J Swanson. IEE Proc.-Gener. Transm. Distrib., 142 (September 1995) 481-486.

Swanson 2006, Ann N Y Acad Sci. 2006 Sep;1076:318-30 Power-frequency electric and magnetic fields in the light of Draper et al. 2005. Swanson J, Vincent T, Kroll M, Draper G.

Swanson 2008, J Radiol Prot. 2008 Mar;28(1):45-59. Methods used to calculate exposures in two epidemiological studies of power lines in the UK. Swanson J.

Trigano et al 2005, J Am Coll Cardiol. 2005 Mar 15;45(6):896-900. Clinical study of interference with cardiac pacemakers by a magnetic field at power line frequencies. Trigano A, Blandeau O, Souques M, Gernez JP, Magne I. Department of Cardiology, Centre Hospitalier Universitaire Nord, Marseille, France.

UKCCS 1999, Lancet 1999 Dec 4;354(9194):1925-31. Exposure to power-frequency magnetic fields and the risk of childhood cancer. UK Childhood Cancer Study Investigators.

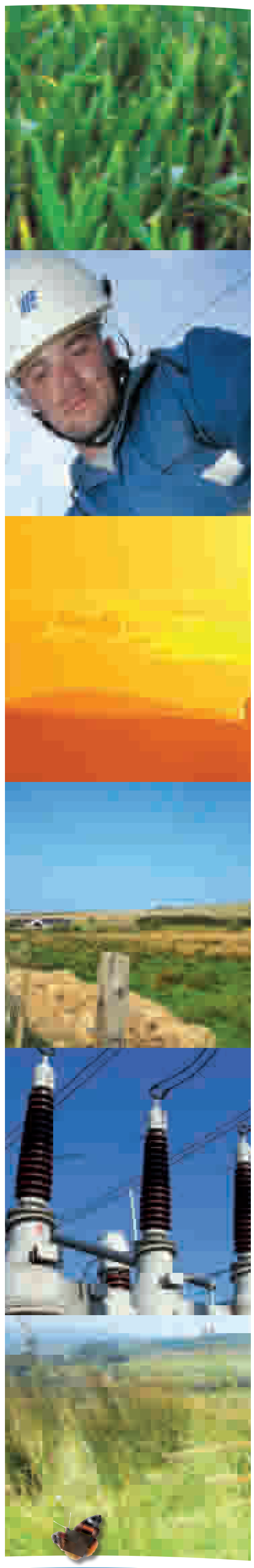
WHO 2007, Extremely Low Frequency Fields, Environmental Health Criteria Monograph No.238, WHO 2007, http://www.who.int/peh-emf/publications/elf_ehc/en/index.html; Electromagnetic fields and public health Exposure to extremely low frequency fields Fact sheet N°322 June 2007 http://www.who.int/mediacentre/factsheets/fs322/en/index.html

The Medical Devices Regulations 2002

Tyrone - Cavan Interconnector

Chapter 8

Water Environment



Consolidated Environmental Statement

Volume 2

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8 Water Environment

Chapter Executive Summary

As a linear development, the proposed overhead line will cross a number of surface watercourses that vary in size, importance and sensitivity. The majority of the watercourses are small unnamed streams or drains that are tributaries of the larger River Blackwater, Ballymartrim Water and River Rhone.

Watercourses have been physically avoided as much as is practicably possible. However, there is the potential during construction of the overhead line and substation for temporary adverse impacts on the water environment leading to short term reductions in water quality. Where works adjacent to watercourses is unavoidable, these can be effectively managed by implementing good working practices and adherence to relevant legislation and current good practice.

In assessing the significance of impacts careful attention has been made to the importance of the water receptors and the magnitude of any effect, taking into account the relatively small scale and duration of the works.

At nine locations ephemeral (or possible ephemeral) ditches may be impacted during construction works to install tower foundations, but these will be reinstated resulting in no overall effect. The proximity of the River Rhone to the substation construction site means that it may be indirectly impacted by contaminated site runoff, resulting in an effect of Slight Adverse. All other effects are neutral.

During operation, it is predicted that there will be no permanent or long term adverse impacts from the towers, nor from the substation on the basis that that the drainage system will be well maintained and NIE will operate a Pollution Prevention Plan.

8.1 Introduction

1. This chapter presents an assessment of the Proposed Development in relation to the water environment – specifically surface water. It describes the existing baseline water environment and identifies potential effects from the construction and operation of the Proposed Development. The mitigation measures that will be implemented during construction and operation to reduce or offset potential adverse effects are outlined.

2. This assessment should be read in conjunction with the assessments presented within Chapter 9 Soils, Geology and Groundwater (which considers the effects from any ground contamination), Chapter 10 Ecology, and Chapter 18 Flood Risk Assessment.

8.2 Methodology

3. The scope of assessment and methodology has been determined through a baseline study to fully understand the existing water environment within the study area coupled with an evaluation of the risks posed by the Proposed Development, and confirmed through consultation with statutory and non-statutory consultees.

8.2.1 Consultation

4. As described in Chapter 6 Scoping and Consultation, consultation was undertaken with both statutory and non-statutory consultees as part of the EIA. Responses which are relevant to this revised assessment are summarised in Chapter 6 of this ES and have been included in their unabridged form in Appendix 6A.

8.2.2 Scope of Assessment

5. This surface water quality impact assessment focuses on the construction phase as it is during this phase of the Proposed Development that there is the greatest potential for significant adverse effects to occur to surface water bodies. Potential effects may include direct physical impacts to watercourses, and silt and chemical pollution. Potential receptors may be impacted directly or via pollution that has travelled downstream. The assessment has considered the construction of the new substation and installation of each tower together with any associated temporary infrastructure, such as access tracks.

6. Although the ecological sensitivity of watercourses has been considered, Chapter 10 Ecology provides an assessment of in-combination effects to receptors of ecological sensitivity. This includes information on European protected sites and habitats.

7. Determining the appropriate spatial study area is important to ensuring that this water quality impact assessment is robust and accurately predicts the potential effects on surface water bodies. There is no formal published guidance and thus the zone within which there is the potential for significant effects has been determined based on the professional judgement of the chapter author.

8. Based on the professional judgement of the chapter author, a study area of 500m (either side of the centreline of the overhead line and from the boundary of the substation) surrounding all development (temporary and permanent) has been assessed, which is sufficiently distant to ensure that all watercourses that may be directly affected are identified. Although there may be additional receptors downstream and outside of this study area, all watercourses are controlled waters, meaning that to pollute them is an offence under the Water (Northern Ireland) Order 1999 (as amended). Therefore, irrespective of their importance, which is determined by their attributes, all watercourses have the same legal protection.

9. The Water Framework Directive (WFD) (2000/60/EC) classification of surface water bodies has been referred to in this assessment. The assessment presented in this chapter has been undertaken with regard to the NIEA guidance on the WFD and its role in EIA projects. These guidance documents are *"Carrying Out A Water Framework Directive (WFD) Assessment On EIA Developments"* (March 2012) and *"EIA Scoping Guidance for Developments Likely to Impact upon the Water Environment A Water Management Unit Guidance Note"* (March 2012).

10. Figure 8.3 illustrates the location and current status (or potential for heavily modified water bodies) of WFD surface water bodies along the route of proposed overhead power line. There are five WFD designated watercourses, the River Rhone, the River Blackwater, the Ballymartrim Water, the Tynan River, and the [tributary] of the Clontibret Stream. Table 8.6 later in this chapter provides a summary of their WFD classification

11. The March 2012 NIEA guidance document outlines what is expected by NIEA in an ES with regard to the WFD. This is listed below along with reference to the relevant section of the chapter where that information is contained:

- Identification of the River Basin District or Districts within which the scheme will be constructed or impact upon **(see Section 8.3.4 of this Chapter and Figure 8.3);**
- Identification of all waterbodies that may be impacted by the scheme **(see Section 8.3 and specifically Sections 8.3.3 and 8.3.4 of this Chapter and Figures 8.1-8.3);**
- The current status of each waterbody, as classified under the WFD **(see Section 8.3.4 of this Chapter);**

- The water quality objectives for each waterbody **(see Section 8.3.4 of this Chapter);**
- An assessment of the potential impact of the scheme component on the current status of each waterbody and on future water quality objectives **(see Section 8.4 of this Chapter for the Potential Impacts and Section 8.6 for Residual Impacts)**; and,
- A description of mitigation measures proposed to ensure deterioration in water quality or ecological status is avoided **(see Section 8.5 of this Chapter).**

8.2.3 Methods

12. A qualitative assessment was undertaken considering the potential interactions between the Proposed Development and existing baseline conditions. The assessment was based on a combination of professional judgment, experience of similar developments, the requirements of relevant legislation and statutory policy, and best practice guidance.

8.2.4 Legislative Context

13. The following European legislation was considered as part of this impact assessment (refer to Appendix 8A for further details):

- Priority Substances Directive (2008/105/EC);
- Fish (Consolidated) Directive (2006/44/EC) (replacing 78/659/EC);
- Dangerous Substances Directive (2006/11/EC replacing 76/464/EC);
- Environmental Liability Directive (2004/35/EC);
- Water Framework Directive (2000/60/EC); and,
- Nitrates Directive (91/676/EC).

14. The following national legislation was considered as part of this impact assessment (please refer to Appendix 8A for further details):

- Water Framework Directive (Priority Substances and Classification) Regulations (Northern Ireland) 2011;
- Control of Pollution (Oil Storage) Regulations (Northern Ireland) 2010 (as amended 2011);
- Nitrates Action Programme Regulations (Northern Ireland) 2010 (as amended);
- Environment Liability (Prevention and Remediation) Regulations (Northern Ireland) 2009 (as amended);
- Water Abstraction and Impoundment (Licensing) Regulations (Northern Ireland) 2006;
- Protection of Water Against Agricultural Nitrate Pollution Regulations (Northern Ireland) 2004;
- Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2003 (as amended);
- Control of Pollution (Applications and Registers) Regulations (Northern Ireland) 2001 (as amended);
- Environment (Northern Ireland) Order 2002 (including amendments up to 2004);
- Water (Northern Ireland) Order 1999 (as amended);
- Drainage (Northern Ireland) Order 1973 (as amended); and

- Fisheries Act (Northern Ireland) 1966 (as amended).

15. More information on the legislation listed above and on relevant planning policy has been provided in Appendix 8A (Please also refer to Chapter 3 Planning and Development Context of this ES for a discussion of relevant national, regional and local, planning policies).

8.2.5 Baseline Data Collection

16. Current and future predicted baseline conditions were established via a desk study and consultation with relevant statutory bodies (including Northern Ireland Environment Agency (NIEA), Department for Agriculture and Rural Development (DARD), Rivers Agency (RA), and Department for Cultural Arts and Leisure (DCAL) Inland Fisheries) for data and information, including:

- A review of Ordnance Survey Northern Ireland (OSNI) maps and aerial photography in order to identify the locations of surface water bodies within the study area;
- Review of the River Basin Management Plan (RBMP) for the Neagh Bann International River Basin District (IRBD) (NIEA, December 2009);
- Review of the River Blackwater Local Management Area Action Plan (NIEA March 2010) (and the Blackwater Water Management Unit (WMU) Action Plan for the Clontibret Stream, which is a cross-border waterbody) which includes WFD Action Plans for the River Rhone, River Blackwater, Ballymartrim Water, Tynan Water and Clontibret Stream;
- Discharges and abstractions to watercourses within the study area, provided by the NIEA; and,
- Identification of protected areas and sensitive fisheries within the study area.

17. NIEA was unable to provide further information on other water attributes or recreational / amenity activity (commercial fishery, angling, navigation, etc.) for any of the water bodies. In addition, it has not carried out any hydrological surveys in the study area.

18. To supplement the desk study, a watercourse survey was carried out between 4th and 7th September 2012 by an experienced water quality impact assessor, who is a full member of the Chartered Institute of Water and Environmental Management and a Chartered Environmentalist. The purpose of the survey was to identify any watercourse(s) or other water bodies that may be affected by the Proposed Development.

8.2.6 Effects Evaluation

19. This qualitative impact assessment is based on professional judgement and informed by best practice guidance including the '*Guidelines for Environmental Impact Assessment*' (IEMA 2004), and the Highways Agency's Volume 11, Section 3, Part 10 of the Design Manual for Roads and Bridges (DMRB). Although the DMRB guidance was designed for the assessment of road schemes, the method to determine impact significance is independent of the nature of the project being assessed, and this method is a robust and reliable way to assess the significance of impacts from this proposed linear development on the surface water environment.

20. In assessing the significance of potential effects of the Proposed Development, three key factors were taken into account.

- The likelihood of that effect occurring;
- The importance of the receiving environment; and,
- The potential magnitude of the effect.

21. The likelihood of an effect occurring is based on a scale of: certain, likely or unlikely. The terms receptor '*importance*' and receptor '*sensitivity*' are used interchangeably within impact assessments. However, in the context of assessing the effects on the water environment it is commonplace to refer to receptor 'importance' only. This is because larger watercourses have a greater potential to dilute and disperse pollutants (i.e. a greater buffering capacity) and are thus less sensitive, although they are often the water bodies that support more diverse aquatic fauna and flora, more likely to be designated as a nature conservation site, and have more important socio-economic and aesthetic attributes. Therefore, to ensure that these water bodies are given an appropriate consideration by the assessment, this impact assessment refers to 'importance' only and may differ from other topics as a result. The importance of the receiving environment is defined by the criteria in Table 8.1.

Table 8.1 Criteria to assess the importance / sensitivity of water receptors

Importance	Criteria	Selected Examples
Very High	Attribute has a high quality and rarity on a regional or national scale	European Designated salmonid fishery (or salmonid & cyprinid fishery); Site protected under EU or UK wildlife legislation (SAC, SPA, ASSI, Ramsar site); and Critical social or economic uses (e.g. water supply and navigation).
High	Attribute has a high quality and rarity on a local scale	European Designated Cyprinid Fishery; Aquatic species protected under EU or UK wildlife legislation (e.g. Smooth Newt); and Important social or economic uses such as water supply, navigation or mineral extraction.
Medium	Attribute has a medium quality and rarity on local scale	May be designated as a local wildlife site. May support a small / limited population of protected species. Limited social or economic uses.
Low	Attribute has a low quality and rarity on a local scale	No nature conservation designations. Low aquatic fauna and flora biodiversity and no protected species. Minimal economic or social uses.

Source: Adapted from HD45/09 (Highways Agency, 2009)

22. No examples of indicative water quality for each water body importance class are provided. This is because it is no longer appropriate to base the importance of a water body on its current water quality, since this approach by definition suggests that it is more acceptable to physically alter or discharge a poorer quality effluent into a water body of lower quality, than it is to alter or discharge into a water body of higher current quality. Instead, the importance of water bodies has been determined based on various ecological, social and economic attributes, which are described above.

23. The magnitude of effect considers the scale of the predicted change to baseline conditions resulting from a given impact and takes into account its duration (i.e. temporary or permanent). Definitions are described in Table 8.2:

Table 8.2 – Magnitude of Effect Criteria

Magnitude	Criteria	Examples
Major Adverse	Results in loss of attribute and / or quality and integrity of the attribute.	Loss of Protected Area. Pollution of potable sources of water abstraction. Deterioration of a water body leading to a failure to meet Good Ecological Status (GES) under the WFD and reduction in Class (or prevents the successful implementation of mitigation measures for heavily modified or artificial water bodies).
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute.	Loss in production of fishery. Discharge of a polluting substance to a watercourse but insufficient to change its water quality status (WFD class) in the long term. No reduction in WFD class, but effect may prevent improvement (if not already at GES) or the successful implementation of mitigation measures for heavily modified or artificial water bodies.
Minor Adverse	Results in some measurable change in attributes quality or vulnerability.	Noticeable effect on features, or key attributes of features, on the Protected Areas Register. Measurable changes in attribute but of limited size and / or proportion, which does not lead to a reduction in WFD status or failure to improve.
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity.	No effect on features, or key attributes of features, on the Protected Areas Register. Discharges to watercourse but no significant loss in quality, fishery productivity or biodiversity. No effect on WFD classification or water body target.
Minor Beneficial	Results in some beneficial effect on attribute.	Where the Proposed Development provides an opportunity to enhance the water environment but does not result in an improvement in class, status, output or other quality indicator.

Source: Adapted from HD45/09 (Highways Agency, 2009)

24. The significance of likely effects (adverse or beneficial) has been determined using the matrix presented in Table 8.3.

Table 8.3 – Assessment of Significance Matrix

Importance	**Magnitude**			
	Major	**Moderate**	**Minor**	**Negligible**
Very High	Very large	Large / very large	Moderate / large	Neutral
High	Large / very large	Moderate / large	Slight / moderate	Neutral
Medium	Large	Moderate	Slight	Neutral
Low	Slight / moderate	Slight	Neutral	Neutral

Source: Adapted from HD 45/09 Volume 11, Section 3, Part 10 Road Drainage and the Water Environment

25. Where a choice of two effect significance descriptors (e.g. Slight/Moderate) is available, only one should be chosen. This choice allows for professional judgement and discrimination in assessing effects on water environment assets on a case by case basis

26. The magnitude of effects was initially assessed without taking mitigation measures and good practice construction techniques into account. Effects that remain once mitigation measures are taken into consideration are residual effects. Temporary effects have been considered in the construction

phases, whilst permanent effects have been discussed in the operational phase, albeit that the effect may first occur during construction.

8.2.7 Indication of Any Difficulties Encountered

27. Though an attempt was made to survey each tower location to identify nearby surface water features, in ten cases (see Figure 10.1), access to the land was withheld by the landowner which prevented the surveyor from accessing land which contained a tower location. The other main difficulty associated with observing water courses at the tower location related to vegetation cover in and around the channel. In these circumstances the assessment is based on observations of the watercourses at the nearest possible location downstream.

28. Along field boundaries and through hedgerows there are potential ephemeral ditches that flow only seasonally (during wetter periods or when groundwater levels are higher) or only for a short period following a storm event. Due to the seasonal and temporary nature of these watercourses it was not possible to observe all watercourses with water running through them. Where it was not possible to observe the watercourse, the assessment is based on Ordnance Survey Northern Ireland (OSNI) maps and aerial photographs. For these locations, ephemeral ditches have been included in the assessment, unless the absence of any minor water course has been confirmed.

29. Ephemeral ditches have been identified using the local topography, morphology of the dry ditches, and presence of pools of water. Where the presence or absence of ditches and drains cannot be confirmed, the assessment and mitigation is based on information derived from these parameters. As part of the pre-construction works, ground investigations will be undertaken to confirm the assessment base, and any changes used to adapt mitigation as necessary.

30. Water quality monitoring was not undertaken as part of this study, since other data sources (including WFD data and water quality data from NIEA) were available to inform the assessment and the determination of water body importance.

8.2.8 Design Summary

31. In selecting the line route for the proposed overhead line, account was taken of NIE’s policy to avoid the placement of towers or other structures in the immediate vicinity of navigable watercourses. NIE policy (NIE policy 06/025) provides **vertical** standoff distances according to the type of the overhead line and size of the watercourse. For navigable waters the vertical distance between the lower bank to the conductor or earth wire must be 10.5 m, and for non-navigable more minor watercourses the same distance should be at least 7.6 m. However, the Proposed Development has been designed with a minimum clearance of 9.0 m – i.e. the overhead lines will be at a greater minimum height from the ground. The clearance distance will vary depending on the distance from the tower (the mid-point between towers will generally be the lowest point of over head line but no less than 9.0 m). As outlined in Chapter 7 (EMF) of this ES, weather and operating conditions will also affect the clearance distance. It is considered that the typical minimum clearance will be 10.2 m but will be no less than 9.0 m.

32. Construction working areas and stringing areas are all relevant design details when determining the risk posed to nearby water features. Wherever possible, tower locations stringing areas have been relocated away from watercourses, or the working area re-orientated to avoid watercourses. Where this is not possible, recommendations have been proposed to prevent pollutants running off into the watercourse.

33. Chapter 5 (Proposed Development) details how the towers will be constructed and notes that towers will be constructed in sections, such as three or four at a time. The result of this approach is that multiple towers may be constructed simultaneously close to the same watercourse or within the same river catchment. Qualitative comments and recommendations have been provided, as the construction sequence will be decided by the contractor appointed to build the line.

34. Where possible, existing farm and field access tracks will be used to avoid disruption to local land owners. Where these pass close to watercourses or drainage ditches mitigation will be required to ensure that the water body is protected from erosion or pollution. The principal concern regarding temporary access roads with respect to water quality are the physical effects that may occur during any stream crossings that are required and the potential for particulates and oils to runoff into watercourses. The assessment adopts a precautionary approach so where there is a risk appropriate mitigation measures are provided. Therefore, should the route or location of an access track change slightly, appropriate mitigation has already been set out in this assessment.

35. Chapter 18 Transport provides details of the predicted vehicle movements associated with the construction of each tower. In the worst case, it has been predicted that a tower location will have approximately 54 vehicle movements which will take place each day, including movements by 4x4, delivery lorries, dumper trucks, and other plant. In some locations one access track may serve two separate towers resulting in additional vehicle movements. As a result of the traffic movements associated with the development, the assessment has included runoff from tracks (including eroded soil particles) and spillage risk.

36. Where a tower is located in an area with existing field drainage, the assessment has identified the need for ditch reinstatement. This assessment proposes that all reinstatement will broadly follow the course and profile of the existing ditch or drain.

37. The location of the substation may have physical effects on watercourses. Discharges, including the risk of oil spillages from oil stored within transformers and from car parking (six spaces only), could also be a source of pollution and mitigation is a relevant design consideration.

38. Drainage from the substation will be managed using a three staged process in accordance with a surface water management plan developed following the guidance in the SuDS Manual (CIRIA, 2007). Stage 1 (interception storage) will treat surface water runoff falling on gravel area by filtration, removing fine particulates and any oils associated with them. Stage 2a includes new filter drains and stage 2b includes oil interceptors (2 No. designed to European Standard PR EN 585-1&2). These oil interceptors will be maintained once every 6 months (or in accordance with manufacturer's requirements).

39. The proposed SuDS pond design at the substation has been developed following the flood risk assessment (Chapter 18), which has allowed for the appropriate size of the pond and the details of discharge to and from the treatment facility. The designed treatment volume is designed to capture 75-90% of the storms in a year. This is in line with the industry guidance for the design of SuDS (CIRIA 2009) – the remaining 10-25% of storms will discharge to the existing minor watercourses/drains on site and through the pond. The designed four stages of treatment will treat all flows generated from the hardstanding area and the access road of the substation. This ensures that smaller volumes of runoff are stored within the treatment systems and treated in accordance with the guidance from The SuDS Manual. The smaller volumes of runoff are those in which pollution is most concentrated, as the initial runoff from surface washes the pollutants into the surface water collection systems.

40. The pond will be inspected bi-monthly to ensure inlet/outlets are not blocked, and typically once a year it is expected that some work to remove litter, debris, and potentially silt and vegetation may be required (see Chapter 5 for detail).

8.3 Baseline Conditions

8.3.1 Overview

41. The following section describes the current baseline and forms the basis of the future conditions against which impacts have been assessed. It describes the geography of the river catchments, including topography, climate and hydrology, before presenting information on the attributes of water features that are used to define their importance. The water quality information in this section also references how the watercourses within the study area are categorised under the WFD, which includes

information on ecological water quality, protected areas, fisheries and water resources. This information has been included to give an account of catchment management within the study area.

8.3.2 Topography and Climate

42. Topography and climatic conditions exert a considerable influence over the water environment. Topography along the overhead line route varies quite considerably with elevations ranging from approximately 20 m AOD at the lowest point to 150 m AOD at the highest point. Generally the towers will be located on lower hill slopes and at the bottom of drumlin valleys.

43. Meteorological Office records (Met Office 2012) of average annual rainfall data recorded at the Armagh meteorological station, were reviewed to establish general climatic conditions. Over the last ten years rainfall levels were relatively constant and the following total annual rainfall was recorded:

Table 8.4: Local Annual Rainfall 2002 to 2011 (Met Office)

Year	Rainfall
2002	1070.5 mm
2003	683.6 mm
2004	799.4 mm
2005	739.1 mm
2006	827.9 mm
2007	822.4 mm
2008	857.2 mm
2009	891.5 mm
2010	894.6 mm
2011	871 mm
2012	853.1 mm
Mean Average	846.5 mm per year

8.3.3 Surface Hydrology

44. The study area is crossed by a number of waterways or watercourses, most of which are unnamed small streams or field drains. In Northern Ireland, a waterway is defined under the Water (Northern Ireland) Order 1999 as:

> *'any river, stream, watercourse, inland water (whether natural or artificial) or tidal waters and any channel or passage of whatever kind (whether natural or artificial) through which water flows but, does not include:*
>
> *(a) The waters beyond 3 international nautical miles seaward from the baseline from which the breadth of the territorial sea adjacent to Northern Ireland is measured;*
>
> *(b) Any public sewer or public sewage treatment works;*
>
> *(c) Any main or service pipe within the meaning of the Water and Sewerage Services (Northern Ireland) Order 1973 which is vested in or under the control of the Department of the Environment;*
>
> *(d) Any drain or road drain—*
>
> *(i) Constructed and laid by the Department of the Environment under Article 45(1) of the Roads (Northern Ireland) Order 1993; or*
>
> *(ii) Acquired by the Department of the Environment under Article 45(6) of that Order.'*

45. The Drainage (Northern Ireland) Order 1973 further defines a watercourse as:

> *'any channel or passage of whatever kind, whether natural or artificial, through which water flows and, without prejudice to the generality of the foregoing, includes any river, stream, canal, ditch, drain, cut, culvert, dyke, sluice, valve, sewer, overland carrier, millrace or layde, but does not include any drain or sewer [,.], or any water main or service pipe.'*

46. Based on this definition, a watercourse is defined by whether or not there is a channel formed for the conveyance of water. The legislation does not provide any further guidance regarding whether or not a channel only runs with water seasonally or infrequently following storm events. This is important since ephemeral ditches have been identified across the study area that may only contain water or flow during the wetter months of the year, when groundwater levels are high, or for only a short period following a storm. Overall, various terms are used in this assessment to distinguish between the different sizes and types of watercourse, and these are described below:

- ***River*** – A significant watercourse important at a regional scale, with a permanent flow of water and a channel typically more than a few metres wide; Likely to be named on OSNI, may be designated for nature conservation, fisheries or as a Main River;
- ***Stream*** – A watercourse with a channel width typically greater than 1 m but less than a few metres, with a permanent flow of water. May be included in fisheries and nature conservation designations;
- ***Field Drain*** – Typically a first or second order watercourse running with water throughout the year, but with a relatively small channel width (typically less than 1 m) and a low flow[128];
- ***Ephemeral Drainage Ditch*** – Similar to a field drain, but with a less well formed channel, lower flows and seasonally dry (other than during prolonged periods of wetter weather or when ground water levels are higher); and,
- ***Storm Drain*** – A ditch that only runs with water following heavy or prolonged rainfall.

47. Using OSNI mapping and the site survey the larger and more important watercourses have been identified on Figures 8.1 and 8.2. Some minor watercourses are also shown, although it has not been possible to illustrate every field drain or ditch.

48. The most significant surface water feature is the River Blackwater and the majority of the study area lies within its catchment. At the northern end of the proposed overhead line, east of Benburb the River Blackwater crosses the study area from west to east, before flowing northwards and eventually draining into Lough Neagh (approximately 8 km downstream the study area).

49. The River Rhone is located north of the substation site and flows in a south-easterly direction ultimately discharging into the River Blackwater at a confluence close to Clonteevy Bridge (at approximately H 870 584).

50. The Ballymartrim Water originates south of the A3 road and flows north along the eastern side of the proposed overhead line, within the study area, draining into the River Blackwater south of Blackwatertown (at approximately H 841 519).

51. The Tynan River (otherwise known as the Balteagh Stream) flows in a northwesterly direction along the eastern side of the proposed overhead line before crossing the study area south of the A3. This watercourse flows into River Blackwater east of Tynan.

52. A tributary of Clontibret Stream flows in a northwesterly direction along the border between Northern Ireland and the Republic of Ireland, on the southern edge of the study area. Clontibret Stream ultimately discharges into Cor River, which then flows into River Blackwater east of Tynan.

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[128] Buried drainage pipes can sometimes be called field drains. This chapter is not using the term in that context.

53. There are also a large number of field drains / ditches (many of which are ephemeral) and storm drains throughout the study area, predominantly along field boundaries and often within hedgerows. Where possible, these were identified and examined during a Watercourse Survey carried out between 4th and 7th of September 2012.

8.3.4 Water Quality - Water Framework Directive

54. The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2003 transpose the Water Framework Directive (WFD) in Northern Ireland. The directive introduced a holistic approach to catchment management with greater emphasis on the ecological status as a broader indicator of river health. The overall objective of the WFD is the '*protection of the water environment*' meaning preventing further deterioration of, and protecting and enhancing, the '*status*' of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on those aquatic ecosystems. Where water bodies have been modified by human activity and are unable to aspire to the standards set for unmodified water bodies, they are set an alternative target of good ecological potential. Good ecological potential will be met when all practical mitigation measures have been implemented.

55. The WFD has resulted in the identification of the River Basin Districts (RBDs) for which River Basin Management Plans (RBMP) have been prepared. When a RBD is transboundary it is termed an International River Basin District (IRBD). The Proposed Development is located in the River Blackwater Local Management Area (LMA) within the Neagh Bann IRBD. The RBMP for the Neagh Bann IRBD identifies the existing condition of the water environment, the pressures placed upon it, the risk of water bodies not achieving the targets of the WFD, and sets out targets and measures to improve the water environment.

56. Table 8.5 summaries the WFD classification (refer to Figure 8.3) and where the watercourses are not achieving good ecological status the reason for this.

Table 8.5 – WFD Surface Waterbody Status, Risk and Objectives

Watercourse	WFD Status / Potential	If not at good status, the reason for not achieving good status	2015 objective
River Rhone UKGBNI1NB030307036	Poor	Due to benthic invertebrates and macrophytes	Moderate (GEP by 2027)
River Blackwater UKGBNI1NB030307132 (River Blackwater stretch from south Derrycaw to Lough Neagh)	Poor	Due to phytobenthos	Moderate (GEP by 2027)
River Blackwater UKGBNI1NB030307027 (River Blackwater stretch from Ballymartrim Water to south Derrycaw)	Poor	Due to phytobenthos	Moderate (GEP by 2027)
River Blackwater Benburb UKGBNI1NB030307043 (River Blackwater stretch from west of Benburb to Ballymartrim Water)	Moderate	Due to benthic invertebrates	Good
River Blackwater UKGBNI1NB030307095 (Tynan Water/Balteagh Stream)	Poor	Due to benthic invertebrates and macrophytes	Moderate (GEP by 2027)
Ballymartrim Water UKGBNI1NB030307045	Poor	Due to benthic invertebrates	Moderate (GEP by 2027)
Clontibret Stream (ROI) UKGBNI1NB030308202	Poor	Due to macroinvertebrates	Moderate (GEP by 2027)

Source: NIEA website 2012 and Blackwater Water Management Unit Action Plan

Key:PEP: Poor Ecological Potential; MEP: Moderate Ecological Potential; GEP: Good Ecological Potential

57. The River Blackwater, Tynan Water, River Rhone, Ballymartrim Water and Clontibret Stream are all classified as currently being at Poor Ecological Status, with the exception of the stretch of River Blackwater from Benburb to Ballymartrim Water which is at Moderate Ecological Status. Their current ecological status is based on benthic invertebrates, macrophytes or phytobenthos, or a combination of these parameters. Good Ecological Status by 2015 is only predicted for the River Blackwater (from Benburb to Ballymartrim Water). This is the only watercourse expected to achieve Good Ecological Status by the end of the first river basin planning cycle in 2015. The other watercourses are not likely to achieve their WFD target until 2027. The reasons for setting alternative objectives are the specific source of the adverse pressure or combination of pressures on each water body, causing deterioration in status, which is yet to be determined. Consequently, a solution cannot be feasibly identified and further investigation is necessary by NIEA. It should be noted that some tributaries of the above watercourses have been incorporated into their WFD classification as shown on Figure 8.3.

58. The major water courses referenced in the preceding section are intersected and linked by many smaller watercourses. Though they are not routinely monitored by the NIEA and no water quality data is publicly available, within this assessment, they have been considered as of local importance. As part of the water quality assessment, a site visit allowed observations of water quality within these water courses to take place. It was concluded that many of these watercourses have been enriched through agricultural sources and experience low flows.

8.3.5 Protected Areas and Fisheries

59. As part of the implementation of the WFD a Register of Protected Areas (RPA) has been compiled by NIEA. Protected areas are those requiring special protection under existing national or European legislation, to protect surface or groundwater, or to conserve habitats or species that directly depend on those waters. Protected Areas are described in Table 8.6.

Table 8.6 - Protected Areas

Protected Area	Comment
Waters used for the abstraction of drinking water	There are no known or recorded water abstractions for potable supplies (i.e. public supply) within the 500 m study area.
Freshwater Fish (e.g. salmonid and cyprinid fisheries)	According to the Freshwater Fish Directive Compliance tables 2003-2006 (NIEA) River Blackwater, Ballymartrim Water, Tynan Water are all designated salmonid fisheries under the Fish (Consolidated) Directive (FCD). River Rhone is designated as a cyprinid river.
Nutrient Sensitive Areas (e.g. Nitrate Vulnerable Zones)	The whole of Northern Ireland has been designated as a Nitrate Vulnerable Zone.
Water dependant Special Protected Areas (SPAs) and Special Areas of Conservation (SACs)	None present within the study area. River Blackwater discharges into Lough Neagh (approximately 10 km downstream the study area) which is an SPA.
Bathing Water	None present. Development area is inland.

Source: http://maps.ehsni.gov.uk/wmuviewer/ accessed September 2012)

60. The River Blackwater, River Rhone, Ballymartrim Water and Tynan Water are all designated under the Fish (Consolidated) Directive (FCD) (please refer to Figure 8.4). River Blackwater, Ballymartrim Water and Tynan Water are designated salmonid rivers whilst River Rhone is a cyprinid designated fishery under this directive. The FCD provides protection to, and seeks to improve, freshwaters in order to support fish life. It sets water quality standards and monitoring requirements for ensuring the protection of coarse and game fisheries. The FCD sets out 14 physical and chemical parameters for which '*imperative*' and / or the more rigorous '*guideline*' standards are given for the two categories of

designation. The NIEA monitors watercourses protected under the FCD and their compliance status has been reviewed for the period between 2003 to 2009 and is presented in Table 8.7. The River Blackwater and Tynan Water have generally been compliant with the FCD at all monitoring locations. The Rhone River has been non-compliant, approximately 600m north-east of the proposed substation downstream the study area, for four out of the seven years monitored, whilst Ballymartrim Water downstream of the study area has been non-compliant in 2007 and 2009, partially compliant in 2006 and compliant in 2003, 2004 and 2008.

Table 8.7 - Watercourse FCD Compliance

Watercourse FCD sampling location	Designation (in 2007)	2003	2004	2005	2006	2007	2008	2009
River Blackwater (at Bonds Bridge H 873 586) Approximately 1.3km downstream of the study area	Salmonid	P [1]	P [1]	P [1]	P [1]	F [2]	P [1]	P [1]
River Blackwater (at Benburb Bridge H 819 520) Approximately 1km upstream of the study area	Salmonid	P [1]	P [1]	P [1]	P [1]	P [1]	P [1]	P [1]
River Rhone (at Clonteevy Bridge H 864 585) Approximately 600m downstream of the study area	Cyprinid	F [2]	F [2]	F [2]	P [1]	F [2]	P [1]	P [1]
Tynan Water (at A28 Road Bridge H 764 446)	Salmonid	P [1]	P [1]	F [2]	P [1]	P [1]	P [1]	F
Ballymartrim Water (at bridge on Artasooly Road H 842 519) Approximately 1km downstream of the study area	Salmonid	-	P [1]	P [1]	F [2] (sanitary) /P [1] (Zinc)	F [2]	P [1]	F [2]

[1] P: Pass (i.e. compliant); [2] F: Fail (i.e. non-compliant)

Source: Freshwater Fish Compliance Tables in Northern Ireland 2003 – 2006 (NIEA, updated August 2010)

61. Further information on aquatic ecology including salmonid interests is contained within Chapter 10, Ecology.

8.3.6 Water Resources

62. NIEA provided data on known water abstraction licences, discharge consents, and water pollution incidents during the past five years. These activities and events have been illustrated on Figure 8.2 and discussed below. Where a record was close to the 500m study area boundary, it has been included in the assessment as a precautionary measure.

63. There is only one water abstraction along the route, just beyond the 500m study area to the east of tower 51 and the overhead line. This abstraction is from the Ballymartrim Water near Ballydoo and the water is used for a hydroelectric scheme and is thus not sensitive to changes in quality. Therefore, it will not be necessary to consider this abstraction any further.

64. There are six known discharge consents within the study area, and a further six just outside of the study area. These include discharges from wastewater treatment works, pumping stations, private sewage, a site for food manufacturing, and site drainage from fuel depots and scrap yards. Although not sources or receptors in their own right, they represent the type of effluent routinely discharged from local farms and businesses into watercourse along the route, and which contribute to their current quality.

65. There are 35 pollution incidents within and just beyond the study area recorded in the past five years. This includes 13 medium and 22 low severity incidents. The majority of pollution incidents relate to discharges from septic tanks and slurry from farms.

8.3.7 Importance of Surface Water Features

66. The importance of the relevant surface water bodies within the study area has been assessed applying the criteria presented in the Methodology Section to the baseline information presented throughout this section. To the north of the Proposed Development is Lough Neagh SPA, which has been designated for breeding waders, the assessment of impacts to Lough Neagh SPA has been conducted through the Habitats Directive Test of Likely Significance (Appendix 10H) and due to its proximity to the site (it is approximately 10km north of the Proposed Development, the impacts associated with the development have been addressed using this platform.

67. The level of importance for each water receptor within the study area and the justification for their classification is compiled in Table 8.8.

Table 8.8 – Importance of Surface Water Features

Surface Water Feature	Justification	Level of Importance
River Blackwater	River Blackwater is designated as a salmonid river under the FCD. There are no protected areas within the study area. The River Blackwater is designated under the WFD (for benthic invertebrates, macrophytes or phytobenthos, plus physico-chemical parameters) and in stretches it is only at Poor Ecological Status. There are also records of otters using the River Blackwater, although no evidence was found during surveys carried out for this project.	Very High
River Rhone	The River Rhone is designated as a cyprinid River under the FCD. There are no protected areas within its catchment. The River Rhone has Poor Ecological Status under the WFD due to benthic invertebrates and macrophytes.	High
Ballymartrim Water	Ballymartrim Water is designated as a salmonid river under the FCD. Due to benthic invertebrates the Ballymartrim Water has a Poor Ecological Status under the WFD.	Very High
Tynan Water/Balteagh Stream	Tynan Water / Balteagh Stream is designated as a salmonid river under the FCD. Due to benthic invertebrates and macrophytes it is considered to have Poor Ecological Status under the WFD.	Very High
Tributary of the Clontibret Stream	No data was available for this tributary so the classification of importance has been based on the Clontibret Stream (into which it flows). The Clontibret Stream is designated by the WFD and is currently at Poor Ecological Status due to macroinvertebrates.	Medium
Unnamed streams and field drains	No data is available for these minor watercourses, some of which are ephemeral or have very limited flow. None are designated under the FCD or WFD, although they may contribute a small amount of flow to larger watercourses within the study area as identified above. In addition, although these minor watercourses may have some local importance in terms of land drainage and water supply for farm animals, during the site visit many were observed to be dry and eutrophic, or have been contaminated with farm slurry waste.	Low

8.4 Potential Impacts

68. The following section considers the potential effects of the Proposed Development on the water environment, taking into account best practice mitigation measures that have been committed to by NIE (please refer to the principles of mitigation described in Section 8.5) and the drainage proposals for the substation.

8.4.1 Construction Phase

8.4.1.1 Overview

69. The construction phase impact assessment is divided into four parts, considering separately the proposed substation, tower locations, stringing operations and guard locations.

8.4.1.2 Substation

70. The construction of the proposed substation, including the removal of an existing 275 kV tower and the construction of two new 275 kV towers, will require the use of heavy plant and machinery on site, earthworks, as well as the temporary storage of construction materials, oils, diesels and chemicals. There is the potential for accidental spillage or release of potentially contaminative construction materials (such as cement, concrete, diesel or hydraulic fluid) directly into field drains in the vicinity of construction activities. It is estimated that there will be 1,200 lorry loads of ready mixed concrete delivered to the site with an estimated maximum of 60 deliveries per day. Such materials also may become mobilised by surface runoff and eventually enter watercourses and impact on water quality. Construction activities associated with land lowering and raising would require extensive earthworks. Surface runoff could mobilise exposed sediment or other construction materials and result in the pollution of nearby waterbodies with sediment and silt. High sediment load in runoff may also arise where dewatering activities are required during excavations.

71. There is the potential that if construction site runoff is left to drain untreated, sediment loaded runoff would discharge to the field drain running northwards to the east of the proposed substation site. Runoff contaminated with high concentrations of silt or oils might eventually discharge into the River Rhone approximately 300 m downstream, although some natural attenuation will be provided by the drainage ditch and the dilution and dispersion potential of the River Rhone will help to reduce any potential adverse effects. Due to the proximity of the minor ditch through the proposed substation site, moderate adverse impacts from silt laden runoff and the risk of chemical spillages are predicted with mitigation taken into account. Providing the mitigation measures as set out later in this Chapter are adopted, the potential effects on the River Rhone from silt laden runoff and spillage risk are slight adverse only.

8.4.1.3 Overhead Line and Towers

72. The following section gives an overview of the construction activities associated with the Proposed Development. The main activities associated with the construction of tower structures are:

- Enabling of access to allow plant, materials and workers on to the tower sites;
- Tower foundation Installation;
- Tower erection; and,
- Installation / stringing of conductors and insulators.

73. The construction of each tower requires the installation of concrete foundations typically in the corners of a maximum foundation size of 20 m by 20 m. It also requires a winch (known as a floating derrick) to

lift the tower components into place. The construction process uses standard techniques and is limited in its extent at each tower location (with ready mixed concrete being delivered to site via dumper trucks from where the readymix concrete lorry can safely access). The excavation of earth for foundations and the movement of plant and vehicles will increase the potential for runoff to contain fine particulates, and potentially oils and other substances (concrete). Many of the watercourses that may be impacted are small with limited dilution and dispersion potential, and as works may be required in close proximity to them they would be sensitive to changes in water quality.

74. To reduce the risk to all watercourses, an exercise to identify watercourses (including where possible any ephemeral ditches) has been undertaken. This survey information has informed the design and the location of towers so that they are as far away from any watercourse as possible. Of the 102 tower locations, the construction of 89 tower locations are considered not to pose any risk to the surface water environment, providing that best practice mitigation described in Section 8.5.1 is applied. This includes those sites where the construction working area will be temporarily stoned upon a geotextile / geogrid base (please refer to Chapter 5 Proposed Development). The remaining 13 tower locations have been assessed in more detail below to determine any adverse effects from physical disturbance, contaminated site runoff and spillages of chemicals and fuel that may occur. Further details of proposed mitigation also appear in Section 8.5.1.

75. Construction activities associated with erection of the overhead line would be short term and transient in nature, occurring along the entire length of the proposed overhead line route. At any particular location along the overhead line route construction activities would take between four and six months.

Tower 4

76. Please refer to Figure 8.2 Sheet 1. The angle tower location is in the corner of a marshy grassland field, which is generally flat. Waterlogged ground conditions are indicated by the vegetation type with a stagnant drainage ditch, which appeared to be exhibiting eutrophic nutrient conditions, running north along the field boundary to the west of the tower location. Artificial drainage has been installed along the southern edge of the field adjacent to the existing gravel access track as indicated by the presence of concrete man hole covers, although no works should affect this directly.

Illustration 8.1: Photograph facing north from nearby access track along the course of a field drain (tower would be located in the field on the right hand side of the photograph)

77. The angle tower will be located in the marshy area, but will be over 9 m from the ditch at its closest approach. This is sufficiently far that direct impacts on the ditch will be avoided. However, the ditch may be polluted by construction runoff during the installation of the tower.

78. As this is an angle tower, the position of the tower has been determined by a range of environmental and engineering constraints. Mitigation measures including barrier controls (such as a silt fence or an existing riparian buffer zone. Please refer to 'Site Specific Measures' in Section 8.5.1 later in this chapter and site specific working practices (as detailed in a Silt Management Plan – See the Outlined CEMP in Appendix 5A) are required to prevent this ditch being polluted during the works. Ground erosion and fine particulate pollution will be minimised by the placement of prewashed stone hardcore as a temporary construction surface. Construction activities will avoid the ditch with equipment, spoil, and plant being located to the south and east of the tower (within the planning application boundary) away from the ditch (any stockpiled earth should be stored to the east of the tower). The flat topography will assist with the management of construction runoff and a buffer strip at least a few metres wide marked out by a silt fence, or other barrier that will be provided. Refuelling will not be permitted in close proximity (i.e. 30 m) to any watercourse / ditch or on steep slopes. Spill kits and other spillage containment equipment (absorbent pads, sand, and river booms) will also be available on site. Providing these measures are taken, no adverse effects are predicted.

<u>Tower 20</u>

79. Please refer to Figure 8.2 Sheet 3. Tower 20 is located on a hedgerow that runs parallel to a field drain that is a tributary of the River Blackwater. It has been determined that an ephemeral ditch is present at this location. To construct the foundations will require the ephemeral ditch to be diverted slightly between the legs of the tower, which will result in a temporary moderate adverse impact as there is also an associated pollution risk. Construction activities will be located to the north and south (i.e. away from the hedgerow, but within the associated works planning application boundary (herein referred to as 'planning application boundary')) with any ephemeral ditch temporarily '*stoppered*' up to prevent it becoming a conduit to the field drain at the bottom of the slope for contaminated construction site runoff. Barrier controls as described in Section 8.5.1.3 will also be required to prevent any construction site runoff running overland towards this drain in heavy rain conditions. Refuelling will not be permitted in close proximity (i.e. 30 m) to any watercourse / ditch or on steep slopes. Spill kits and other spillage containment equipment (absorbent pads, sand, and river booms) will be available on site.

80. During construction, there will be a temporary impact to the adjacent ditch, although the risk of pollution to watercourses downstream can be effectively managed providing appropriate mitigation measures are implemented (section 8.5). It is intended to reinstate the ephemeral ditch broadly on the same course and profile to maintain current drainage profile or better.

<u>Tower 21</u>

81. Please refer to Figure 8.2 Sheet 3. Similarly Tower 21 is located on a hedgerow that runs in a north-north-east direction towards a tributary of the River Blackwater. It has been determined that an ephemeral ditch is present at this location. To construct the foundations will require the ditch to be diverted slightly (between the legs of the tower), which will result in a temporary moderate adverse impact. There is also an associated pollution risk in the absence of mitigation. Construction works will be located to the north and south (i.e. away from the hedgerow but still within the planning application) with the assessed ephemeral ditch temporarily '*stoppered*' up to prevent it becoming a conduit to the field drain at the bottom of the slope for contaminated construction site runoff. Barrier controls as described in Section 8.5.1.3 will also be required to prevent any construction site runoff running overland towards this drain in heavy rain conditions. Refuelling will not be permitted in close proximity (i.e. 30 m) to any watercourse / ditch or on steep slopes. Spill kits and other spillage containment (absorbent pads, sand, and river booms) equipment will be available on site.

82. During construction, there will be a temporary impact to the adjacent ditch, although the risk of pollution to watercourses downstream can be effectively managed providing appropriate mitigation measures are implemented. It is intended to reinstate the ephemeral ditch broadly on the same course and profile to maintain current drainage profile or better.

Tower 28

83. Please refer to Figure 8.2 Sheet 3. The tower is located in a narrow flat grass field close to two mature boundary hedgerows. The assessment is based on the presence of a small ephemeral ditch along the southern boundary of the field (far end of Illustration 8.2). To minimise any risk, the tower has been relocated from the hedgerow to the south further into the field. However, the south-western concrete foundation will be installed within a few metres of the hedgerow and the assessed ephemeral ditch. Ground erosion and fine particulate pollution will be minimised by the placement of prewashed stone hardcore as a temporary construction surface. Stone material will be prevented from falling into the ephemeral ditch and all stone will be removed at the end of the construction period.

Illustration 8.2 Tower 28 would be located close to the hedgerow at the far end of the field in this view

84. Direct physical impacts to the ditch have been assessed as of neutral residual impact because the ephemeral ditch is of low importance and the Proposed Development will have a minor adverse impact upon it.

85. A temporary minor adverse impact from silt laden construction runoff / fine particulates from stone hardcore, erosion of the ditch, and spillages of concrete is predicted with mitigation, that is not significant (see 'Site Specific Mitigation' in Section 8.5.1) .

Tower 33

86. Please refer to Figure 8.2 Sheet 4. The land is relatively flat around Tower 33 with slopes rising to the west to a drumlin. There is a small field drain to the east that flows north into the River Blackwater a short distance away. It is considered that with the gentle topography that construction site runoff will run downslope to the east into the small field drain approximately 25 m away to the east. The concrete foundations for this angle tower will be located on either side of the east-west trending hedgerow, and although there would be some physical disturbance to an ephemeral ditch, resulting in a temporary adverse impact, since the ditch will be restored post construction (the effect of which is recorded in the operation phase assessment) no significant long term adverse impact will occur.

87. Ground erosion and fine particulate pollution will be minimised by the placement of prewashed stone hardcore as a temporary construction surface. Stone material will be prevented from falling into the ephemeral ditch through geotextile matting and all stone will be removed at the end of the construction period.

88. Construction works will be located to the north and south (away from the hedgerow, but within the planning application boundary) with the assessed ephemeral ditch temporarily '*stoppered*' up to prevent it becoming a conduit for contaminated construction site runoff to the field drain and the River Blackwater. Barrier controls will also be required to prevent any construction site runoff running overland towards this drain in heavy rain conditions. Refuelling will not be permitted in close proximity (i.e. 30 m) to any watercourse / ditch or on steep slopes. Spill kits and other spillage containment equipment will be available on site. Despite the application of mitigation measures, it is predicted that the assessed ephemeral ditch will be temporarily impacted (slight adverse) during construction, although the risk of pollution to the Blackwater River further downstream would be mitigated by implementing the mitigation measures set out later in this chapter.

Tower 44

89. Please refer to Figure 8.2 Sheet 5. The assessment is based on the presence of an ephemeral drain in the hedgerow (to the south and west) that would be affected by the proposed tower. During construction, the installation of foundations is likely to have a temporary moderate adverse impact upon any channel and this will need to be restored afterwards. Since the foundations will straddle the hedgerow it is considered appropriate that this hedgerow and any ditch that exists will be restored.

90. There is also the slight possibility that this ditch could act as a preferential pathway for polluted water to enter the tributary of the Ballymartrim Water which flows just to the west. Therefore, any ephemeral ditch should be temporarily '*stoppered*' up during the construction works to prevent it becoming a conduit for contaminated construction site runoff. Barrier controls as described in Section 8.5.1.3 may also be required to prevent any construction site runoff running overland towards this drain in heavy rain conditions. Refuelling will not be permitted in close proximity (i.e. 30 m) to any watercourse / ditch or on steep slopes. Spill kits and other spillage containment equipment will be available on site. With the implementation of these measures, pollution risk to the tributary of the Ballymartrim Water downstream will be avoided.

Tower 48

91. Please refer to Figure 8.2 Sheet 5. Tower 48 is located on a hedgerow that runs perpendicular to a field drain (approximately 60 m to the west) that is a tributary of the Ballymartrim Water. It has been determined that there is an ephemeral ditch in this hedgerow that may drain west towards this field drain.

92. To construct the foundations will require the ditch to be diverted slightly between the legs of the tower, resulting in a temporary moderate adverse impact. There is also a pollution risk that will need to be managed at this tower location. Construction works will be located to the north and to the south (i.e. away from the hedgerow on either side, but within the planning application boundary) with the ephemeral ditch temporarily '*stoppered*' up to prevent it becoming a conduit for contaminated construction site runoff to the field drain and thence to the Ballymartrim Water. Barrier controls (see section 8.5.1) will also be required to prevent construction site runoff running overland towards this drain in heavy rain conditions. Refuelling will not be permitted in close proximity (i.e. 30 m) to any watercourse / ditch or on steep slopes. Spill kits and other spillage containment equipment will be available on site.

93. During construction, there will be a temporary slight adverse impact on this ditch, although the risk of pollution to watercourses downstream can be effectively managed providing appropriate mitigation measures are implemented. The ephemeral ditch will be reinstated as far as practically possible along the same course and profile once the work has been completed (this is considered in the operational phase impacts assessed below).

Tower 62

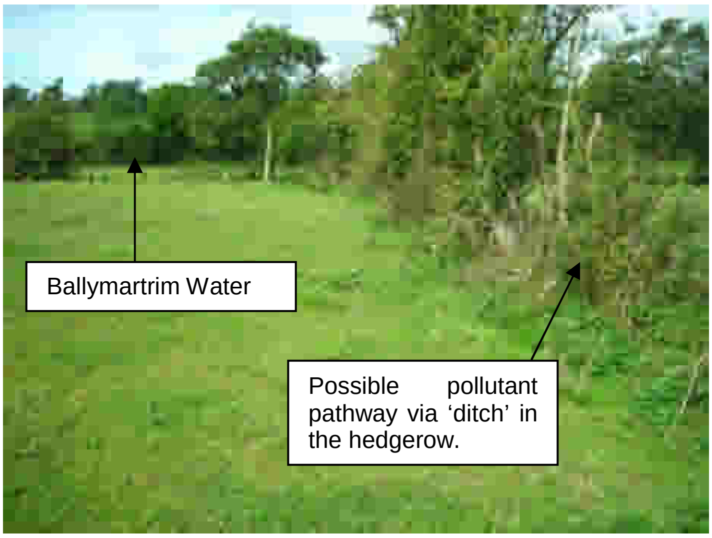
94. Please refer to Figure 8.2 Sheet 6. This location is flat and there is the possibility that the tree and shrub hedgerow contains a very shallow storm drain, although the poor channel formation means that it

cannot be considered a functioning watercourse. However, it may provide a conduit by which construction site runoff can drain to the Ballymartrim Water, within 25m of the tower location to the west.

95. Ground erosion and fine particulate pollution will be minimised by the placement of prewashed stone hardcore as a temporary construction surface. Stone material will be prevented from falling into the ephemeral ditch and all stone will be removed at the end of the construction period.

96. To avoid this watercourse being polluted the ditch will have straw bales installed, to act as particulate filters. Barrier controls and spillage prevention measures as set out in Section 8.5 will be applied. This will be a neutral impact.

Illustration 8.3 Tower 62 would be located on the hedgerow to the right on this photograph



Tower 68

97. Please refer to Figure 8.2 Sheet 7. This proposed angle tower lies on a hedgerow in a grass field with gently sloping sides. Access was not possible at the time of the survey so observations were made from a nearby highway. Since the tower is located across a hedgerow approximately 10 m east of a tributary to the Ballymartrim Water, a precautionary approach was taken, which dictated the site should be assessed for the likely significant effects to the ephemeral ditch.

Illustration 4 Tower 68

98. The construction of concrete foundations will require the slight diversion of any ephemeral ditch that is present, resulting in a temporary moderate adverse effect since the ditch would be reinstated (which is assessed in the operational phase).

99. Ground erosion and fine particulate pollution will be minimised by the placement of prewashed stone hardcore as a temporary construction surface. Stone material will be prevented from falling into the ephemeral ditch through the use of geotextile matting and all stone will be removed at the end of the construction period.

100. There is also a pollution risk that will need to be managed at this tower location. Construction works will be located to the northeast and southeast (i.e. away from the tributary of the Ballymartrim Water, but within the planning application boundary) with any ephemeral ditch temporarily '*stoppered*' up to prevent it becoming a conduit to the field drain at the bottom of the slope to the west for contaminated construction site runoff. Barrier controls will also be required to prevent any construction site runoff running overland towards this drain in heavy rain conditions. Refuelling will not be permitted in close proximity (i.e. 30 m) to any watercourse / ditch or on steep slopes. Spill kits and other spillage containment equipment will be available on site. With the implementation of these measures, any significant pollution risk to the assessed ditch, and the watercourse downstream, will be avoided.

101. During construction, there will be a temporary adverse impact on this ditch, although the risk of pollution to watercourses downstream can be effectively managed providing appropriate mitigation measures are implemented. The assessed ephemeral ditch will be permanently diverted broadly on the existing course (within the associated works planning application boundary) and profile as close to the existing course once the work has been completed (please refer to the operational phase impacts assessment later in this Chapter). There will be a slight adverse impact.

<u>Tower 78</u>

102. Please refer to Figure 8.2 Sheet 7. As a precautionary measure, it has been assessed that an ephemeral ditch present at this tower location. During construction, the installation of foundations is likely to have a temporary moderate adverse impact upon any channel and this will need to be restored afterwards. The foundations will straddle the hedgerow and post-construction restoration of the site will include ditch reinstatement. Ground erosion will be minimised by the placement of stone hardcore as a temporary construction surface, which will be pre-washed to minimise introducing fine particulates. Stone material will be prevented from falling into the ephemeral ditch through the use of geotextile matting and all stone will be removed at the end of the construction period.

103. The ephemeral ditch will be temporarily '*stoppered*' up to prevent it becoming a conduit to the field drain at the bottom of the slope for contaminated construction site runoff. Barrier controls (see section 8.5.1) will also be required to prevent any construction site runoff running overland towards this drain in heavy rain conditions. Refuelling will not be permitted in close proximity (i.e. 30 m) to any watercourse / ditch or on steep slopes. Spill kits and other spillage containment equipment will be available on site. Providing these measures are implemented it should be possible to avoid any significant pollution risk to watercourses downstream.

Tower 79

104. Please refer to Figure 8.2 Sheet 8. The proposed tower is located in a tree lined hedgerow with no obvious ditch, although there is a small field drain approximately 15 m downslope. The field drain is less than 1 m wide, slightly incised into the ground, and appears to be enriched.

Illustration 8.5 Tower 79 would be located along the hedgerow running down the slope in the centre of this Photograph

105. Construction works will be located as much as possible to the south (but within the planning application boundary) where the land is relatively flatter and which will reduce the risk of runoff flowing towards the drain. Barrier controls will be required to prevent any construction site runoff running overland towards this drain in heavy rain conditions. Refuelling will not be permitted in close proximity (i.e. 30 m) to any watercourse / ditch or on steep slopes. Spill kits and other spillage containment equipment will be available on site. With the implementation of the proposed measures, any significant pollution risk to watercourses downstream will be avoided.

Tower 81

106. Please refer to Figure 8.2 Sheet 8. An ephemeral ditch has been assessed at this tower location. During construction, the installation of foundations is likely to have a temporary moderate adverse impact upon any channel and this will need to be restored post construction. The foundations will straddle the hedgerow and post construction site restoration will include ditch reinstatement, but during construction a temporary moderate adverse impact is predicted due to the direct impact upon this watercourse that will occur.

107. Any ephemeral ditch will be temporarily '*stoppered*' up to prevent it becoming a conduit to the less than 4m wide stream running at the bottom of the slope for contaminated construction site runoff. During ecological surveys the stream was observed as having a pebble bed and thus it may provide suitable

habitat for local populations of fish. It will therefore be important to avoid silt contamination of this watercourse and barrier controls may also be required to prevent any construction site runoff running overland towards this drain in heavy rain conditions. Refuelling will not be permitted in close proximity (i.e. 30 m) to any watercourse / ditch or on steep slopes. Spill kits and other spillage containment equipment will be available on site. With the implementation of the proposed measures, any pollution risk to watercourses downstream will be avoided.

Tower 87

108. Please refer to Figure 8.2 Sheet 8. The proposed tower is located on a steep east facing slope and the assessment has taken into account the presence of an ephemeral ditch at this location. During construction, the installation of foundations is likely to have a temporary moderate impact upon the ephemeral ditch, which will be restored post construction.

109. Any ephemeral ditch will be temporarily '*stoppered*' up to prevent it becoming a conduit to the field drain at the bottom of the slope for contaminated construction site runoff. Barrier controls (see section 8.5.1) will also be required to prevent any construction site runoff running overland towards this drain in heavy rain conditions. Refuelling will not be permitted in close proximity (i.e. 30 m) to any watercourse / ditch or on steep slopes. Spill kits and other spillage containment equipment will be available on site. With the implementation of the proposed measures, any significant pollution risk to watercourses downstream will be avoided.

8.4.1.4 Access Tracks and Tower Working Areas

110. All temporary access tracks will use existing farm accesses and tracks. Some ground levelling will be needed before construction of the tower on undulating pasture. In areas of very wet ground aluminium Trackway will be used where the weight of the road and plant will be spread by a geogrid across a wider area. Temporary access tracks will be removed following completion of the works

111. In order to minimise impacts to the land, 53 access tracks will be stoned or partially stoned with 100mm stone (Aluminium Trackways may also be used – see Chapter 5 Proposed Development for further details) placed on top of a geogrid or geotextile. Stoned tracks will be 3 m wide and runoff will drain to the verge. The stone will be sourced as 'washed' to minimise introducing a source of fine particulates.

112. There will be no new watercourse crossings, as existing crossing points will be used. Access tracks have been designed where possible to be at least 5 m from watercourses, other than where existing tracks are closer or at crossing points.

113. There may be the need to slightly widen the existing field access at 59 tower access locations (see Chapters 5 and 18 of this ES). As a precautionary approach, it has been assumed that a low importance ditch exists at all these access locations. Widening of these crossings may require the increasing the length of any existing culverts. Although only a short section of any ditch will need to be temporarily culverted, this will have a moderate adverse effect on any ditches present.

114. Of the larger watercourses (i.e. not including ephemeral ditches and field drains), there are only two locations where the access track runs close to a watercourse for a relatively long distance. This includes the access to Tower 37, and the access to Towers 38 and 39. In these locations silt fencing or other suitable barriers (such as existing riparian buffer zones or grass strips) will be provided to prevent fine particulates that may wash off the temporary tracks following rainfall into the watercourse. Temporary access tracks will be removed following completion of the works. Access 62SL crosses the Ballymartrim Water but no works to the existing bridge are required.

115. Chapter 5 (Proposed Development) and Chapter 18 (Transport) outline the approach to be taken to the widening of access points. If it is determined by the Department that temporary traffic measures are not to be used, existing accesses could be temporarily enlarged to accommodate the larger types of construction vehicles. A precautionary approach has been taken which assessed for the presence of low importance ditches at all access locations. Widening of these crossings may require the increasing the length of any existing culverts. Although only a short section of any ditch will need to be temporarily culverted, this will have a moderate adverse effect on any ditches present.

8.4.1.5 Stringing Locations

116. The stringing operation (see Chapter 5 Proposed Development for details) requires the use of static plant and associated vehicles at angle towers. It is a non-intrusive operation and the only risk to watercourses is from a spillage of plant oil or fuel. This will be limited by the size of the fuel tank of the largest plant / vehicles used on the site, thus there is a relatively low risk from these works. In addition, the risk can be controlled by good working practices and the implementation of an effective pollution prevention plan all as outlined in the Outline CEMP (Appendix 5A). Where possible, stringing locations have been sited to avoid watercourses, but this is not always possible as their locations have been determined by the position of angle towers. Where watercourses are close by, spillage prevention measures (as described in 'Site Specific Measures' later in this chapter) will be implemented. No adverse effects to any watercourses are predicted from stringing activities, but as a guide to the implementation of appropriate mitigation measures, all angle tower locations have been reviewed in Table 8.9 to identify those close to known watercourses and drainage ditches.

Table 8.9 – Watercourses and Stringing Locations

Angle Tower	Watercourse nearby and mitigation requirements (as described in the mitigation section of this Chapter)
AT1	Close to a field drain, but which will be lost following construction of the substation.
AT2	East stringing arm close to a drain and appropriate barrier controls will be implemented.
AT3-4-5-6	There are numerous drains in this location and mitigation measures will be implemented.
AT7	Stringing will be above a field drain and appropriate controls for works above water will be implemented.
AT8-9	There are no watercourses sufficiently close to be affected.
AT13	Northern stringing arm close to a ditch and appropriate mitigation will be implemented.
AT16-17	There are no watercourses sufficiently close to be affected.
AT19	There are no watercourses sufficiently close to be affected.
AT22-23	Southern arm requires works above a field drain and appropriate mitigation will be implemented.
AT26	There are no watercourses sufficiently close to be affected.
AT27-28	There are no watercourses sufficiently close to be affected.
AT33	There are no watercourses sufficiently close to be affected.
AT37	No watercourse sufficiently close to be affected, but access close to Ballymartrim Water since existing access through the hedgerow is being used.
AT37-38-39	There are no watercourses sufficiently close to be affected.
AT41	There are no watercourses sufficiently close to be affected.
AT46	There are no watercourses sufficiently close to be affected.
AT49	Requires works above a field drain, although this is within an old railway cutting and is already protected. Barrier controls to protect from spillages will be implemented.
AT52	There are no watercourses sufficiently close to be affected.
AT55	There are no watercourses sufficiently close to be affected.
AT58	There are no watercourses sufficiently close to be affected.
AT62	Southern stringing arm close to the Ballymartrim Water and appropriate mitigation will be implemented.
AT68	Stringing location is relatively close to a watercourse but there is sufficient distance to avoid any adverse effects without mitigation.
AT71	There are no watercourses sufficiently close to be affected.
AT74	There are no watercourses sufficiently close to be affected.
AT76	There are no watercourses sufficiently close to be affected.
AT81	Southern stringing arm close to field drain and appropriate barrier controls will be implemented.
AT83	There are no watercourses sufficiently close to be affected.
AT85	There are no watercourses sufficiently close to be affected.
AT89	Stringing location is close to a tributary of the Tynan Water and appropriate barrier controls will be implemented.
AT97	There are no watercourses sufficiently close to be affected.
AT102	Stringing location is close to a tributary of the Clontibret Stream and appropriate barrier controls will be implemented.

8.4.1.6 Guarding Locations and their Access Tracks

117. Guards are temporary structures that may consist of scaffolding, poles or telehandlers that are put in place to protect sensitive locations (roads and the River Blackwater) on the ground from line works above. Guards are to be provided for the crossing of the River Blackwater, between which will be hung a suitable netting to prevent any inert materials from falling into the channel.

118. All other watercourses along the route of the overhead line are relatively small with channel widths less than a few metres. Therefore, there is no need to provide guards and netting for these as should any inert material fall into their channels it could easily be recovered without having any adverse effect on the watercourse.

8.4.1.7 Linwoods Bioremediation Willow Plantation

119. In 2007, the Linwoods Food Manufacturing Plant installed a 12.9 hectare willow plantation to treat effluent, subject to a discharge consent enforced by the NIEA. The plantation filters effluent from the Linwoods plant through formal blocks 0.5 ha in size of willow coppice, with each zone automatically irrigated with effluent depending on prevailing soil temperature, soil moisture, rainfall, zone irrigation and volume history. The system includes a complex network of irrigation pipes, storage tanks, pumps, filters and valves. Through liaison with the landowner and contractors, a construction methodology will be proposed to avoid impact upon the operation of the site, or provide alternative means by which the effluent currently treated by the system can be temporarily disposed off in accordance with the facilities discharge consent. This will ensure there is no significant impact to water quality downstream of the treatment area.

8.4.1.8 Summary of Construction Effects

120. Table 8.10 summarises the impact assessment of the construction phase:

Table 8.10 – Summary of Construction Effects

Impact	Aspect of the Works	Waterbodies Potentially Affected	Importance of Waterbody	Impact Assessment with Mitigation		
				Duration of Effect	Magnitude of Effect	Significance of Effect
Silt contaminated construction site runoff (multiple sources)	Turleenan Substation	Drainage ditch	Low	Short term	Moderate Adverse	Slight Adverse
		River Rhone	High	Short term	Minor Adverse	Slight Adverse
	Towers 4	Ephemeral Ditch	Low	Short term	Negligible	Neutral
	Towers 20, 21, 28, 33, 44, 48, 68, 78, 81, and 87	Ephemeral Ditch	Low	Short term	Minor adverse	Neutral
	Tower 62	Ballymartrim Water	Very High	Short term	Negligible	Neutral
	Towers 79, 81 and 87	Minor streams / field drains	Low	Short term	Negligible	Neutral
	All other towers	Various	Low-High	Short term	Negligible	Neutral
Direct chemical / fuel spillages and contaminated construction site runoff	Turleenan Substation	Drainage ditch	Low	Short term	Moderate Adverse	Slight Adverse
		River Rhone	High	Short term	Minor Adverse	Slight Adverse
	Tower 4	Ephemeral Ditch	Low	Short term	Negligible	Neutral
	Towers 20, 21, 28, 33, 44, 48, 68, 78, 81, and 87	Ephemeral Ditch	Low	Short term	Minor adverse	Neutral
	Tower 62	Ballymartrim Water	Very High	Short term	Negligible	Neutral
	Towers 79, 81 and 87	Minor streams / field drains	Low	Short term	Negligible	Neutral

Impact	Aspect of the Works	Waterbodies Potentially Affected	Importance of Waterbody	Impact Assessment with Mitigation		
				Duration of Effect	Magnitude of Effect	Significance of Effect
	All other towers	Various	Low-High	Short term	Negligible	Neutral
Physical effects to morphology of watercourse from construction of towers	Towers 20, 21, 33, 44, 48, 68, 78, 81, and 87	Ephemeral Ditches	Low	Short term	Moderate adverse	Slight Adverse
	All other towers	No watercourses affected				
Physical effects to morphology of watercourse from widening field access	59 locations	Ephemeral Ditches	Low	Short term	Moderate adverse	Slight Adverse

8.4.2 Operational Phase

121. Once construction is complete there will be very few ongoing activities at the proposed substation except for regular inspections and maintenance on an '*as required*' basis. However, the substation will occupy an area of approximately 22,600 m^2 and there is the potential for adverse effects during operation relating to contaminated runoff and fuel and chemical spillages.

122. It is anticipated that runoff from new impermeable surfaces may contain low quantities and concentrations of particulates, oils, heavy metals and organic debris, and therefore runoff represents only a low risk to the water environment. A Surface Water Management Strategy (Chapter 18 Flood Risk Assessment) has been prepared for the substation. Site drainage will be collected via filter drains and combined with intercepted field drainage, before being passed through oil interceptors into a storage and settling pond. This pond will overflow into a small drainage ditch, which flows north and joins the River Rhone approximately 300m away.

123. The proposed drainage system will provide multiple barriers to treat runoff before it is discharged from the site. In the event of an extreme flood event, the location of the pond will not be subject to high velocity flood waters as, due to the distance from the main river the floodplain function is primarily for storage, therefore, the potential for any mobilisation is minimal. In addition, the impact from the pond in a 1-in-100 year flood event is considered to be insignificant. If material was mobilised under storm conditions, the receiving watercourse will also be in spate and will have elevated suspended sediment concentrations. Any contaminants that are mobilised from the treatment pond will be rapidly dispersed, short term and are very unlikely to become bio-available to aquatic organisms.

124. Operations on the substation site will be carried out in accordance with NIE's environmental guidance and industry best practice (see Appendix 5A for the Outline CEMP) incorporating pollution prevention measures and spill kits. Other spillage management equipment will be stored on site in strategic locations and kept in good working order. A serious spillage is unlikely since all transformers will be housed within bunded areas with firewalls. However, in the event of a serious spillage, it will be possible to shut off the oil interceptors to retain the spill on site. If this containment is not possible, and as a last resort, any spillage that occurs would be contained with the storage pond, thus preventing it from entering the receiving watercourse. The proposed drainage arrangements provide treatment of pollutants that may be found in runoff in low quantities, as well as providing multiple barriers to prevent spillages from escaping and polluting the nearby watercourse. No impact on the minor tributary of the River Rhone is predicted.

125. A small number of staff will make occasional visits to the substation for inspection purposes and in the absence of any nearby foul sewer it is proposed that welfare facilities will discharge via a septic tank to a soakaway. The tank will be appropriately designed and sized and will provide adequate treatment of the low volumes of foul flows expected. As the discharge from the septic tank will be to a soakaway, it will not impact on any surface water body.

126. During the operation phase, each tower will become a passive feature on the landscape in terms of surface water quality (i.e. they will not exert any physical effect on watercourses or result in any discharges). Routine maintenance of vegetation and the tower will be required. These activities will not require the use of heavy plant or equipment, and the site can be accessed by a 4 x 4 vehicle or on foot. Therefore, once installed and operational, the towers will not result in any deterioration of water quality or have any long term continuous adverse impact on the morphology of any watercourse. Thus, no significant long term effects on the water environment are predicted.

8.4.2.2 Summary of Operation Effects

127. Table 8.11 summarises the impact assessment of the construction phase:

Table 8.11 – Summary of Operation Effects

Impact	Aspect of the Works	Waterbodies Potentially Affected	Importance of Waterbody	Impact Assessment with Mitigation		
				Duration of Effect	Magnitude of Effect	Significance of Effect
Reinstatement of ephemeral drainage ditches	Towers 20, 21, 33, 44, 48, 68, 78, 81, and 87	Various possible ephemeral ditches	Low	Long term, permanent	Moderate beneficial	Slight Beneficial
Reinstatement of ditches temporarily culverted for widened field access	59 locations	Ephemeral Ditch	Low	Long term, permanent	Moderate beneficial	Slight Beneficial
Site runoff	Substation	Drainage ditch	Low	Long term, permanent	Negligible	Neutral
		River Rhone	High	Long term, permanent	Negligible	Neutral
Oil Spillages	Substation	Drainage ditch	Low	Long term, temporary	Negligible	Neutral
		River Rhone	High	Long term, temporary	Negligible	Neutral
Tower site runoff	Maintenance of all towers	Various	Low to High	Short term, temporary	Negligible	Neutral

8.5 Mitigation Measures

8.5.1 Construction Phase

8.5.1.1 Overview

128. The Proposed Development, particularly the location of towers, is designed wherever possible to avoid watercourses. Where this was not possible, site specific mitigation to adequately protect watercourses will be provided. These are detailed in this chapter. In addition to following all good practice guidance, the CEMP will be implemented by the Contractor (to be appointed) to ensure adequate protection of the water environment. The terms of the construction contract will require the Contractor to deliver all the mitigation measures contained within this ES. To this end an Outline CEMP has been included in this ES (Appendix 5A). A site induction will be undertaken in order to brief site workers of the requirements of the CEMP and highlight the measures to be followed when working near watercourses.

129. Mitigation measures have been identified and developed to address the potential effects on the water environment as identified in Section 8.4. These measures seek to minimise or reduce potential

adverse effects, principally through the implementation of good practice construction methods and adherence to all relevant legislation. Opportunities for enhancements are limited, other than where there is a need for the reinstatement of ephemeral drainage ditches following the installation of the tower.

130. Where there was no access during the hydrological survey or where there remains some uncertainty regarding the presence of an ephemeral ditch, a pre-construction survey will be undertaken to inform the development if site specific mitigation from the range of measures described in this Section is required. Such measures will be in keeping with the mitigation principles set out in this ES chapter and the general information provided.

131. The extent of mitigation that will be required at each tower location will vary slightly according to the proximity of surface water receptors and the nature of the site (angle of any slope, vegetation cover). All watercourses, irrespective of their size and importance (salmonid rivers), will be treated the same since it is an offence to pollute any controlled waters. Although every effort has been made to identify the presence of watercourses, due to size of the study area, the linear nature of different aspects of the proposed construction works (access tracks), and the seasonal nature of some watercourses, there may be other drains that have not been identified. The assessment has applied a precautionary principle where site data may be limited and mitigation options have been developed which will enable any potential impact on drains to be addressed. Mitigation measures have been set out to prevent pollution occurring in all locations

132. Runoff from the site will not be allowed to drain directly into any watercourse and would be treated using measures to filter or settle silt. Silt management (barrier control) measures will be made to collect and treat drainage from the working areas in order to remove sediments and other contaminants before discharging to surface watercourses. These measures include silt traps, silt fences, filter strips, straw bales and swales as appropriate. The mitigation measures will be positioned within the planning application boundary as close to the working areas as possible. In this way the measures will prevent siltation of the watercourses.

8.5.1.2 Pollution Prevention Guidance

133. In order to mitigate likely significant impacts during the construction phase, all works associated with the construction of both Turleenan substation and the proposed overhead line will be undertaken with due regard to the DCAL / NIEA good practice guidance (PPGs) documents and other good practice guidance such as that published by Construction Industry Research and Information Association (CIRIA). The construction of the Proposed Development will be in accordance with good practice set out in the following documents:

- DCAL (believed to have been published in 2009 but the document is un-dated) Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites;
- CIRIA Report 650 (2010) Environmental Good Practice on site (3rd Edition);
- CIRIA Report 697 (2007) The SuDS Manual;
- CIRIA Report 648 (2006) Control of Water Pollution from Linear Construction Projects – Technical Guidance;
- CIRIA Report 521 (2000) SuDS – Design Manual for Scotland and Northern Ireland;
- BS6031:1981 Code of Practice for Earth Works;
- Northern Ireland Environment Agency (NIEA) (2004) Getting Your Site Right: Industrial and Commercial Pollution Prevention; and
- NIEA Pollution Prevention Guidelines (PPG), the most relevant being:
- PPG 1 – General Guide to the Prevention of Pollution (no date);
- PPG 2 – Above Ground Oil Storage Tanks (August 2011);
- PPG 3 – Use and Design of Oil Separators in Surface Water Drainage Systems (April 2006);

- PPG 4 – Treatment and Disposal of Sewage Where No Foul Sewer Is Available (July 2006);
- PPG 5 – Works or Maintenance In, or Near Watercourses (October 2007);
- PPG 6 – Pollution Prevention Guidance for Working at Construction and Demolition Sites (April 2010);
- PPG 7 – Refuelling Facilities (July 2011);
- PPG 8 – Safe Storage and Disposal of Used Oils (February 2004);
- PPG 13 – Vehicle Washing and Cleaning (July 2007);
- PPG 18 – Managing Fire Water and Major Spillages (no date);
- PPG 21 – Pollution Incidence Response Planning (March 2009);
- PPG 22 – Dealing with spills (April 2011); and
- PPG 26 - Storage and Handling of Drums and Intermediate Bulk Containers (May 2011).

8.5.1.3 Consents and Licences

134. Appropriate consents will be required for works affecting watercourses and construction work will need to comply with any conditions imposed. Applications for appropriate permits will be made following detailed design and development of the temporary works. All consents, permits and licences will be in place prior to commencement of any works at the relevant site.

135. Any proposals that involve interference with any watercourses, such as diversion, culverting or bridging, or the temporary discharge of site drainage to any watercourse, require written consent from the Rivers Agency. NIEA and the Rivers Agency will be consulted during the detailed design stage if any work is required near a watercourse. Failure to obtain the necessary approval is an offence under the Drainage (Northern Ireland) Order 1973. Consent from the Rivers Agency should be obtained before placing structures in any waterway that are likely to affect its drainage. Under the Water (Northern Ireland) Order 1999 (as amended) it is an offence to '*knowingly or otherwise discharge or deposit material in a waterway or groundwater without consent'*. Where discharges of any trade or sewage effluent to any waterway, or any water contained in underground strata are required, appropriate consents will be sought from NIEA prior to commencing any works.

136. DCAL Inland Fisheries has overall policy responsibility for the supervision and protection of salmon and inland fisheries, and from the establishment and development of fisheries, in Northern Ireland. DCAL has been consulted on the Proposed Development by NIE and has not expressed any concerns.

8.5.1.4 Site Specific Mitigation

<u>Silt Management (Barrier Controls)</u>

137. The risk of silt pollution to watercourses will be controlled by adopting the following three principles of mitigation:

- Programme and manage construction activities to prevent sediment generation;
- Protect water bodies from sediment pollution by preventing silt-laden runoff reaching watercourses; and,
- Propose adequate measures to treat runoff prior to discharge (under consent from NIEA if to watercourse).

138. Measures will be taken to prevent all potentially contaminated drainage from the working areas and substation from entering watercourses and surface water drains. Following guidance given in CIRIA Document C521 '*Sustainable Urban Drainage Systems – Design Manual for Scotland and Northern*

Ireland,' and CIRIA Document 648 '*Control of water pollution from Linear Construction Sites*' provisions will be made to collect and treat drainage from the construction site and working areas in order to remove sediments and other contaminants before discharging to surface watercourses, drains or to ground.

139. Mitigation measures will consist of temporary settlement ponds, silt traps, filter strips and swales as appropriate, which will be implemented within the planning application boundary indicating the area of construction works.

140. During the initial site preparation works prior to the start of construction, there will be a requirement for the formation of temporary measures to ensure controlled management of runoff draining from the construction site (referred to as 'barrier controls'). Runoff from the site will be treated and attenuated using measures to filter or settle fine particulates. There are many ways in which this can be achieved and the guidance documents provide information on these. Options may be relatively simple, such as the use of straw bales and gravel berms (which will be washed prior to arriving on site), or measures that store water to encourage fines to settle out, such as purpose construction temporary settlement lagoons or a series of two or three skips in sequence. The arrangements of such drainage infrastructure will be set out in the detailed design and as appropriate agreed with NIEA prior to construction. The above measures have all been assessed and their use will ensure that any sediment carried in suspension in the surface water runoff from the work sites will have settled out to an acceptable level to prevent a deterioration in the quality of the receiving stream before being discharged into watercourses close to the site.

141. Earthworks will be undertaken in accordance with BS6031:1981 '*Code of Practice for Earth Works*.' Any disturbed areas will be stabilised as soon as possible after construction. There are no new watercourse crossings. Access tracks using existing farm access will be reinforced if required with hardcore on top of a geotextile or metal plating (which will also be used on existing watercourse crossings). There are many options that can be implemented to control soil erosion and surface runoff, and highlighted below are measures that will be implemented as appropriate in the Proposed Development:

- Scheduling construction activities in order to minimise the area and period of time that soil would be exposed, particularly during wetter periods;
- Construction areas will be demarcated from the rest of the site so as to minimise the disturbance of land not required for development;
- Installation of cut-off drains around the working areas to intercept surface runoff and divert it around the works;
- Minimising the stockpiling of materials and locating essential stockpiles as far away as possible from watercourses, and with geotextile coverings where possible (seeding not appropriate in the timescales);
- Implementation of site working practices to minimise the risk of concrete spillages;
- Movement of construction vehicles and plant will be strictly controlled in order to minimise the potential for soil compaction and erosion;
- Operate machinery from access track wherever possible;
- Timeframe for open excavations to be kept to a minimum;
- Dewatering requirement will be kept to a minimum. Works will not to be carried out following extreme rainfall;
- During any dewatering activities a water filtration system will be utilised to control the amount of sediment in the pumped water;
- Washed, fines-free stone for access tracks and some tower working areas will be imported rather than quarried on site; and,
- A buffer zone will be established to protect the riparian and aquatic zones from disturbance from construction work (other than those few sites where the tower has had to be located across an

ephemeral ditch). The buffer area will be as wide as possible (a minimum of 5 m if possible where not possible the measures indicated above will be used) and will extend beyond the existing riparian zone. Where space is limited or the ground is steep it will be necessary to install other barrier controls, such as silt fences.

142. Specific excavation methods required for tower foundations will be determined following detailed ground investigations and soil analysis. Tower foundations have been designed to minimise the excavation requirements.

143. During the excavation of tower foundations, temporary drainage infrastructure (settlement tank, straw bunds, slit fences) will be installed to attenuate, treat and where appropriate discharge to watercourses any groundwater pumped from the excavations and any surface water runoff that has collected in the excavations following rainfall (if it will not readily soakaway). If works are close to a watercourse and the topography is such that there is a risk that contaminated runoff could flow untreated into it, then temporary barriers will be installed during the works. These will also intercept overland flows so they can be contained prior to discharge to soakaway or be treated prior to discharging into the watercourse. Barriers could include existing riparian buffer zones, silt fences, or gravel bunds. These features will be small, in keeping with the area of works for each tower, and temporary being removed completely after the works have been completed. Providing this water remains uncontaminated it will be discharged into nearby watercourse or allowed to soakaway without the need for treatment or consent from NIEA.

Spillage Management

144. Training will be given in the actions to take in the event of a spillage of potential contaminants. Emergency procedures to be implemented in the event of a spillage or leakage of any polluting material such as fuel, oil or silt-laden drainage, will be in place on-site and incorporated into the CEMP. Provision for containment and clean-up of the material will be made. The procedure will follow the recommendations contained within PPG21 '*Pollution Incident Response Planning*.' Any oil or similar material will be cleaned away immediately using an absorbent material (sand, absorbent pads or other purpose made products) to prevent it entering any watercourse. Spill kits will be provided and training on their use given to all site personnel.

145. Due to the remoteness of the site and no requirement for a specific construction compound, plant will need to be refuelled on site. Plant will be refuelled from a double skinned bowser controlled by a specially trained operator. Refuelling will take place where possible on areas of hard standing and before plant access fields where towers are proposed. No refuelling of plant will be permitted in close proximity to any watercourse, ditch (i.e. within 30 m) or on steep sloping ground. Spill kits will be carried by the bowser and the plant being refuelled.

146. Chemicals, fuels and oils will be stored in secure and designated storage areas at NIE's existing Carn depot. These substances will be stored in accordance with the appropriate regulatory requirements; including COSHH Regulations 1994 (updated 1999). Storage areas will all be located on hard standing areas so as to prevent the possible infiltration of contaminants into the soil. Stockpiles of dry materials will be stored in locations that prevent contamination of surface waters and materials will not be stockpiled without appropriate safety and mitigation systems in place.

147. Due to the remoteness of the study area it is not possible to connect welfare facilities to existing public sewers. Welfare facilities will comprise on site self contained chemical toilets and washing facilities. The facilities will be taken offsite to a suitable treatment facility for cleaning. Any waste material will be treated and disposed of off site at a suitable treatment facility.

148. The delivery of concrete will be controlled and the wash-out of vehicles will be allowed only in designated areas within the construction working area (35x35m area), where all washed residues of concrete chutes will be collected in suitable sealed containers for disposal at a licensed facility.

149. In order to prevent materials leaking from static plant, such as pumps and generators, contaminating the ground and being washed into the drainage system, static plant will be placed on drip trays and will be located only within area shown to be included in the planning application boundary. For biosecurity reasons to prevent the spread of disease plant will need to be washed before moving from one farm to

another. Plant will be washed by hose at a location as far from any nearby watercourses as is practically possible and no runoff will be allowed to drain into a watercourse without prior treatment (to filter fine particulates). If wash water is contaminated with oil it will be isolated and pumped into a bowser for disposal offsite. Discharges to any watercourse will only be permitted in accordance with water activity permits from NIEA. Any waste material or washings will be treated and disposed of off site at a suitable treatment facility.

150. Wet concrete waste in the bucket from dumper trucks will be emptied onto containers where it will be allowed to dry before being removed from the site for disposal at a landfill. If the bucket of dumper trucks needs to be washed out, this will take place at the Carn Depot or a suitable hard standing location where the wash water can be contained so that it can be pumped into a bowser for offsite disposal at a licensed landfill.

Access Tracks

151. There are 53 access tracks to be stoned or partially stoned as part of the Proposed Development. The remaining access tracks will use the existing ground conditions (concrete, stone or grass). As part of a wider access strategy, where possible, construction traffic will use existing tracks on the ground to minimise the potential for soil disturbance. As outlined in Chapter 5 (Proposed Development) of this ES, aluminium Trackways could also be used to minimise disturbance to the soil.

152. The stoned access tracks will be laid such that they minimise disturbance to existing surface runoff drainage patterns. No positive drainage will be provided. Should surface water runoff collect on the edges of these stoned access tracks, not soak away and potentially run downslope causing erosion, it will be intercepted at regular intervals within the planning application boundary (using silt traps, slit fencing, straw bales or pumping) to direct it into vegetated verges and fields where it will soak away. Further detail on the access tracks proposed is contained in Chapter 5 (Proposed Development) of this ES.

153. All access tracks are proposed along existing farm accesses and no new watercourse crossing are required. Apart from crossings, all tracks will be located at least 5 m from watercourses, which allows for a buffer zone and barrier mitigation measures (as outlined in Section 8.5.1) to be provided will take into account NIEA's PPG05 '*Works and Maintenance in or Near Water*' and the framework of mitigation measures as set out in this ES.

Restoration of Ephemeral Drainage Ditches

154. In nine locations (towers 20, 21, 33, 44, 48, 68, 78, 81 and 87) the construction of the tower foundations will have adverse effects (as assessed above in Section 8.4.1.3) on the morphology of any drainage ditch that is present. Where this is the case, it will be necessary for the drainage ditch initially to be stoppered up and then reinstated on the line of the hedgerow. A pre-construction survey will be undertaken to record information about the current form, so that it can be reinstated accordingly and if possible with environmental enhancement.

Rolling Construction

155. The Proposed Development consists of a rolling programme of tower construction, and thus adjacent towers may be constructed simultaneously. Table 8.12 provides a summary of those towers that lie close to the same watercourse and where simultaneous construction could lead to cumulative water quality effects. However, providing the mitigation set out in this Chapter is implemented no significant adverse effects are predicted.

Table 8.12 Locations Where Cumulative Effects from Simultaneous Tower Construction May Occur

Towers	Watercourse
1 and 2	A tributary of the River Rhone
18 to 23	Tributaries of the River Blackwater
30 to 32 on the north bank and tower 33 on the south bank	River Blackwater
36 and 37	A tributary of the Ballymartrim Water and the Ballymartrim Water
42 to 45	A tributary of the Ballymartrim Water
49 and 50	A tributary of the Ballymartrim Water (different to towers 42-45)
57 to 64	Ballymartrim Water
68 to 70	A tributary of the Ballymartrim Water
81 to 85, and 91 to 93	A tributary of the Tynan Water

Monitoring

156. As part of the CEMP and to ensure an adequate pollution control regime is in place, a water quality monitoring programme will be implemented during construction. This will be targeted on watercourses considered to be at a higher risk of pollution (i.e. towers where there are watercourses within 20 m of the construction works).

157. The monitoring will be primarily based on observations by a suitably qualified environmental scientist who will look for signs of sediment and oil pollution of nearby watercourses. Daily observations of watercourses close to construction works will be taken and detailed records of observations including photographs will be made.

158. If pollution is suspected, samples will be collected from the point of discharge from the tower construction site, and from just upstream and downstream of this point. The samples will be sent to an appropriately accredited laboratory for analysis. All works at this location will halt until the source has been identified and appropriate remediation measures undertaken.

8.5.2 Operational Phase

159. NIE will operate the substation in accordance with a standard NIE Environmental Management Plan which will be taken into account when the CEMP is finalised, which will include pollution prevention measures and a plan for emergency response prepared in accordance with NIEA's PPG 21. This will require, amongst other things, spill kits to be kept alongside fuel / oil storage areas, to be maintained in good working order and staff trained in their use. It is also important that the purpose built drainage system is well maintained to ensure that it is operating correctly and providing the necessary treatment and spillage containment.

160. Routine maintenance work of the towers and the overhead line will be carried out in accordance with a CEMP making reference to relevant best practice at the time of the works. In particular, any works above Main Rivers will need a consent under Schedule 6 of the Drainage (Northern Ireland) Order 1973, and this will likely include protection to prevent items falling into the water.

8.6 Residual Impacts

161. Table 8.13 provides a summary of the residual effects on the surface water environment:

Table 8.13 Residual Effects Summary

ITEM	Residual Impacts						
	DESCRIPTION OF POTENTIAL IMPACT	**MITIGATION OBJECTIVE AND COMMITMENT**	**VALUE OF RECEPTOR**	**DURATION OF IMPACT SHORT/LONG TERM**	**MAGNITUDE OF IMPACT WITH MITIGATION**	**SIGNIFICANCE OF IMPACT WITH MITIGATION**	**DESCRIPTION OF LIKELY IMPACTS**
1.	Construction works affecting ephemeral drainage ditches.	Ditches will be reinstated.	Low	Short term, temporary	Moderate adverse	Neutral	No overall effect
2.	Physical effects to morphology of watercourse from widening field access	Ditches will be reinstated.	Low	Short term, temporary	Moderate adverse	Neutral	No overall effect
3.	Silt contaminated construction site runoff (multiple sources)	Various mitigation measures have been proposed, which will be made site specific following detailed design	Low to Very High	Short term, temporary	Moderate Adverse to Negligible	Slight to Neutral	Potential for short term deterioration of water quality, but no long lasting effects.
4.	Direct chemical / fuel spillages and contaminated construction site runoff.	Various measures have been proposed, which will be made site specific following detailed design	Low to Very High	Short term, temporary	Moderate Adverse to Negligible	Slight to Neutral	Potential for short term deterioration of water quality, but no long lasting effects.
5.	Substation site runoff during operation	Filter drains, oil interceptors and storage pond	River Rhone - High	Long term, permanent	Negligible	Neutral	No effect
			Drainage ditch - low	Long term, permanent	Negligible	Neutral	No effect
6.	Oil spillage risk from substation site during operation	Filter drains, oil interceptors and storage pond	River Rhone - High	Long term, permanent	Negligible	Neutral	No effect
			Drainage ditch - low	Long term, permanent	Negligible	Neutral	No effect

162. As outlined in "*Carrying Out A Water Framework Directive (WFD) Assessment On EIA Developments*" (NIEA 2012), potential impacts of schemes or activities should be assessed against the relevant WFD classification elements and the WFD Objectives. This chapter has provided a thorough assessment of the potential water environment impacts.

163. The WFD is concerned with non-temporary long term impacts at the water body level. The impact assessment presented in Section 8.4 demonstrates that the proposed development will not have any

direct, non-construction related adverse effects on any WFD water body (i.e. there will be no new crossing structures, outfalls, abstractions or diversions etc.). Access track 62SL crosses the Ballymartrim River, but there is no need for any bridge improvements. Indirectly, treated surface water runoff will ultimately discharge into the River Rhone via a small drainage ditch, but the risk is low and the scale of any potential effect small and not relevant at the water body level. There is the potential for some temporary construction effects with mitigation taken into account (minor adverse on the River Rhone – see Table 8.11), but these will not be of sufficient magnitude to compromise the achievement of WFD objectives at the water body level, and in any case will be short term when viewed in the context of the five year planning cycles. Since the same robust mitigation will be applied to each site any potential cumulative effects can also be effectively mitigated (see Section 8.5). Thus, there is no potential for deterioration of ecological status, failure to improve, non-compliance with proposed NIEA mitigation measures, or the failure of adjacent water bodies to meet their targets. Therefore, it is considered that the proposed development is compliant with the objectives of the WFD.

8.7 Conclusions

164. As a linear development, the proposed overhead line will cross a number of surface watercourses that vary in size, importance and sensitivity. The majority of the watercourses are small unnamed streams or drains that are tributaries of the larger River Blackwater, Ballymartrim Water and River Rhone. All of these surface waters are included on the Protected Areas Register as a result of their fisheries interests and their ecological status.

165. In identifying the location of the overhead line towers watercourses have been physically avoided as much as is practicably possible. However, there is the potential during construction of the overhead line and substation for temporary adverse impacts on the surface water environment leading to short term reductions in water quality. Where works adjacent to watercourses are unavoidable, these can be effectively managed by implementing good working practices and adherence to relevant legislation and current good practice including PPGs.

166. In assessing the significance of impacts careful attention has been made to the importance of the water receptors and the magnitude of any effect, taking into account the relatively small scale and duration of the works. Regardless, it is an offence to knowingly pollute a Controlled Water and therefore irrespective of the impact assessment, adequate mitigation measures have been set out to prevent pollution occurring in all locations.

167. At nine locations ephemeral (or possible ephemeral) ditches may be impacted during construction works to install tower foundations, but these will be reinstated resulting in no overall effect. The proximity of the River Rhone to the substation construction site means that it may be indirectly impacted by contaminated site runoff, resulting in an effect of Slight Adverse; however the impacts will be of short term deterioration with no long lasting effects. All other effects are neutral.

168. It is proposed, that as part of the preconstruction works, thorough landowner consultation will be undertaken to develop a construction methodology that avoids an impact on the operation of the Linwoods willow plantation bioremediation system, or provides alternative means by which the effluent currently treated by the system can be temporarily disposed off in accordance with the existing site discharge consents. If it proves impossible to achieve this, the effluent will be taken off site to a suitable treatment facility (see Chapter 15 for further details). This will ensure there is no significant water quality impact downstream of the treatment area.

169. During operation it is predicted that there will be no permanent or long term adverse impacts from the towers, nor from the substation providing that the drainage system is well maintained and NIE operate a Pollution Prevention Plan.

170. The Proposed Development is considered to be compliant with the objectives of WFD designated water bodies within the study area.

8.8 References

Note: Legislation is provided in Appendix 8A.

BS6031:1981 Code of Practice for Earth Works.

CIRIA Report 650 (2010) *Environmental Good Practice on site* (3rd Edition).

CIRIA Report 697 (2007) *The SuDS Manual*.

CIRIA Report 648 (2006) Control of Water Pollution from Linear Construction Projects – Technical Guidance.

CIRIA Report 521 (2000) SuDS – Design Manual for Scotland and Northern Ireland.

IEMA (2004) Guidelines for Environmental Impact Assessment.

DCAL (no date) Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites.

Design Manual for Roads and Bridges (2009) Volume 11, Section 3, Part 10 Drainage and the Water Environment (HA45/09), The Highways Agency, Transport Scotland, Welsh Assembly Government and the Department for Regional Development Northern Ireland. Available at: http://www.standardsforhighways.co.uk/dmrb/vol11/section3.htm.

NIE Policy 06/025.

NIEA (2004) Getting Your Site Right: Industrial and Commercial Pollution Prevention.

NIEA (August 2010) Freshwater Fish Compliance Tables in Northern Ireland 2003 – 2006.

NIEA (December 2009) Neagh Bann International River Basin District.

NIEA (no date) PPG 1 General Guide to the Prevention of Pollution.

NIEA (August 2011) PPG 2 Above Ground Oil Storage Tanks.

NIEA (April 2006) PPG 3 Use and Design of Oil Separators in Surface Water Drainage Systems.

NIEA (July 2006) PPG 4 Treatment and Disposal of Sewage Where No Foul Sewer Is Available.

NIEA (October 2007) PPG 5 Works or Maintenance In, or Near Watercourses.

NIEA (April 2010) PPG 6 Pollution Prevention Guidance for Working at Construction and Demolition Sites.

NIEA (July 2011) PG 7 *Refuelling Facilities*.

NIEA (February 2004) PPG 8 Safe Storage and Disposal of Used Oils.

NIEA (July 2007) PPG 13 Vehicle Washing and Cleaning.

NIEA (no date) PPG 18 Managing Fire Water and Major Spillages.

NIEA (March 2009) PPG 21 Pollution Incidence Response Planning.

NIEA (April 2011) PPG 22 *Dealing with spills*.

NIEA (May 2011) PPG 26 Storage and Handling of Drums and Intermediate Bulk Containers.

Ordnance Survey Northern Ireland Maps.

http://www.metoffice.gov.uk/climate/uk/stationdata/

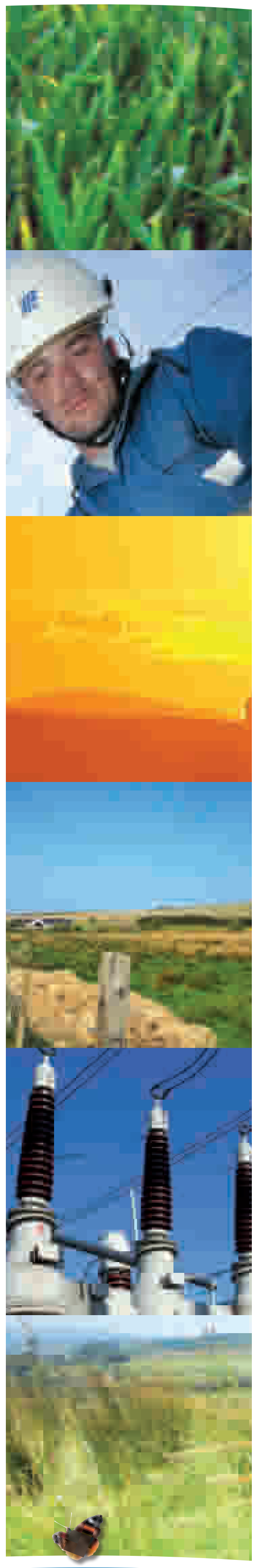
http://www.doeni.gov.uk/niea/neagh_bann_rbp

http://www.doeni.gov.uk/niea/river-blackwater_lma_actionplan.pdf.

Tyrone - Cavan Interconnector

Chapter 9

Soils, Geology and Groundwater



Consolidated Environmental Statement

Volume 2

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9 Soils, Geology and Groundwater

Chapter Executive Summary

The Proposed Development has the potential to cause minor local adverse effects on soils, geology and groundwater. Land take for the tower bases and the substation would entail disturbance of surface materials during construction. The relatively small scale of the tower bases and their dispersed distribution means that losses in individual fields will be of minor significance.

The proposed working areas avoid potentially contaminated land and known areas of peat. Proposed mitigation measures would reduce the potential degree and extent of soil degradation and reduce the significance of any adverse effect.

The proposed excavation for the towers and the substation would result in uncontaminated surplus materials which would be sent to landfill.

There is no evidence that the towers or the substation would impact on any areas of contaminated ground. The construction of the towers has the potential to cause a temporary modification in the groundwater level and flow where dewatering is required to facilitate construction. However, any potential impacts will be managed by mitigation measures implemented on the site and would be of minor significance.

9.1 Introduction

1. This Chapter presents an assessment of the Proposed Development, as set out in Chapter 5 Proposed Development in relation to ground conditions, geology and groundwater.

2. This Chapter provides a description of the geological and hydrogeological conditions along and in the immediate vicinity of the Proposed Development. The Chapter also provides details of potentially contaminated land sites in the study area. The impacts of the Proposed Development on the ground conditions and on groundwater and of constraints posed by the existing ground and groundwater conditions on the Proposed Development are considered for both the construction and operational phases of the development. Mitigation measures that would form part of the development are described and any residual environmental impacts identified and their significance assessed.

9.2 Methodology

9.2.1 Scope of Assessment

9.2.1.1 Overview

3. The assessment considers the geology and the ground and groundwater conditions of the Proposed Development and the adjacent area, based on published and other publically available information that was collated. The data obtained has been used to prepare a detailed assessment of the existing conditions on and in the immediate vicinity of the Proposed Development. The existing conditions form the baseline against which the impact assessment will be determined.

4. The principal objectives of this ES Chapter are to identify:

- Geological and groundwater factors which might affect the technical viability of the Proposed Development;
- Impacts that the Proposed Development may have on soils, geology and groundwater and on contaminated land along the Proposed Development and in the adjacent area;
- Constraints that these features may place on the Proposed Development;
- Mitigation measures which may be required to minimise any adverse impacts of or on the Proposed Development; and,
- Assessment of significance of any residual impacts.

5. Impacts on geology, soils and groundwater were considered within a study area approximately 500m wide either side of the route of the Proposed Development (from the centre line of the overhead line and the edge of the substation boundary) between the site of the proposed substation in the north and the border with the Republic of Ireland in the south. In addition, the locations of any designated sites of geological/geomorphological/physiographical significance and sites of potentially contaminated land in the vicinity of the Proposed Development were identified.

6. The assessment was designed to identify the rock and soil types and structures and the groundwater conditions along the route of the Proposed Development, in particular to identify sensitive geological and hydrogeological locations and any areas of poorly consolidated ground that could adversely affect the stability of the towers or adjacent land. Reference was made to the following sources of information:

- Geological Survey of Northern Ireland (GSNI) 1:50,000 scale geological maps, Sheets 35 Dungannon and 47 Armagh;
- GSNI 1:63,360 scale geological map, Sheet 59;
- Geological Memoir of Sheet 47 '*Country around Armagh'* 1873;
- GSNI 1:10,560 and 1:10,000 scale geological plans field sheets and notes;
- GSNI Shafts and Adits Database;
- Borehole logs from the GSNI archive;
- NIEA Land Use Database;
- CIRIA document 552 'Contaminated Land Risk Assessment, A Guide to Good Practice' (2001);
- Observations made during site walkovers in 2011 and 2012;
- The results of the ground investigation at the proposed substation site, Stratex 2006;
- Ordnance Survey of Northern Ireland (OSNI), historical plans of sites of potential ground contamination;
- OSNI 1:50,000 scale maps, Sheets 19 Armagh and 28 Monaghan-Keady;
- Environment Service 1:250,000 scale map, *'Hydrogeological Map of Northern Ireland'* 1994;
- Environment Service, Department of the Environment for Northern Ireland (1993): Groundwater Vulnerability Map of Northern Ireland, 1:250,000 scale;
- Environment and Heritage Service report 'Policy and Practice for the Protection of Groundwater in Northern Ireland' 2001; and,
- British Geological Survey report, entitled '*Hydrogeology of Northern Ireland'* 1996.

7. The GSNI was consulted with regard to the possible impact of the Proposed Development on geological features. The NIEA Land Resource Management was consulted regarding the location of contaminated land sites in the vicinity of the Proposed Development included in the NIEA Land Use Database and to identify any comments NIEA had on the Proposed Development.

8. The assessment of the severity of any predicted impacts is based on the sensitivity of the feature, which could be impacted, such as by:

- Direct damage to sites of special geological/geomorphological/physiographic interest;
- Destruction and loss of agricultural soils;
- Importance of groundwater as a source of public or private water supply or as a feed to surface water features, wetlands and watercourses;
- Potential impacts of excavation and handling of soils; and,
- The scale of disturbance of contaminated materials and potential associated risks to human health and 'controlled waters' (surface waters and groundwater).

9.2.1.2 Assessment Methodology

9. The magnitude of any effects considers the likely scale of the predicted change to the baseline conditions resulting from the predicted effect and takes into account the duration of the effect i.e. temporary or permanent. Definitions of the magnitude of any effects are provided in Table 9.1.

Table 9.1: Impact Magnitude Definitions

Magnitude	Criteria
High	Fundamental change to ground conditions, groundwater quality or flow regime
Medium	Measureable change to ground conditions, groundwater quality or flow regime
Low	Minor change to ground conditions, groundwater quality or flow regime
Negligible	No measureable impacts on ground conditions, groundwater quality or flow

10. A qualitative approach was used in the assessment generally following the significance classification in Table 9.2 and through professional judgement. The significance of a predicted impact is based on a combination of the sensitivity or importance of the attribute and the predicted magnitude of any effect. Effects are identified as beneficial, adverse or negligible, temporary or permanent and their significance as major, moderate, minor or not significant (negligible).

11. The assessment considers both predicted effects on the groundwater environment and residual effects which would remain after the implementation of any mitigation measures. The details of any mitigation measures were developed based on best practice and standard construction techniques.

12. Adverse effects may be predicted where the Proposed Development is deemed to pose a negative effect on the baseline groundwater flow or quality conditions. Beneficial effects may be predicted where the Proposed Development is considered to result in an improvement in the baseline conditions, such as an improvement in groundwater quality.

Table 9.2: Assessment Criteria

Sensitivity	**Magnitude**				
	Very High	**High**	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

13. In order for a potential impact to be realised, three factors must be present. There must be a source or a potential effect; a receptor which can be adversely affected; and, a pathway or connection which allows the source to impact the receptor. Only when all three factors are present can an effect be realised.

9.2.2 Legislative and Policy Context

14. An assessment of the Proposed Development was carried out in relation to relevant legislation and other statutory policies and guidance. Impacts of the Proposed Development on the ground and groundwater conditions were determined by reference to a number of key statutory and guidance documents, including:-

- The Water Framework Directive (2000/60/EC), enacted in Northern Ireland by The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2003;
- The Water Resources (Environmental Impact Assessment) Regulations (Northern Ireland) 2005;
- The Water Resources (Environmental Impact Assessment) (Amendment) Regulations (Northern Ireland) 2006;
- The Pollution Prevention and Control Regulations (Northern Ireland) 2012;
- The Groundwater Regulations (Northern Ireland) 1998, as amended 2009; and,
- Environment Agency and NIEA Pollution Prevention Guidance Notes (PPGs).

9.2.3 Indication of Any Difficulties Encountered

15. There is an absence of specific detailed information published on the geology of the Proposed Development, in particular the thickness of the superficial deposits and their lithological variation with depth. For the southern part of the route between Towers 77 and 100, there is no published geological map and the assessment was based on a review of a previously published map, Sheet 59, dated 1875 and based on mapping undertaken in 1872. There is no historical or published geological map for the southernmost towers 101 and 102.

16. Other than at the proposed substation site, where a ground investigation was undertaken in 2006, full details of the groundwater depth are not available. However, it can be inferred that where the towers would be in the valley floor, it is likely that the groundwater is shallow. On the higher ground, it is likely that the groundwater level is deeper and may be below the base of any excavations required for the tower foundations.

9.3 Baseline Conditions

9.3.1 Geology

17. The assessment presented in this Chapter is based on the available data and is considered to be an accurate assessment of the likely significant effects of the Proposed Development.

18. In general, the Proposed Development is underlain by a sequence of superficial drift deposits (boulder clay and sand and gravel) and more recent peat and alluvial deposits, associated with the river valleys. The superficial deposits overlie a complex bedrock geology of variable age, ranging from Ordovician to Tertiary. Much of the area is covered by a significant thickness of drift deposits, which obscure the bedrock and hence reduce the precision of the bedrock mapping due to the absence of bedrock exposures. A summary of the geology along the Proposed Development is provided at Table 9.3.

19. Lower Palaeozoic greywackes and slates of the Acton Group underlie the southern part of the route of the Proposed Development, from Tower 66 southwards. Greywackes comprise sandstones formed in deep water conditions by turbidity currents generated down the margins of a subsiding geosyncline. These deposits are widespread across the southern part of the Proposed Development and it is difficult to differentiate between deposits of Silurian or Ordovician age. The beds frequently comprise rock fragments in a fine grained matrix. Occasional dolerite and basalt dykes of Tertiary age, trending north-west to south-east, have been mapped within the Acton Group. Mineral development within the Acton Group indicates low grade metamorphism.

20. The central part of the overhead line route of the Proposed Development, to the west of Armagh crosses the Carboniferous Limestone of the Tyrone and Armagh Groups. The Armagh Group comprises principally limestone with occasional thin beds of shale and gritstone. The overlying Tyrone Group comprises a more variable sequence of alternating limestone, shale, mudstone and sandstone with thin coal seams. Geological map Sheet 47 shows occasional faulting within the Carboniferous Limestone. However, where the rocks outcrop, such as around Benburb, a much more complex structure has been mapped with extensive faulting.

21. The Carboniferous Limestone strata are overlain unconformably *(at different angles of bedding)* by sandstones of the Triassic (formerly Bunter) Sherwood Sandstone Group, represented by the basal Milltown Conglomerate and the overlying Derrycreevy Sandstone Formation. The Sherwood Sandstone underlies the majority of the northern section of the route of the Proposed Development between Towers 1 and 48, apart from a section west of Moy where a faulted area of limestone of the Tyrone Group underlies approximately 3km of the Proposed Development. The Sherwood Sandstone consists principally of the Derrycreevy Sandstone, a thick sequence of red sandstone with occasional siltstone and mudstone.

22. Geological plan Sheet 35 shows that the Sherwood Sandstone strata extend beneath the route of the Proposed Development, past the proposed substation at the northern end of the Proposed Development. However, the findings of a ground investigation carried out at the substation site in 2006 showed that the bedrock consists of the Triassic Mercia Mudstone Group rather than the Sherwood Sandstone as shown on the published geological plan. The Mercia Mudstone Group comprises red and green mudstone with gypsum bands and overlies the Sherwood Sandstone.

23. At the substation site, the ground conditions are highly variable. On the higher ground to the north-west, there is a surface layer of fluvio-glacial deposits of clay, silt and sand between 3.9m and 7m thick overlying hard, reddish-brown and pale grey clay and silt of the Mercia Mudstone sequence. In the eastern part of the substation site towards the River Blackwater, the thickness of the superficial deposits increases. In borehole BH9 at the eastern corner of the site, the superficial deposits have been proved to a depth of at least 30m and comprise approximately 20m of mainly clay and silt overlying a basal sand band. It is interpreted that the fluvio-glacial deposits have been deposited in an over-deepened valley of glacial or post-glacial origin. Peat was not found in any of the boreholes or trial pits on the proposed substation site.

24. Figure 9.1 shows a summary of the bedrock geology of the Proposed Development. Figure 9.2 provides a summary of the superficial deposits present along the route of the Proposed Development.

Table 9.3: Summary of the Geology of the Study Area

Age	Formation	Thickness (m)	Lithology
Recent and Quaternary	Peat Alluvium Boulder clay Fluvio-glacial sands and gravels	Variable, up to 30	Variable
Tertiary	Igneous intrusive		Dykes of dolerite and basalt
Triassic	Mercia Mudstone Group	75	Red and green marl with gypsum
	Sherwood Sandstone *Derrycreevy Sandstone Formation* *Milltown Conglomerate*	 150-1400 10-20	 Red sandstone with micaceous siltstone and mudstone. Grey conglomerate with thin beds of reddish-purple sandstone.
Carboniferous	Tyrone Group *Blackwater Limestone Formation* *Carrickaness Sandstone Formation* *Blackstokes Limestone Formation* *Maydown Limestone Formation*	 26 60 20 126	 Fossiliferous limestone, sandstone and mudstone. Pale grey to white sandstone with siltstone and mudstone and thin coal seams. Fossiliferous mudstone overlain by dark limestone with shale partings. Calcareous shales and siltstones and limestone. 5.5m thick conglomerate and sandstone layer near top of sequence (*Crow Hill Conglomerate and Sandstone Member*)
	Armagh Group	420	Limestone with thin shales and gritstone. Sandstone and siltstone near base of sequence
Silurian and Ordovician	Acton Group	More than 1000	Greywacke (flaggy sandstone) with slates and mudstones

25. Thin coal beds are present within the Carboniferous Limestone, but have not been commercially viable within the study area. Locality 98 (known as the Knockagraffy Shaft) in the GSNI Shafts and Adits Database is approximately 170m from Tower 55 and 180m from Tower 56. This shaft was sunk in search of coal, but has long since been filled in. A tunnel approximately 70m long was bored, and therefore does not approach either of the towers closely. Thin beds of coal were found but were not of exploitable quality or quantity. Locality 99 (the Drumgar Pit) lies approximately 220m from Tower 54 and 400m from Tower 55. Thin beds of coal were found near the surface, but there is now no trace of the excavation.

26. Local evidence of mineralisation is present within the Lower Palaeozoic strata. Lead ore lodes occur within the Ordovician strata and have been commercially exploited in the past. However, the nearest mine to the Proposed Development is approximately 1.7km east of Tower 92. Also within the Ordovician strata, a pit at Derrybennet was recorded as having supplied coal in the 19th century, from a location approximately 650m to the east of Tower 85. Based on the assumed depositional conditions of the Ordovician rocks, the presence of coal in these strata is considered highly unlikely.

27. The Quaternary and Recent deposits in the area of the Proposed Development record Midlandian ice movements from an ice mass centred on Lough Neagh. Fast ice flow during the final retreat phase of the ice sheet resulted in the present drumlin-dominated landscape. The drift mantle is largely clay-dominated, but sand and gravel deposits are present locally, recording changes in the depositional

environment, and are often associated with drainage channels. Alluvial deposits, including peat, mark the floors of river valleys throughout the Proposed Development corridor.

28. Sands and gravels of fluvio-glacial origin have been worked for aggregate in the area of the Proposed Development. Former sand and gravel workings were located particularly to the north-west and south of Moy, associated with an esker deposit shown on the geological plan of the area.

29. Peat deposits occur locally in inter-drumlin hollows, but the Proposed Development avoids or passes over known peat deposits. Proposed towers are located in places underlain by drift, near a boundary with peat deposits. However, these locations are invariably on flat ground or on very low angle slopes, where movement of peat would not be expected. Accordingly, there is little potential for the excavations to cause downslope movement of adjacent peat bodies. Instability of superficial deposits in Ireland is most frequent in peat, but there are no known peat deposits along the Proposed Development that might render towers unstable during construction or operation. Peat slope failures occur in upland blanket bogs and the lowland blanket bogs in the west, neither of which is affected by the Proposed Development.

30. The bedrock in the area of the Proposed Development generally is well-consolidated. Limestone outcrops in the Armagh area have locally developed karst features. However, there are no known swallow holes or surface solution features *(depressions in the ground surface developed on limestone, which allow the percolation of surface water directly to the groundwater often connected to cave systems)* in the immediate vicinity of the proposed towers.

31. Mineral soils are mainly derived from the glacial tills, sands and gravels. Irish lodgement and englacial tills (boulder clay) that form the bulk of the superficial deposits in the area generally have relatively high angles of shearing resistance and are generally well graded with sufficient fines to produce cohesive soils in the short term. Short-term excavations for the provision of tower platforms will therefore have little impact on stability of the local surface. Recent alluvial soils deposited in low lying areas along the Proposed Development do not pose a risk of landslides as no fill would be placed on the surface or material dredged or excavated. There are no recorded landslides in the Proposed Development area.

32. Table 9.4 shows the superficial and bedrock geology at each of the tower locations taken from published and other available data sources. The geology at each tower has been interpreted from published and unpublished geological maps of the route of the Proposed Development; geological mapping field sheets and borehole logs provided by GSNI; historical plans; and, observations made during site visits. However, it should be recognised that it is only possible to identify the nature of the surface drift and the interpreted underlying bedrock from the plans. In the absence of boreholes specific to each tower, it is not possible to confirm the thickness and any vertical variation in the superficial deposits. In addition, the general absence of exposures of bedrock reduces the local precision of any interpretation.

33. During a site walkover, an outcrop of basalt was identified at the proposed location of Tower 83, beneath a very thin soil cover. It is likely that similar geological conditions exist also at the proposed location of Tower 84.

34. Italicised Text in Table 9.4 refers to notes and descriptions copied from the GSNI field mapping sheets. The relevant field mapping sheets are shown in the Data Sources column. Relevant GSNI borehole information also is referenced in Table 9.4.

Table 9.4*: Geological conditions at each tower location*

Tower No.	Drift	Bedrock	Data Sources
1	Fluvio-glacial clay/silt to 8m, over sand to 11.6m. *'Very sandy Boulder Clay ploughed with pockets of bright red soil'* – Fluvio-glacial basin indicated to south-west. Sheet 55 indicates peat to north-east.	Mercia Mudstone	BH13: Stratex GI 2006. GSNI FS Sheet 55 Tyrone SW
2	Boulder clay and fluvio-glacial sands and gravels. *'Red and red brown very sandy boulder clay'*. Fluvio-glacial basin indicated to north-east of this location.	Bunter Sandstone (Derrycreevy Sandstone)	GSNI Sheet 35. GSNI FS Sheet 55 Tyrone SW
3	Boulder clay	Bunter Sandstone (Derrycreevy Sandstone)	GSNI Sheet 35
4	Boulder clay and peat. *'Peaty flat'.*	Bunter Sandstone (Derrycreevy Sandstone)	GSNI Sheet 35. GSNI FS Sheet 55 Tyrone SW
5	Boulder clay. Red boulder clay to north-east	Bunter Sandstone (Derrycreevy Sandstone)	GSNI Sheet 35. GSNI FS Sheet 55 Tyrone SW
6	Boulder clay and peat	Bunter Sandstone (Derrycreevy Sandstone)	GSNI Sheet 35
7	Boulder clay and fluvio-glacial sands and gravels. *'Heavy clay ground - red boulder clay'.*	Bunter Sandstone (Derrycreevy Sandstone)	GSNI Sheet 35. GSNI FS Sheet 55 Tyrone SW
8	Gravel to 6.4m over boulder clay to more than 15.2m. *"'Hummocky' to east, 'clayey loam?' to north, reddish boulder clay to south"*	Bunter Sandstone (Derrycreevy Sandstone)	GSNI Sheet 35 and borehole 179SE/4. GSNI FS Sheet 55 Tyrone SW
9	Peat to 1.2m, over gravel to 2.44m, clay and sand to 10.97m. *'Sand and gravel.'*	Bunter Sandstone (Derrycreevy Sandstone)	GSNI Sheet 35 and borehole 179NE/30. GSNI FS Sheet 55 Tyrone SW
10	Topsoil and peat to 1.2m, over sand and gravel to 4.7m, then broken sandstone to 7.6m. Indication that tower may be on top of a boundary between sand and gravels and boulder clay. Hill described as *'Flat top, steep fall to south'. Sand and Gravel - 'Coarse gravel and boulders with a little sand'."*	Bunter Sandstone (Derrycreevy Sandstone)	GSNI Sheet 35 and borehole 179NE/27. GSNI FS Sheet 61 Tyrone NE
11	Boulder clay and fluvio-glacial sands and gravels. *"Indication that the tower is close to a boulder clay/alluvium boundary"*	Carboniferous Limestone	GSNI Sheet 47. GSNI FS Sheet 61 Tyrone NE
12	Boulder clay and fluvio-glacial sands and gravels. *"Indication that the tower is close to a boulder clay/peat boundary."*	Bunter *Sandstone 'pale purple calcareous medium to fine grained sandstone.'*	GSNI Sheet 47. GSNI FS Sheet 61 Tyrone NE
13	Boulder clay and peat. *'2-3ft [of] peat, 2ft [of] alluvium, sands and gravels)'*	Carboniferous Limestone	GSNI Sheet 47. GSNI FS Sheet 61 Tyrone NE
14	Boulder clay and fluvio-glacial sands and gravels. *'Coarse sands and gravels'.*	Carboniferous Limestone	GSNI Sheet 47. GSNI FS Sheet 61 Tyrone NE
15	Boulder clay	Carboniferous Limestone	GSNI Sheet 47

Tower No.	Drift	Bedrock	Data Sources
16	Boulder clay	Carboniferous Limestone	GSNI Sheet 47
17	Boulder clay	Carboniferous Limestone	GSNI Sheet 47
18	Alluvium and boulder clay	Carboniferous Limestone	GSNI Sheet 47
19	Boulder clay. *'Indication that the tower is close to a boulder clay/alluvium boundary'*	Carboniferous Limestone	GSNI Sheet 47. GSNI FS Sheet 61 Tyrone NE.
20	Boulder clay	Milltown Conglomerate	GSNI Sheet 47
21	Boulder clay and fluvio-glacial sands and gravels	Carboniferous Limestone	GSNI Sheet 47
22	Boulder clay. *'Localised coarse sand.'*	Derrycreevy Sandstone Gorestown Fault runs from north to south, west of tower position. Carboniferous Limestone to west of fault.	GSNI Sheet 47. GSNI FS Sheet 61 Tyrone SE and 62 Tyrone NW
23	Alluvium, boulder clay and fluvio-glacial sands and gravels. *"Localised 'Fine sandy gravels'.'2ft alluvium, 4ft sand and peat with tree trunks'"*	Derrycreevy Sandstone	GSNI Sheet 47. GSNI FS Sheet 61 Tyrone SE and 62 Tyrone NW
24	Fluvio-glacial sands and gravels.	Derrycreevy Sandstone	GSNI Sheet 47
25	Boulder clay and fluvio-glacial sands and gravels. *"Gravel pits to the east. 2' peaty alluvium over sand and coarse gravel.*"	Derrycreevy Sandstone	GSNI Sheet 47. GSNI FS Sheet 62 Tyrone NW
26	Boulder clay. *"Indication that the tower is close to a boulder clay/sand and gravel boundary."*	Derrycreevy Sandstone	GSNI Sheet 47. GSNI FS Sheet 61 Tyrone SE
27	Boulder clay, peat and fluvio-glacial sands and gravels	Derrycreevy Sandstone? Maydown Limestone Formation	GSNI Sheet 47. GSNI FS Sheet 62 Tyrone NW
28	Boulder clay, peat and fluvio-glacial sands and gravels. *'Orange red fine sand and gravelly clay.'*	Derrycreevy Sandstone? Maydown Limestone Formation	GSNI Sheet 47. GSNI FS Sheet 62 Tyrone NW
29	Alluvium, boulder clay and fluvio-glacial sands and gravels. *'Orange red fine sand under 1ft of soil.'*	Derrycreevy Sandstone	GSNI Sheet 47. GSNI FS Sheet 62 Tyrone NW
30	Boulder clay. NOTE: Borehole 199NW/3 (1km east) shows sand, gravel and peat to more than 7.1m	Derrycreevy Sandstone	GSNI Sheet 47 and borehole 199NW/3.
31	Alluvium, peat and fluvio-glacial sands and gravels	Derrycreevy Sandstone	GSNI Sheet 47
32	Alluvium, peat and fluvio-glacial sands and gravels	Derrycreevy Sandstone	GSNI Sheet 47
33	Boulder clay and peat	Derrycreevy Sandstone	GSNI Sheet 47
34	Boulder clay	Derrycreevy Sandstone	GSNI Sheet 47
35	Boulder clay	Derrycreevy Sandstone	GSNI Sheet 47
36	Alluvium and boulder clay. *'3ft of alluvium over grey sand and gravel'* close to position of tower.	Derrycreevy Sandstone	GSNI Sheet 47. GSNI FS Sheet 8 Armagh SW
37	Alluvium and boulder clay. Indication that the tower is close to a boulder clay/alluvium boundary.	Derrycreevy Sandstone	GSNI Sheet 47. GSNI FS Sheet 8 Armagh SW
38	Alluvium and boulder clay. *'2 feet alluvium over peat.'*	Derrycreevy Sandstone	GSNI Sheet 47. GSNI FS Sheet 8 Armagh SW

Tower No.	Drift	Bedrock	Data Sources
	Indication that the tower is close to a boulder clay/alluvium boundary.		
39	Alluvium and boulder clay. NOTE: Boreholes 198SE/1 and 198SE/2 (1.3km west) show 1.3m-4.3m peat and boulder clay over limestone. *'Over 2ft coarse basalt gravel under 2ft alluvium'*	Derrycreevy Sandstone Red flaggy sandstones and thin mudstones	GSNI Sheet 47 and boreholes 198SE/1 and 198SE/2
40	Alluvium and boulder clay	Derrycreevy Sandstone. Red flaggy sandstones and thin mudstones to west. Dip/strike label: *'160/15°E. 40 yard section of block, ripple marked fine red Triassic sandstone'*.	GSNI Sheet 47. GSNI FS Sheet 8 Armagh SW and 11 Armagh NE
41	Boulder clay	Derrycreevy Sandstone. Lisadian Fault inferred to the north of the proposed tower.	GSNI Sheet 47. GSNI FS Sheet 11 Armagh NE
42	Boulder clay. Indication that the tower is on a boulder clay/alluvium boundary.	Derrycreevy Sandstone	GSNI Sheet 47. GSNI FS Sheet 11 Armagh NE
43	Alluvium and boulder clay	Derrycreevy Sandstone	GSNI Sheet 47
44	Boulder clay	Derrycreevy Sandstone	GSNI Sheet 47
45	Alluvium and boulder clay. *'Indication that the tower is on a boulder clay/alluvium boundary.'*	Derrycreevy Sandstone	GSNI Sheet 47. GSNI FS Sheet 11 Armagh NE
46	Boulder clay	Derrycreevy Sandstone. Benburb Fault immediately west of site.	GSNI Sheet 47.GSNI FS Sheet 11 Armagh NE
47	Alluvium and boulder clay. *'Sandy and gravelly boulder clay (6ft)'.*	Derrycreevy Sandstone. Benburb Fault adjacent to site. Limestone to west of fault.	GSNI Sheet 47, GSNI FS Sheet 11 Armagh NE
48	Alluvium and boulder clay	Derrycreevy Sandstone. Benburb Fault immediately west of site.	GSNI Sheet 47. GSNI FS Sheet 11 Armagh NE
49	Alluvium and boulder clay. Indication that the tower is on a boulder clay/alluvium boundary. *'Fine white running sand and brown alluvium'.*	Armagh Group Benburb Fault immediately to the west of site. Approximately 50m to the east, another fault running north-west to south-east.	GSNI Sheet 47. GSNI FS Sheet 11 Armagh NE
50	Boulder clay. NOTE: Borehole 217NE/1 (800m east) shows thin alluvium (0.9m) over limestone to 30.5m.	Armagh Group	GSNI Sheet 47 and borehole 217NE/1
51	Boulder clay	Armagh Group	GSNI Sheet 47
52	Alluvium and boulder clay	Armagh Group	GSNI Sheet 47
53	Boulder clay	Armagh Group	GSNI Sheet 47
54	Boulder clay *15 ft stiff boulder clay*	Armagh Group	GSNI Sheet 47 GSNI FS Sheet 11 Armagh SE
55	Alluvium and boulder clay	Armagh Group	GSNI Sheet 47
56	Alluvium and boulder clay. Indication that the tower is on a	Armagh Group	GSNI Sheet 47. GSNI FS Sheet 11 Armagh SE

Tower No.	Drift	Bedrock	Data Sources
	boulder clay/alluvium boundary.		
57	Boulder clay.	Armagh Group	GSNI Sheet 47
58	Alluvium and boulder clay. *'Broad 'U' shaped valley'.*	Armagh Group	GSNI Sheet 47. GSNI FS Sheet 11 Armagh SE
59	Boulder clay	Armagh Group	GSNI Sheet 47
60	Alluvium and boulder clay. Tower position close to alluvium/boulder clay boundary.	Armagh Group	GSNI Sheet 47. GSNI FS Sheet 15 Armagh NE
61	Boulder clay. *'Many basalt blocks' present on surface.*	Armagh Group	GSNI Sheet 47. GSNI FS Sheet 15 Armagh NE
62	Alluvium and boulder clay. *'Many basalt blocks in the valley. Few sandstone and limestone blocks'.*	Armagh Group. *'Local farmer says that a "seam of coal" runs right along this valley. This fact appears to be at least one or two generations old. Said that it was mined a mile or so to the north but the Government closed it down'.*	GSNI Sheet 47. GSNI FS Sheet 15 Armagh NE
63	Alluvium. *'Basalt blocks in alluvium'.*	Armagh Group	GSNI Sheet 47. GSNI FS Sheet 15 Armagh NE
64	Boulder clay. *Peat adjacent in Brootally Bog, said to be 15 ft deep*.	Armagh Group. 'Note on 1872 map: *Flags of light coloured limestone dug up about here in drain gleaning (?) from description to describe when in situ. Seen one in window sill of house'*	GSNI Sheet 47. GSNI FS Sheet 15 Armagh NE
65	Boulder clay and peat. *Peat basin to north-east of tower location (Brootally Bog).* Note on Brootally Bog: *'Marsh said to be 15ft deep. Remains of antlers found resting on marl'.*	Armagh Group	GSNI Sheet 47. GSNI FS Sheet 15 Armagh NE
66	Boulder clay	Acton Group	GSNI Sheet 47
67	Alluvium and boulder clay	Acton Group. *'Many sandstone and limestone blocks in stream at this point'.* This is just to the south-west of the tower position.	GSNI Sheet 47. GSNI FS Sheet 15 Armagh NE
68	Alluvium and boulder clay. Indication that the tower is on a boulder clay/alluvium boundary.	Acton Group	GSNI Sheet 47. GSNI FS Sheet 15 Armagh NE
69	Boulder clay. Boulder clay present in ditch to the north, *'peaty soil'* present all around proposed tower location.	Acton Group	GSNI Sheet 47. GSNI FS Sheet 15 Armagh NE
70	Boulder clay	Acton Group	GSNI Sheet 47
71	Boulder clay. NOTE: Boreholes 234NW/1 and 234NW/2 (1.2km west) show bedrock, siltstone/mudstone at surface	Acton Group	GSNI Sheet 47 and boreholes 234NW/1 and 234NW/2
72	Boulder clay. Boundary between boulder clay and	Acton Group	GSNI Sheet 47. GSNI FS Sheet 15 Armagh SE

Tower No.	Drift	Bedrock	Data Sources
	peat present to north-east of tower location.		
73	Boulder clay with bedrock close to surface. Indication that the tower is on a boulder clay/sand and gravel boundary. *'...light brown clay with Silurian fragments angular and rounded, also basalt and occasional sandstone'.*	Acton Group	GSNI Sheet 47. GSNI FS Sheet 15 Armagh SE
74	Boulder clay with bedrock close to surface. Indication that the tower is on a boulder clay/sand and gravel boundary.	Acton Group	GSNI Sheet 47. GSNI FS Sheet 15 Armagh SE
75	Alluvium and boulder clay with bedrock close to surface. *Dark peaty alluvium.*	Acton Group	GSNI Sheet 47. GSNI FS Sheet 15 Armagh SE
76	Alluvium and boulder clay. *Coarse gravelly alluvium.*	Acton Group	GSNI Sheet 47. GSNI FS Sheet 15 Armagh SE
77	Lower boulder beds	Acton Group	GSNI Sheet 59
78	Lower boulder beds	Acton Group	GSNI Sheet 59
79	Peat and lower boulder beds	Acton Group	GSNI Sheet 59
80	Peat and lower boulder beds	Acton Group. *'Outcrops of Lower Palaeozoic, Ordovician rocks.'*	GSNI Sheet 59. GSNI FS Sheet 15 Armagh SE
81	Absent	Acton Group *'Fine bluish grits and gritty flags with occasional compact blue flags.'*	GSNI Sheet 59 GSNI FS Sheet 15 Armagh SE
82	Absent (?)	Acton Group *'Grey grits and dark schists.'*	GSNI Sheet 59 GSNI FS Sheet 19 Armagh NE
83	Absent	Acton Group with igneous (possibly basalt) intrusion *'Grey grits and dark schists.'*	GSNI Sheet 59 and site visit GSNI FS Sheet 19 Armagh NE
84	Absent(?)	Acton Group with igneous (possibly basalt) intrusion *'Grey grits and dark schists. '*	GSNI Sheet 59 and site visit GSNI FS Sheet 19 Armagh NE
85	Lower boulder beds	Acton Group	GSNI Sheet 59
86	Lower boulder beds	Acton Group	GSNI Sheet 59
87	Lower boulder beds	Acton Group	GSNI Sheet 59
88	Lower boulder beds	Acton Group	GSNI Sheet 59
89	Lower boulder beds	Acton Group	GSNI Sheet 59
90	Lower boulder beds. *'Shallow pit exposing light brown clay with sub angular gravel and shingle. Chiefly Silurian, also basalts'.* This feature is present due south of the proposed tower.	Acton Group and basalt	GSNI Sheet 59. GSNI FS Sheet 19 Armagh NE
91	Lower boulder beds. *'Shallow pit exposing light brown clay with sub angular gravel and shingle. Chiefly Silurian, also basalts'.* This	Acton Group and basalt	GSNI Sheet 59. GSNI FS Sheet 19 Armagh NE

Tower No.	Drift	Bedrock	Data Sources
	feature is present due north of the proposed tower.		
92	Lower boulder beds. *'Drift contains boulders of Silurian grits - diorite - basalts'.*	Acton Group	GSNI Sheet 59. GSNI FS Sheet 19 Armagh NE
93	Lower boulder beds	Acton Group	GSNI Sheet 59
94	Lower boulder beds. Deep drift inferred below this tower.	Acton Group *'Compact and fairly gritty flags with.... Netted strings of quartz. Massive grits with veins of quartz and carbonate of lime'.* These descriptions refer to outcrops south-west of Tower 94.	GSNI Sheet 59. GSNI FS Sheet 19 Armagh SE
95	Lower boulder beds. *'Brown clay with Silurian blocks and gravel'.* Deep drift inferred below this tower.	Acton Group	GSNI Sheet 59. GSNI FS Sheet 19 Armagh SE
96	Lower boulder beds. Deep drift inferred below this tower.	Acton Group	GSNI Sheet 59 GSNI FS Sheet 19 Armagh SE
97	Lower boulder beds. Deep drift inferred below this tower.'	Acton Group	GSNI Sheet 59 GSNI FS Sheet 19 Armagh SE
98	Lower boulder beds. Deep drift inferred below this tower.	Interpreted as Acton Group *'Dark grits and shales.'* Basalt dykes approx 1km to east.	GSNI Sheet 59 GSNI FS Sheet 19 Armagh SE
99	Lower boulder beds. Deep drift inferred below this tower.	Interpreted as Acton Group *'Thin...gritty flags, dark slaty flags - Upper Silurian'*	GSNI Sheet 59. GSNI FS Sheet 19 Armagh SE
100	Lower boulder beds	Interpreted as Acton Group GSNI FS Sheet 19 Armagh SE	GSNI Sheet 59 GSNI FS Sheet 19 Armagh SE
101	No drift indicated, likely to be boulder beds.	Inferred to be *'Flaggy shales'*	Sheet 58. GSNI FS Sheet 19 Armagh SE
102	No drift indicated, likely to be boulder beds.	Inferred to be *'Flaggy shales and massive grits.'*	Sheet 58. GSNI FS Sheet 23 Armagh NE

9.3.2 Hydrogeology

35. Soils and bedrock along the study area are widely variable in their hydrogeological characteristics. Ordovician greywackes and shales beneath the southern end of the overhead line route are generally of low permeability, and lack groundwater except at shallow depth. In contrast, the Sherwood Sandstone beneath the northern part of the Proposed Development (Towers 2-10, 12 and 22-48) forms a highly productive aquifer. Viséan limestones around Armagh are also productive aquifers, although flow in these strata is dominantly through fissures. Alluvium has limited potential as an aquifer, and does not contain significant groundwater. The alluvial and sand and gravel parent materials that occur along parts of the study area are moderately permeable. Glacial clays are generally of low permeability, although they may be locally interspersed with more permeable granular deposits.

36. Typically alluvium and glacial sands and gravels give rise to soils of high groundwater vulnerability to contamination. These soils generally are vulnerable to liquid discharges since they have little ability to

attenuate diffuse contaminants. Soils that have developed on densely-textured cohesive drift have a low leaching potential, particularly where soils have a high clay content.

37. Groundwater is present in the granular units of the superficial deposits and it is likely that the groundwater generally is in hydraulic continuity with the local surface water system.

38. The southern section of the overhead line route of the Proposed Development from the border northwards to a point approximately 8km south-west of Armagh (approximate Towers 66 to 102) is underlain by Ordovician and Silurian greywacke, shale, sandstone and mudstone of the Acton Group. These strata generally have a low permeability and are of negligible importance for groundwater supplies. Groundwater is present in these strata but it is likely that quantities are low and groundwater generally is limited to fractures and to the upper weathered zone of the strata.

39. The next section of the overhead line route of the Proposed Development (approximate to Towers 49 to 65) approximately 15km in length is underlain by Carboniferous strata, consisting principally of limestone, with sandstone and shale bands. These strata are considered to be moderately permeable with local importance as a groundwater resource.

40. The final northern section of the Proposed Development to the proposed substation (approximate Towers 1 to 48) is underlain by further Carboniferous strata but principally by Triassic rocks. The Triassic strata comprise mainly the Sherwood Sandstone, represented by the Derrycreevy Sandstone and the Mercia Mudstone Formation, the former Keuper Marl. The Sherwood Sandstone typically has a high intergranular permeability and a significant secondary permeability, imparted by the presence of fractures, which facilitates groundwater movement. The Sherwood Sandstone is a major aquifer of regional importance. The Mercia Mudstone, which overlies the Sherwood Sandstone and is present beneath the proposed substation, has a low permeability which restricts groundwater flow and has negligible importance for water supply.

41. Information provided by NIEA indicates that there are no existing public water supply boreholes or springs in close proximity to the Proposed Development.

42. The archaeological assessment of the Proposed Development has identified two historical wells of religious significance within the vicinity of the Proposed Development, including St Malachy's Well, which is still in use as a holy well. Whilst the sites are referred to as 'wells', typically such features are in reality springs which have been captured to form a stone chamber. Detailed descriptions of the wells are provided in Chapter 12 Cultural Heritage.

43. A review of historical mapping has identified a former holy well (Tobermesson Well) near Ninewell Bridge approximately 3km to the south-west of Moy (H82975441). St Malachy's Well is located in the southern part of the Proposed Development approximately 5km south-west of Keady (H79353229).

44. From the GSNI field mapping sheets, it is considered that Tobermesson Well is located in an area of sands and gravels overlying the Carboniferous Limestone. The Gorestown Fault runs north-south in close proximity to the well location. The identified well location is approximately 200m east of Tower 21 and 200m north of Tower 22. However, it is understood that there is now no trace of the well. St Malachy's Well is shown as being underlain by boulder clay overlying the Acton Group. The well is approximately 400m south-east of Tower 94 and a similar distance north-east of Tower 95.

45. Other than at the substation site there have been no ground investigations of the Proposed Development and hence there is little site specific information on groundwater levels. Information from the ground investigation at the substation site in 2006 indicates that locally perched groundwater *(isolated pockets of groundwater above the level of the main groundwater table)* in the superficial deposits would be above the level of the proposed excavations.

46. There is a risk that groundwater in siltstone layers in the underlying Mercia Mudstones is confined under pressure and that the piezometric level is above ground level, particularly in the eastern part of the proposed substation site. It is unlikely that significant quantities are present but the confined groundwater may need to be managed to prevent uncontrolled groundwater inflow into the excavation.

9.3.3 Designated Sites

47. Two Areas of Special Scientific Interest (ASSI) have been designated for their geological interest within 5km of the Proposed Development. Both sites are located in the area of Benburb and are shown on Figure 9.1. Details of the ASSI designations for the two sites are provided at Appendix 9A.

48. The site at Benburb (H811522) is the only peat deposit known in Northern Ireland containing fossiliferous evidence of interglacial conditions, and has been assigned to the Gortian Interglacial.

49. The Benburb-Milltown site was designated as an ASSI in February 2012. The site is located along the valley of the River Blackwater to the south and west of the village of Benburb, approximately centred on grid reference H805518. The closest location of the Proposed Development is at grid reference H832520, approximately 1.5km east of the eastern boundary of the ASSI.

50. The Benburb-Milltown ASSI has been designated due to the presence of exposures of bedrock, consisting of units of the Carboniferous (sandstone and limestone) and Triassic (sandstone and conglomerate) periods. Because of the extensive cover of superficial deposits, exposures of the underlying bedrock are rare and as a result, the ability to undertake a detailed interpretation of the bedrock geology is limited. The valley of the River Blackwater to the west of Benburb is one of the few locations where good exposures of the bedrock are present. The bedrock is exposed in a number of disused quarries and in cliffs along the river.

51. Additionally, there are a small number of Earth Science Conservation Review (ESCR) sites within 5km of the Proposed Development. The objective of the ESCR is to define systematically all earth science localities in Northern Ireland, both geological and geomorphological, which achieve at least national significance. It is anticipated that all sites identified by the ESCR eventually will be designated as ASSIs. The ESCR sites in the vicinity of the Proposed Development are listed in Table 9.5.

Table 9.5: Geologically Designated Sites in the Vicinity of the Proposed Development

Site Name	Location	Distance and direction from route (m)	Interest
Benburb ASSI	H811522	2km west	Fossiliferous evidence of interglacial conditions
Benburb-Milltown ASSI	H805518	1.5km west	Bedrock consisting of units of the Carboniferous (sandstone and limestone) and Triassic (sandstone and conglomerate) periods.
College Mine ESCR, Carryhugh	H806335	1.5km east	Mineral development, including calcite, galena, pyrite, quartz.
Derrynoose ESCR	H798315	750m east	Mineral development, with galena, quartz, sphalerite, and presence of hydrothermal vein deposits.

52. As the Proposed Development does not impinge on the area of the ASSIs or the ESCR sites, it is concluded that there will be no impact on the geologically designated sites. As the Proposed Development does not pose a risk to the designated sites, it is considered that a review of potential impacts on these features can be scoped out of the assessment as there are no likely significant effects.

9.3.4 Soils

53. The low permeability of both bedrock and glacial deposits along much of the route of the Proposed Development gives rise to soils of poor surface drainage characteristics, which are generally gleyed. These soils may retain moisture in their surface layers throughout much of the year, and soil horizon development is poor. Better differentiated brownearths may develop where surface drainage is less impeded, particularly on the Triassic Sandstones.

54. Land use throughout the study area reflects the characteristics of local soils, and is dominated by agriculture, with the emphasis on improved pasture. Grassland fields are of variable agricultural quality, but most are improved, although there are occasional fields dominated by rushes. Arable farming is localised and where it occurs is generally devoted to the production of cereals.

9.3.5 Contaminated Land

9.3.5.1 Overview

55. Contaminated land is defined as land where substances are present in sufficient quantities or concentrations to cause or are likely to be causing harm, directly or indirectly, to humans or the environment, in particular surface water or groundwater.

56. An assessment to determine the presence and extent of potentially contaminated land in the study area is based on the following approach:-

- Identification of potential sources of contamination;
- Identification of potential receptors that might be adversely affected by the contaminants; and,
- Identification of potential pathways between the source(s) and the receptor(s).

57. If all three elements (source, pathway and receptor) are present, there is a contaminant linkage and there is a potential for the contamination to represent a risk to the receptor(s) and for the site to be considered as contaminated.

58. A number of sites have been identified from the NIEA Contaminated Land database as having a potential for land contamination in the immediate area of the Proposed Development. It should be noted that the contaminated land sites provided by NIEA are derived from a pilot study, and are therefore not likely to be comprehensive. The identified sites have not been fully validated and it is considered likely that they represent worst case conditions, where a potential for contamination has been identified but no evidence of actual contamination has been confirmed, such as a former mineral working/quarry which may or may not have been infilled. The assessment has been undertaken on the assumption that all of the sites are contaminated unless there is strong evidence to the contrary.

59. The sites on the NIEA database are listed in Table 9.6 and shown in Figure 9.3. The distance to the nearest tower has been used, as the overhead lines would have no impact on the underlying ground conditions. On a precautionary basis, only sites within 500m of the route of the Proposed Development have been considered. The only tower sites or access routes that are close to potentially contaminated sites (within around 100m) on the NIEA list are Towers 49 and 72. In addition, Towers 10, 25, 26, 29 and 31 are located within approximately 500m of other potentially contaminated sites on the NIEA list. Specific contaminated land risk assessments have been undertaken in respect of these tower locations.

Table 9.6: Potential contaminated land sites within 500m of the proposed overhead line route

Site Number	Grid Reference	Approximate Distance (m) and direction from nearest tower	Description
DN179/013	H831578	200m south-east of Tower 10	Reclaimed land (gravel pit)
DN198/009	H836540	300m east of Tower 26	Reclaimed land (gravel pit)
DN198/015	H828538	400m west of Tower 25	Textiles (flax mill)
DN198/016	H827538	400m south south-west of Tower 24	Reclaimed land (quarry)
DN198/011	H830534	Adjacent to route of proposed overhead line. 200m south of Tower 25	Reclaimed land (gravel pit)
DN198/003	H830524	100m west of Tower 29	Mineral workings
DN198/008	H835517	450m north-east of Tower 31	Chemical works
AH190/011	H824512	500m north-west of Tower 31	Textiles
AH217/007	H822461	Adjacent to Tower 49	Railway land
AH234/021	H803394	Adjacent to Tower 72	Reclaimed land (quarry)
AH234/016	H798366	200m west of Tower 80	Textiles
AH234/007	H793357	500m west of Tower 83	Reclaimed land (quarry)
AH249/014	H796315	500m north-east of Tower 98	Metal mining and smelting
AH249/003	H787323	250m south-west of Tower 94	Petrol station/fuel storage
AH249/001	H798296	500m north-east of overhead line in Republic	Mineral workings
AH249/012	H794291	Adjacent to route of proposed overhead line.	Reclaimed land (quarry)

NB sites taken from NIEA Contaminated Land database

60. A review was undertaken of potentially contaminated land sites identified on the NIEA database which are located in close proximity to the route of the Proposed Development. The detailed reviews are based on an assessment of historical Ordnance Survey plans of the sites; the 1:10,000 and 1:50,000 scale geology plans; and, a site walkover on 27 September 2012 of all the sites listed on Table 9.6.

61. In addition to specific sites, it should be noted that there is a general potential for pollution from agricultural chemicals in soils and groundwater on present and past agricultural land, and from buried material which may occur almost anywhere along the Proposed Development.

9.3.5.2 Tower 10

62. Tower 10 is located to the north-west of Moy at IGR H828582. The NIEA contaminated land database identifies a former gravel pit located at H831578, approximately 200m south-east of the overhead line and 600m to the south-east of the tower location. The tower location is underlain by a sequence of superficial deposits comprising sand and gravel and boulder clay. The bedrock geology comprises either the Triassic Derrycreevy Sandstone or the Carboniferous Limestone.

63. A review of Ordnance Survey (OSNI) plans for the period 1833 to 1975 shows the presence of two former gravel pits in the area since 1833. One gravel pit was located approximately 500m east of the tower location. This mineral working only is shown on the plan dated 1833 and appears to be the site identified on the NIEA database. A second gravel pit is located approximately 400m south south-west of the tower at IGR H827576. This mineral working is shown on all the OS plans since 1833 with the plan of 1975 showing the workings as disused.

64. Due to the distance of both mineral workings from the tower location, it is considered that the two former mineral extraction sites will not be disturbed by and do not pose a contamination risk to the Proposed Development.

9.3.5.3 Towers 25 and 26

65. These two towers are located on either side of Drumlee Road to the south of Moy. Tower 25 is located at IGR H830536 and Tower 26 at H828533. The NIEA contaminated land database identifies a former gravel pit located at H830534, below the route of the proposed overhead line and approximately 200m to the south of Tower 25. Another mineral working is identified at H830524, approximately 100m west of the proposed overhead line and 800m south of Tower 26. Both towers are located on superficial deposits. Tower 25 is underlain by sand and gravel while Tower 26 is underlain by boulder clay and peat. At both tower sites, the underlying bedrock consists of the Triassic Derrycreevy Sandstone Formation.

66. A review of OS plans for the period 1833 to 1977 shows the presence of former gravel pits in the area since 1833. An area of mineral workings is shown on the plan dated 1935 at H831534. It is considered likely that this is the site referred to on the NIEA database. These workings have since been restored and re-developed for a residential use. There is no evidence of mineral workings in close proximity to Tower 25. It is concluded that the former mineral workings, identified on the NIEA database at H830534 do not pose a risk to Tower 25.

67. The historical plans do not show any evidence of mineral workings in the vicinity of Tower 26. However from the site visit, it is apparent that the area between the location of proposed Tower 26 and the Benburb Road to the west, particularly north of the tower location is much lower than the surrounding land. It is possible that this reflects an area of previous mineral working, restored to a lower level. However, there is no evidence to suggest that the restored workings pose a constraint on Tower 26.

9.3.5.4 Towers 29 and 31

68. Tower 29 is located at IGR H832523, approximately 1.5km east of Benburb. Tower 31 is located at IGR H 832515, approximately 2km east south-east of Benburb. The NIEA contaminated land database identifies a chemical works located at H835517, approximately 600m to the south of Tower 29 and 450m north-east of Tower 31. Both tower locations are underlain by superficial deposits of boulder clay and sand and gravel. The underlying bedrock consists of the Triassic Derrycreevy Sandstone Formation.

69. A review of OS plans for the period 1833 to 1993 shows the presence of a Bleach Mill at H836518 from a date between 1833 and 1851, up to a date before 1907. It appears that this location coincides with the ‘chemical works’ on the NIEA database.

70. The OS plans also show a factory (not referenced in the NIEA database) located approximately 50m west of Tower 29. On the 1977 plan, this is described as a ‘concrete works’. On the 1993 plan, it is described as a ‘tanning works’. At the time of the site walkover, the factory was not in use. As Tower 29 is on higher ground above the factory and as the area surrounding Tower 29 does not appear to have been disturbed, it is considered that the factory does not pose a significant contamination risk to the Proposed Development.

9.3.5.5 Tower 49

71. Tower No.49 is located at IGR H822461, approximately 5.5km west of Armagh. The tower is located close to an abandoned railway cutting which runs south-west to north-east, less than 30m north of the proposed tower location. The cutting deepens to the west and adjacent to the tower location, the former railway line is almost ‘at grade’, at a similar level to the adjacent land. The former cutting to the west is wooded.

72. The geological map shows that the site is underlain by superficial deposits consisting of alluvium and boulder clay (till). The superficial deposits are underlain by Carboniferous and Triassic strata. The Benburb Fault runs north to south immediately to the west of the tower location, downthrown to the east, with limestones of the Carboniferous Tyrone and Armagh Groups present to the west of the fault and the Derrycreevy Sandstone of the Triassic Sherwood Sandstone Group to the east. A second fault

runs north-west to south-east off the Benburb Fault immediately north of the site, separating the limestone of the Armagh Group to the south and the Derrycreevy Sandstone to the north. Based on the published plan, it is inferred that the tower is located south of the fault and is underlain by the Armagh Group. The thickness of the cover of superficial deposits is unknown.

73. Information from the NIEA Land Use Database identifies the area as ‘railway land’ associated with the former Portadown to Cavan railway line. Armagh railway station closed in 1957 and it is considered likely that the railway became disused at a similar date.

74. The earliest OS plan for 1832 shows the site undeveloped, presumably as farmland. The railway had not been constructed at this date. The railway had been constructed by 1860 with the cutting beneath the minor road at Woolsey’s Bridge to the west and a further cutting to the east. Adjacent to the proposed location of Tower 49, the railway emerges from the cutting to the west and is on a slight embankment. There is no change to the site on the map dated 1905-1906. The plan dated 1952 shows that the line had been reduced from a double track to a single track. The plan for 1977 shows the railway track in place with no obvious changes. There is no record of the railway line being disused at this date.

75. Contaminants associated with railway lines typically include hydrocarbons from leakages and spillages, creosote from sleeper treatment, ash and sulphates from track ballast and herbicides. Many of the contaminants associated with railway land are volatile and are likely to have evaporated, and the heavier fractions are sealed within the track route by organic matter. Spillages generally are found in sidings where engines have been stored. There is no evidence of sidings at the site and hence it is considered unlikely that significant concentrations of hydrocarbons are present along the former railway line.

76. Whilst there are plausible contaminant linkages, such linkages have existed ever since the railway was constructed, before 1860. Since the closure of the railway there have been no additional contaminant sources and impacts, if any, would be limited to residual contaminants present from the operation of the railway pre-1957. It is likely that the majority of the mobile contaminants would have migrated from the site over the past 50 years and that any residual contaminants are present in immobile forms. Accordingly, it is considered unlikely that there are any sources of significant residual contamination associated with the former railway line remaining on the site.

77. Tower 49 will be located to the south of the former railway line and the footprint of the tower will not include the former railway line. In the absence of excavation of the former railway line (the ‘source’ of any contamination) for the tower construction, it is concluded that the construction works will not disturb any residual contamination and that the works will not alter the existing ground conditions. As the construction of the tower would not affect the former railway line, it is considered that any contaminant pathways will not be realised as part of the Proposed Development.

78. It is concluded that the construction of Tower 49 will not affect any potentially contaminated land and hence the tower construction would not present a risk to surface water or to groundwater.

9.3.5.6 Tower 72

79. Tower No.72 is located near Tamlaght at IGR H803394, approximately 9km south-west of Armagh. The GSNI 1:50,000 scale map shows that the site is underlain by superficial deposits of boulder clay, which rest on the Silurian, Acton Group, a sequence of thick greywacke with thin bands of slate and mudstone. The 1:10,560 scale maps show that the boulder clay is part of an extensive area of glacial deposits which form an area of drumlins, orientated approximately north-south. An area of peat is mapped on the lower lying ground to the east of the site. There is no information on the thickness of the boulder clay and there are no logs for boreholes in the immediate area.

80. The NIEA Land Use Database has identified the field as a former quarry and is described as “reclaimed land (quarry)”. There is no evidence on the ground that the site was a former quarry as the contours of the field are consistent with the surrounding land, indicating that if the site was a former quarry it has been restored to an exceptionally high standard. It also should be recognised that neither the boulder clay nor the underlying greywacke are important sources of mineral, although there is historical evidence of small quarries within the greywacke to the east of the site.

81. Historical OS plans of the site for the period 1832 to 1977 and geological field sheets for 1872, 1964 and 1976 do not record any evidence of a quarry at the site. The earliest OS plan dated 1832 shows the site as being undeveloped, presumably as farmland. A small quarry is shown on the eastern side of the minor road, which runs to the west of the tower location. The quarry is approximately 200m south of the tower location. On the 1860 plan, the quarry is no longer shown. The field shown on the NIEA Land Use Database is split into two separate fields with a field boundary running approximately east to west. The OS plans dated 1906 and 1955 show no changes on the site.

82. It is considered that there is no evidence that the site is a former quarry and hence it is highly unlikely that it is a site of potentially contaminated land.

83. It is concluded that there is no evidence for a reclaimed quarry on the site and hence the ground conditions do not present a constraint on the construction of Tower No. 72. Equally, in the absence of an obvious source of contamination, there is no contaminant linkage and hence it is concluded that the Proposed Development of the site for the tower would not present a risk to water quality.

9.3.5.7 Summary

84. It is concluded that the potentially contaminated land sites identified on the NIEA database in close proximity to the route of the Proposed Development do not pose a significant risk of contamination or a constraint to the Proposed Development. None of the towers are located on areas of potential contaminated land. Appendix 9B shows the historical OS plans for the potentially contaminated sites identified above. In summary, it is concluded that impacts related to the presence of contaminated land are **negligible**.

9.4 Potential Impacts

9.4.1 Ground Conditions

85. The Proposed Development has the potential to cause adverse effects on the ground and groundwater conditions. Adverse impacts on the groundwater system could result in associated impacts on the surface water system and on groundwater dependent ‘wetlands’. The impacts principally result from:

- Excavation of tower footings on contaminated or natural ground;
- Construction of substation;
- Compaction of soil by plant and vehicles;
- Provision of access tracks to tower locations;
- Possible disturbance of contaminated land for working areas, storage areas, access routes etc outside of the limits of the tower and substation construction;
- Dewatering of excavations; and,
- Management of surplus soils.

86. Impacts of the construction works on the surface water environment are considered in Chapter 8 Water Environment.

87. The methodology adopted to assess the potential impact of the Proposed Development on geology and contaminated land is based on current practice using the source-pathway-receptor approach. For there to be an identifiable risk, not only must there be contaminants present on the site (*source*) i.e. contaminated ground, leachate, landfill gas but also there must be a *receptor* and a *pathway* which allows the source to reach the receptor. All three elements must be present to form a potential

contaminant linkage. The potential impacts of the construction and operation of the Proposed Development on geology and ground conditions have been determined by a qualitative assessment.

88. The significance of potential impacts associated with contaminated land has been assessed broadly based on guidelines in CIRIA document 552 *'Contaminated Land Risk Assessment, A Guide to Good Practice' (*2001).

89. Impacts are assessed for both the construction and operational phases of the Proposed Development. However, it is considered that there would be no significant impacts in respect of the ground conditions during the operational phase.

90. The construction phase of the Proposed Development will impact on the ground and geological conditions through the excavations required for the tower bases and the substation. The extent of the excavations required for the tower bases will vary depending on the precise geological conditions at each tower. The excavations would be within a limited area, a maximum of 20m by 20m and would result in only a small loss of ground. A more extensive disturbance of the ground would result from the construction of the substation.

91. Excavations for the overhead line towers (Towers 1 to 102) would be between 2.5m to a maximum 3.5m deep at each of the four tower footings. The two proposed 275kV towers at the substation would have an excavation a maximum 6m in depth.

92. Despite the number of the excavations required, it is considered that the construction works only would have minor effects on the geomorphology of the area as the tower construction would not materially change the local slopes and topography. Landform modification would be most marked at the proposed substation site, where existing slopes would be regraded to create a suitable platform for the substation and to provide perimeter screening bunds.

93. The tower locations have been selected to avoid known areas of peat, principally because such ground conditions would necessitate more extensive construction works for the tower foundations. Peat was not identified on the site of the proposed substation. Accordingly, it is considered that the excavations required for the construction of the principal elements of the Proposed Development (towers and the substation) would have no adverse impacts on the more-sensitive peat ecosystem.

94. A small number of sites of potentially contaminated land have been identified in proximity to the Proposed Development. None of the proposed towers or the proposed substation are located on these sites. The proposed access tracks would not cross these sites. Accordingly, it is concluded that the sites of potentially contaminated land in proximity to the Proposed Development would not be disturbed by the construction process and do not pose a constraint to the Proposed Development.

95. The excavations necessary for the construction of the Proposed Development would be restricted to the tower locations and the substation. It is estimated that the tower construction works would result in the generation of approximately 15,340m^3 of surplus material. It is considered that the vast majority of this material will consist of sub-soil and naturally excavated soils and rock. It is proposed that approximately 40% of this volume would be retained on each tower site for reinstatement of the land.

96. The surplus excavated material from tower excavations of approximately 9,730m^3 will be taken off-site and deposited in a landfill or at an appropriately licensed waste management site. Approximately 94,000m^3 of surplus material from the substation excavation also will be removed offsite for landfill disposal. As it is anticipated that the excavated materials would comprise natural uncontaminated soils, there would be no contamination restrictions on the ability of landfills to accept the materials.

97. The ground conditions in the vicinity of the Proposed Development are considered to be of low sensitivity, apart from the ASSIs at Benburb, which would be defined as high. However, as the ASSIs are remote from the Proposed Development, these will not be affected and hence do not require a formal impact assessment. Impacts on the existing ground conditions would be restricted to excavations necessary for the tower locations and the substation. The magnitude of the impacts at the tower locations is considered to be low and at the substation high. Accordingly, the significance of the potential impacts on the ground conditions is considered **negligible** other than at substation where a **moderate** impact is predicted.

9.4.2 Groundwater

9.4.2.1 Overview

98. The Proposed Development has the potential to impact locally on groundwater flow and quality. All impacts that are realised would be of a temporary nature for the construction period. The principal potential impacts are:

- Reduction in groundwater level and modification in groundwater flow as a result of dewatering, where necessary, to construct the tower bases and the substation;
- Derogation of existing water supply springs, wells and boreholes due to dewatering pumping;
- Adverse impacts on the principal aquifer e.g. Sherwood Sandstone;
- Deterioration in groundwater quality as a result of suspended solids and contaminant (oils and chemicals) spills/leaks during construction and operation;
- Impact on adjacent surface water features due to reduced groundwater discharges;
- Impact on adjacent surface water features due to uncontrolled discharge of high suspended solids from dewatering; and,
- Impact on adjacent surface water features due to the uncontrolled discharge of contaminated groundwater from dewatering.

99. The assessment of the significance of any identified adverse impact on groundwater also 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. Receptors of high sensitivity from a hydrogeological aspect include highly permeable aquifers, such as the Derrycreevy Sandstone, with potable water supplies in the vicinity and groundwater-dependant designated sensitive sites i.e. sites protected under EU or UK legislation. Medium sensitivity receptors include highly permeable aquifers without adjacent potable abstractions and moderately permeable aquifers, such as the limestones of the Armagh and Tyrone Groups. Low and negligible sensitivity receptors include weakly permeable aquifers and strata with limited or no groundwater resource potential, such as the Acton Group and the Mercia Mudstone.

9.4.2.2 Impact on Groundwater Level and Flow

100. The proposed overhead line towers require the construction of a concrete pad for foundations. Excavation for the pad generally will vary between approximately 2.5m and 3.5m depth, subject to the precise ground conditions at each tower location. The excavation for the towers typically will extend over an area of approximately 400m^2 although the deeper excavations typically will be restricted to the four tower supports.

101. The two proposed 275kV towers at the substation will have an excavation depth of approximately 6m and an area of 625m^2.

102. It is anticipated that at certain locations, especially in the lower-lying areas, the groundwater table is shallow. There also is potential for perched water within the variable superficial deposits. Accordingly, groundwater controls may be necessary to manage shallow groundwater. In these areas it will be necessary to depress by pumping the groundwater level to maintain a dry operational area for construction of the foundations. Pumping to allow the construction of the tower footings typically will continue for a short period of approximately 3 to 6 days.

103. Dewatering of the excavation will depress the groundwater level in the vicinity of the excavation. Any impacts will be restricted to the short period of pumping. The extent of the impact of the dewatering depends on the hydraulic characteristics of the strata and the amount of drawdown of the groundwater level necessary to achieve the required dewatering. Any impact on the surrounding groundwater level reduces significantly with increasing distance from the point of abstraction. Under normal conditions, it is unlikely that significant effects will be recorded more than 50m from the point of abstraction, although effects may be recorded more than 100m from the excavation. As the maximum depth of the footings for the majority of the towers will be approximately 3.5m, the maximum drawdown required to provide a

dry working area will be less than 3.5m. Due to the limited drawdown and the short period of pumping required, it is considered that any significant impacts on the groundwater level will be realised only in close proximity to the point of abstraction.

104. Prior to the commencement of construction, a ground investigation would be undertaken at each tower location to establish the detailed ground and groundwater conditions to facilitate foundation design (as per the options presented in Chapter 5 of this ES). Information from the ground investigation would confirm the need for any dewatering of the tower excavation.

105. Pumping from the excavations would locally modify the direction of groundwater flow. This could result in intercepting groundwater which normally would flow to nearby watercourses or could result in derogation of existing springs, wells and boreholes in the vicinity. The water pumped from the excavation would need to be discharged off-site, following treatment. The most likely destination for the discharge would be to the nearest watercourse or to a soakaway within the working area, subject to the ground conditions. Accordingly, any groundwater intercepted in the excavation, which would have discharged naturally as baseflow to the watercourse would still discharge to the watercourse. As a result, it is concluded that there would be no significant adverse impact on the flow in watercourses as a result of any dewatering.

106. The majority of the tower locations are remote from properties and hence it is unlikely that any dewatering of the excavations would impact on existing wells and boreholes as these tend to be located in close proximity to the user's property. The presence of such water supplies in the vicinity of the tower locations cannot be discounted and, whilst adverse impacts on existing wells and boreholes are unlikely, a precautionary approach will be followed. Where dewatering to construct the tower foundations is required, a water source survey will be carried out over an area approximately 300m from the tower location. If private wells, boreholes or springs are present in the survey area, an assessment will be carried out of the likely impact of dewatering pumping on the source and the need for the provision of a temporary alternative supply for the period of dewatering. In the unlikely event of adverse effects being realised, any impacts would be temporary and limited to the short period of dewatering.

107. Two historical wells of religious significance have been identified from the archaeological assessment. St Malachy's Well is approximately 400m from the nearest proposed towers. It is considered that the well is a sufficient distance from the towers where dewatering may occur, not to be at risk of being affected by the works. Tobermesson Well at Ninewell Bridge is indicated to be approximately 200m from the nearest proposed towers. The well currently cannot be located and may have been buried. It is considered that it is on the limit of any likely effects due to possible dewatering at either Tower 21 or 22. Should the need for extensive dewatering at either tower be identified, an assessment of the potential impact on the well will be completed. If necessary, an investigation will be undertaken to locate the well. If no or very limited dewatering is necessary, it is considered that there would be no significant risk of an impact on the well.

108. The greatest potential impact on groundwater would be associated with the construction of the proposed substation. A large excavation of approximately 20,200m^2 will be necessary for the substation. However the substation design would not involve any excavation below the groundwater table and hence it is considered that the construction of the proposed substation would not impact significantly on the groundwater level or on flow in the underlying sands and gravels as no dewatering would be required.

9.4.2.3 Impact on Groundwater and Surface Water Quality

109. 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 a deterioration in water quality of the receiving system.

110. Details for the management of water pumped from the excavations are provided in Chapter 8 Water Environment of this ES. All water pumped from excavations would be passed through a filtration system to facilitate the settlement of suspended solids before it is discharged. Measures for the prevention of water pollution from plant and machinery and other potentially hazardous substances are discussed in Chapter 8 Water Environment of this ES. With the implementation of the proposed

treatment measures for water discharged from the sites, it is concluded that there would be no significant deterioration in groundwater quality in the vicinity of the excavations.

111. The potential for contaminated land along the route of the Proposed Development is addressed previously in this Chapter. There is no evidence that the towers or the access routes would impact on any area of contaminated ground. Accordingly, there is no likelihood that water pumped from the excavations for the towers would contain chemical contaminants. Therefore, it is concluded that dewatering of the tower excavations would not adversely affect the chemical quality of the receiving water system.

9.4.2.4 Groundwater Summary

112. The construction of the towers has the potential to cause a temporary modification in the local groundwater level and flow and to impact on water quality through dewatering and the discharge of the pumped water to the surface and/or groundwater systems. However, it is concluded that any potential impacts can be adequately managed by the implementation of mitigation measures, outlined in Chapter 8 Water Environment and in Section 9.5, for the management of water on the site. The impacts are considered as **negligible** to **minor** and **temporary.**

113. Where dewatering is required to install the tower foundations, a survey of existing water supply sources in the vicinity of the site would be undertaken. Where there is considered to be a risk of derogation of an existing water supply spring, well or borehole, an appropriate alternative supply would be provided for the period of dewatering.

114. The sensitivity of the groundwater conditions in the vicinity of the Proposed Development varies from high in the northern section where the bedrock comprises the Derrycreevy Sandstone aquifer to negligible in the southern section, underlain by the low permeability Acton Group. It is considered that any impacts on groundwater will be low or negligible and of a temporary nature. The significance of the potential impacts is generally **negligible** or **minor**, where the bedrock is the Derrycreevy Sandstone, although actual adverse impacts are considered unlikely.

9.4.3 Operational Phase

115. Operational impacts on geology and groundwater would be negligible. Access to towers for maintenance purpose will be required, but any additional soil compaction due to vehicle use would be of short duration and of low intensity. The modified landform at the proposed substation would be a permanent feature in the local landscape. It is considered that operational impacts on geology would be non-existent and it is concluded that this issue can be excluded from any further assessment.

116. It is considered that the operation of the Proposed Development generally would have no significant impacts on the groundwater conditions. At the proposed substation, oils would be stored and used. These present a potential risk to groundwater quality in the event of spillage and/or leakages. These substances should be stored and used in accordance with standard operational procedures, including:-

- CIRIA C650 Environmental Good Practice on Site;
- Control of Pollution (Oil Storage) Regulations (Northern Ireland) 2010;
- PPG02 – Above Ground Oil Storage Tanks;
- PPG07 – Refuelling Facilities; and,
- PPG08 – Safe Storage and Disposal of Used Oils.

117. Foul drainage from the substation would be directed through a septic tank soakaway system, located in the north-eastern part of the substation. Provided that the soakaway drains from the septic tank are a minimum 2m above the groundwater level to provide attenuation of contaminants in the unsaturated zone, it is concluded that this operation will have no adverse impact on groundwater quality.

118. With the adoption of these guidelines and controls, it is concluded that the risks posed to the underlying groundwater and any associated surface waters would be **negligible**.

9.5 Mitigation Measures

9.5.1 Overview

119. The impact of the Proposed Development on the local geology and landforms would be negligible and future monitoring of the potential impacts of the Proposed Development on geology and soils is considered unnecessary.

120. Any impacts are considered likely to be minor and of a temporary nature. Measures to mitigate the impacts of the construction of the Proposed Development on geology, soils and groundwater have been considered and are discussed below. It is considered that the operation of the Proposed Development does not pose any likely significant risk to geology, soils or groundwater and that no specific mitigation measures are necessary.

9.5.2 Construction Phase

121. Any impacts of the construction of the Proposed Development on geology and soils will be restricted to the locations of the proposed towers, the proposed substation and the construction access routes.

122. Measures to minimise the effects of the proposed construction activities on local geology include re-use of in-situ materials, wherever possible, and the importation of additional materials, where necessary, from local sources. The tower construction phase will generate approximately 15,340m^3 of material of which 5,610m^3 will be re-used at the tower sites. There would be an excess of approximately 9,730m^3 of materials arising from the construction process, which will be disposed of outside of the planning application boundary. The precise volume of excess material would depend on the type of foundations used at each of the proposed tower locations, which is dependent on the ground conditions at each tower location (as per the options presented in Chapter 5 of this ES). The excess material, comprising naturally excavated soils and rocks would be uncontaminated and removed for disposal to landfill.

123. The estimated total volume of cut material from the proposed substation is 250,000m^3. Approximately 156,000m^3 will be re-used on site for regrading the substation platform and for screening bunds. The excess material of approximately 94,000m^3 will be disposed of at suitability licensed waste disposal/management sites. In total, approximately 103,730m^3 of surplus material will be re-used, recycled or disposed of offsite. Currently, it is proposed that the surplus material will be disposed of at landfills. Further details of the landfills considered are provided at Chapter 18 Transport.

124. Ground investigation currently has been limited to the site of the proposed substation where substantial earth movements would be required. A ground investigation will be undertaken at each tower location to confirm the geology and hence foundation options.

125. Measures to reduce any impacts on soils would include:

- Controlling working practices, for example, by minimising land take to that required for the construction process; avoiding repetitive handling of soils; minimising vehicle movements off-road; and minimising the size of stockpiles to reduce compaction of soils: and,
- Re-instatement of soils to their original location, wherever practical.

126. NIE will contact DARD regarding the safe disposal or replacement of soils affected by Potato Wart Disease (PWD). Where off-site removal of infested soil is unavoidable, NIE would seek advice on the selection of suitable disposal sites and agree a methodology for the works prior to the issue of the necessary movement licence, which would include the measures to be adopted to prevent the spread

of the disease. Even if affected soils are not removed off-site, NIE will implement measures to minimise the risk of spreading of the disease, such as cleaning the wheels of all lorries leaving the construction areas prior to accessing the public road and cleaning of all tools and earth-moving equipment after use in infested areas to avoid carrying infested soil onto unaffected agricultural land.

127. NIE will ensure that a methodology would be agreed for the disposal of all spoil arising from the excavations and that any disposal of the spoil on agricultural land will not be carried out without the benefit of appropriate permissions from the statutory authority (DOE and DARD). Measures agreed for the management of infested soils and spoil are included within the Outline CEMP for the Proposed Development.

128. None of the proposed towers or the proposed substation are located on known areas of contaminated ground. Whilst it is considered that the construction of the towers and the substation would not pose a risk in respect of contaminated ground, there always will be a risk of discovering ground contamination during the construction of the development. As a result specific proposals would be prepared, following the granting of planning permission to facilitate the management of any contaminated material unexpectedly excavated as part of the construction of the development. Further details of these proposals are included within the Outline CEMP.

129. The proposals would be adopted to characterise the pollution potential of any contaminated materials arising from the construction works to ensure that the materials are managed, treated and disposed of in accordance with the statutory guidance current at the time.

130. It is considered that the proposed construction works would not impact on any ASSI or ESCR sites. Accordingly, no mitigation measures are considered necessary to protect these areas during the construction phase of the development.

131. It is anticipated that at certain locations, especially in the lower-lying areas, the groundwater table is shallow. In these areas it may be necessary to lower the water level by pumping to maintain a dry operational area for installation of the foundations. Dewatering of the excavation will lower the groundwater level in the vicinity of the excavation. It is unlikely that significant effects will be recorded more than 50m from the point of abstraction.

132. 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. Where it would be necessary to dewater to construct the tower foundations, a water well survey would be carried out over an area approximately 300m from the tower location. Should an assessment show that there is a risk of derogation of existing water supply sources, a replacement supply would be provided. This will consist of the provision of a temporary supply, such as a water bowser to ensure a continued water supply to the property.

133. It is considered that the greatest potential impact on groundwater will be associated with the construction of the substation at the northern end of the Proposed Development where a much larger excavation of approximately 20,200m^2 will be necessary. However the proposed design for the substation would not involve any significant excavation below the groundwater table and hence it is considered that the construction of the proposed substation would not impact on the groundwater level or on flow as no substantial dewatering would be required. Accordingly any impacts on groundwater will be **negligible** and no mitigation measures would be required as part of the construction of the substation.

134. Water pumped from the excavations may contain suspended solids and contaminants. There is no evidence that water pumped from the excavations for the towers would contain chemical contaminants. Accordingly, it is concluded that no mitigation measures other than simply settlement to reduce the suspended solids concentration would be required to protect the quality of the receiving water system.

9.5.3 Operational Phase

135. Once the infrastructure (towers and substation) to the Proposed Development has been constructed, it is considered that there would be no subsequent impact on the geological conditions during the operational phase.

136. Impacts on groundwater following construction of the Proposed Development would be limited to issues associated with the storage and use of contaminants at the proposed substation and the use of a septic tank soakaway for the management of foul water at the substation. Provided that these substances are stored and used in accordance with standard guidelines and practices, it is concluded that potential risks to and impacts on groundwater and surface water quality would be **negligible**.

9.6 Residual Impacts

9.6.1 Construction Phase

137. The construction of the towers has the potential to cause a temporary modification in the groundwater level and flow. Additionally there is a potential impact on water quality through dewatering and the discharge of the pumped water to the surface and/or groundwater systems. However, it is concluded that any potential impacts adequately could be managed by mitigation measures implemented on the site. Measures for the management of water arising from the construction sites will be included in the Outline CEMP for the Proposed Development.

138. The exact design of the foundations for the towers and the need for any groundwater dewatering to facilitate construction can only be confirmed following a review of the ground investigations which will be carried out at each tower location. However, in the absence of this site-specific information a suite of mitigation measures has been prepared to address all potential geological and hydrogeological site conditions.

139. Where dewatering is required to install the tower foundations, a survey of existing water supply sources in the vicinity of the tower would be undertaken. Where there is considered to be a risk of derogation of an existing water supply spring, well or borehole, an appropriate alternative supply would be provided for the period of dewatering.

140. The implementation of the proposed treatment measures for water discharged from the sites will ensure that there would be no significant deterioration in groundwater quality in the vicinity of the excavations for the towers and substation. The adoption of the proposed mitigation measures would ensure that groundwater is not contaminated. Accordingly, it is concluded there would be **no** significant hydrogeological impacts as a result of the construction of the Proposed Development and **no** residual adverse impacts.

9.6.2 Operational Phase

141. It is considered that the operation of the Proposed Development would have no significant impacts on the soils and geology.

142. No significant adverse effects are predicted on the hydrogeological environment as a result of the operation of the proposed overhead line or the substation. Once the Proposed Development has been constructed, there will be no pumping of groundwater and hence no impacts on groundwater levels or flow. Standard measures in accordance with current guidance would be adopted to manage potential contaminants, in particular oils, stored and used on the substation, as outlined in Chapter 8 Water Environment. Foul water disposal via a septic tank will be managed to minimise impacts on water quality. It is concluded that residual impacts on groundwater quality would be **negligible**.

9.7 Conclusions

143. The Proposed Development has the potential to cause minor local adverse effects on geology, geomorphology, hydrogeology and soils along the route. Land take for the tower bases and the

substation along the length of the overhead line would entail disturbance of surface materials (soils and drift) during construction and would remove the tower base locations and the substation site from other productive uses.

144. The tower bases have been selected to avoid areas of known peat and the consequent absence of risk of potential slope failures arising from poor cohesion of disturbed peat bodies. No peat was found in the boreholes and trial pits on the proposed substation site and there is no evidence from a site walkover of the presence of peat on the site.

145. The geological conditions that would be affected by the construction of the principal elements of the Proposed Development are of widespread occurrence in the area and the works associated with the Proposed Development would have no significant impact on their local or regional availability for study.

146. The two designated geological ASSIs in the vicinity of the Proposed Development would not be affected by the proposed construction and operation of the development.

147. The large scale and widespread occurrence in the area of the geomorphological features that would be affected by the Proposed Development also mean that tower and substation construction would have a minor impact on these features. The setting of these features also would be preserved and their relationships within the landscape would continue.

148. The main effect on geology and soils of the Proposed Development is likely to be limited to the localised loss of good quality soil within the bounds of the working areas, in particular the substation. However, the relatively small scale of the tower bases and their dispersed distribution means that losses in individual fields will be of low significance. Construction sites avoid potentially high risk, contaminated land and known areas of peat. Proposed mitigation measures would reduce the potential degree and extent of soil degradation and hence reduce the significance of any adverse effect.

149. The proposed excavation for the towers and the substation would result in the generation of approximately 103,730m^3 of surplus materials. It is anticipated that these would comprise naturally excavated materials with no contamination potential. These materials would be managed by removal off-site for disposal to landfill.

150. There is no evidence that the towers or the substation would impact on any areas of contaminated ground. Accordingly, there is no risk that water pumped from the excavations for the towers or from the substation would contain chemical contaminants which would pose a risk to the quality of the surface water systems.

151. The construction of the towers has the potential to cause a temporary modification in the groundwater level and flow where dewatering is required to facilitate construction. Additionally there is a potential impact on water quality through dewatering and the discharge of the pumped water to the surface and/or groundwater systems. However, it is concluded that any potential impacts adequately could be managed by mitigation measures implemented on the site

152. In summary, it is concluded that the construction and operation of the Proposed Development pose no significant risk to groundwater. Any minor impacts will be controlled by standard procedures and pre-construction mitigation measures.

9.8 References

Geological Survey of Northern Ireland (GSNI) 1:50,000 scale geological maps, Sheets 35 Dungannon and 47 Armagh;

GSNI 1:63,360 scale geological map, Sheet 59;

GSNI *Shafts and Adits Database;*

Geological Memoir of Sheet 47 ‘*Country around Armagh’* 1873;

OSNI 1:50,000 scale maps, Sheets 19 Armagh and 28 Monaghan-Keady;

Environment Service 1:250,000 scale map, *‘Hydrogeological Map of Northern Ireland’* 1994;

Environment Service, Department of the Environment for Northern Ireland (1993): Groundwater Vulnerability Map of Northern Ireland, 1:250,000 scale;

NIEA Land Use Database;

Environment and Heritage Service report *'Policy and Practice for the Protection of Groundwater in Northern Ireland'* 2001;

British Geological Survey report, entitled *'Hydrogeology of Northern Ireland'* 1996;

The Water Framework Directive (2000/60/EC), enacted in Northern Ireland by The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2003;

The Water Resources (Environmental Impact Assessment) Regulations (Northern Ireland) 2005;

The Water Resources (Environmental Impact Assessment) (Amendment) Regulations (Northern Ireland) 2006;

The Pollution Prevention and Control Regulations (Northern Ireland) 2003;

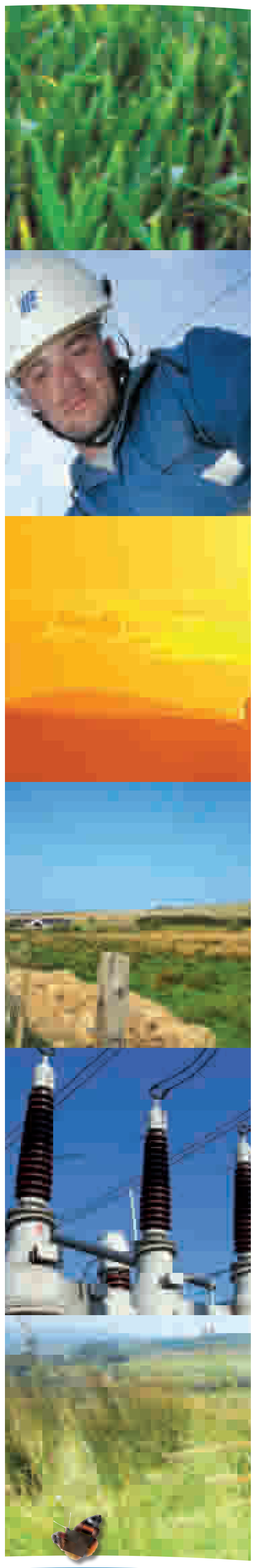
The Groundwater Regulations (Northern Ireland) 1998;

Environment Agency and NIEA Pollution Prevention Guidance Notes (PPGs); and,

CIRIA document 552 *'Contaminated Land Risk Assessment, A Guide to Good Practice' (*2001).

Chapter 10

Ecology



Consolidated Environmental Statement

Volume 2

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10 Ecology

Chapter Executive Summary

The assessment indicates that provision of the proposed Turleenan substation and the proposed overhead line between the substation site and the border with the Republic of Ireland will have a minimal impact on the ecology of the line route. The habitats present within the survey area are generally ecologically impoverished and of low value both intrinsically and as supporting habitats for protected fauna.

The site is dominated by intensive agriculture and the species and habitats reflect this with semi improved and improved grassland and species poor heavily managed hedgerows regularly occurring. Those areas of greater value to biodiversity have been avoided as far as possible by the development proposals and many years of ecological survey have allowed the route to be refined to avoid those areas of greater value in the local context.

The Proposed Development covers a large area of land but has a small footprint and therefore the potential for effects is low. Permanent land take is low and habitats lost are generally of low ecological value. Animals quickly habituate to new infrastructure in the environment and with mitigation as explained in this chapter, the long term effects on biodiversity will be negligible.

10.1 Introduction

1. This Chapter presents an assessment of the Proposed Development, as set out in Chapter 5, in relation to ecology and nature conservation.

2. The results of a desk-based study and a range of ecological surveys have been used to establish the baseline conditions of the site. These are assessed against the details of the development to identify effects that may arise from the Proposed Development. Where potential adverse effects upon species or habitats have been identified as a result of the final design, the chapter details appropriate environmental mitigation measures which are proposed to be undertaken prior to and during the construction and operational phases to reduce or eliminate such effects.

3. The study area includes all areas within the potential zone of ecological influence of the development, which is defined as the areas/resources that may be affected by the biophysical changes caused by activities associated with a project (IEEM, 2006). The development is defined as the area within the Proposed Development site which includes the location of the towers, overhead line, substation, stringing locations and access tracks.

4. The site boundary for the Proposed Development is shown on Figure 5.8. Baseline surveys were undertaken throughout the site boundary and within the immediate vicinity of the site boundary where required and where access permitted. The area surveyed varied depending on the survey type and is set out in the methodology section below. All proposed survey methodologies were discussed with Northern Ireland Environment Agency (NIEA) and agreed to be appropriate for the purpose of identifying potential impacts to the biodiversity and nature conservation value arising from the Proposed Development. The purpose of the ecological surveys is to determine the baseline conditions within the Proposed Development and the potential zone of ecological influence, in order to assess the potential impact of the new infrastructure on the local natural environment.

5. Common names only have been used throughout this chapter except where species do not have a widely recognised common name. Scientific names can be found in Appendix 10D.

10.2 Methodology

10.2.1 Chapter Structure

6. A range of survey types, over a wide area and over a number of years have been undertaken and the baseline results utilised to inform the ecological impact assessment of the Proposed Development. This chapter presents the ecological impacts assessment and is supported by a number of appendices and figures.

7. This chapter is presented as follows:

- Section 10.1 Introduction;
- Section 10.2 Methodology ;
- Section 10.3 Baseline Conditions;
- Section 10.4 Evaluation of Receptors;
- Section 10.5 Impact Magnitude;
- Section 10.6 Mitigation Measures;
- Section 10.7 Conclusions; and,
- Section 10.8 References.

10.2.2 Scope of Assessment

10.2.2.1 Consultations

8. AECOM assessed the route options and identified potential receptors based upon knowledge of the region and habitat types. Methodology for baseline assessment were developed and then sent to the NIEA during the consultation process. Ecological consultation responses from NIEA are included at Appendix 10A.

9. In order to obtain records of habitats, notable or protected species within the Proposed Development the following organisations were consulted:

- NIEA;
- Centre for Environmental Data and Recording (CEDaR);
- Raptor Study Group;
- Ulster Wildlife Trust (UWT);
- Wildfowl and Wetlands Trust (WWT);
- British Trust for Ornithology (BTO);
- Woodland Trust;
- Royal Society for the Protection of Birds (RSPB); and
- Northern Ireland Whooper Swan Study Group (NIWSSG).

10. The responses from consultees were reviewed and more specific issues arising from responses were addressed. In particular, both the RSPB and NIWSSG raised concerns over the potential for disruption to whooper swan flightlines through the construction of new overhead lines. Copies of all ecological consultation responses are included in Appendix 10A with the exception of the Raptor Study Group

which is confidential as it provides breeding details for protected species and is included in confidential Appendix 10C1. This is in addition to Appendix 6A, which presents all consultation responses for the Proposed Development.

10.2.2.2 Survey Effort and Background

11. The following section summarises the survey work undertaken between 2005 and 2012 with further detail provided in section 10.2.5. Survey work commenced for the Proposed Development as early as 2005 when habitat and ecological constraints survey work was undertaken to inform the route options and to ensure that valuable ecological features were avoided as much as possible. Ecological surveys were carried out along an evolving line route corridor and the substation area. The proposed overhead line route was refined, following rejection of a number of possible variations within the overall “preferred route corridor” because of engineering, operational and environmental considerations. A corridor of approximately 35km length was surveyed; surveys extended to a specified distance either side of the proposed works centre line, with the size of the corridor dependant on the nature of the specific surveys. These were:

- Desk study:
- A radius of 30km was used for internationally designated sites (SPAs, SACs and Ramsar sites);
- A radius of 5km for ASSIs designated for habitat features;
- A radius of 10km for ASSIs designated for bird features;
- The qualifying features of all ASSIs within 30km were reviewed but not assessed in full detail due to the static nature of the site and proximity of the development;
- A radius of 5km for Sites of Local Nature Conservation Importance (SLNCIs);
- A radius of 10km for all Important Bird Areas (IBAs);
- A radius of 500m for all Ancient Woodland Inventory Sites (AWIs);
- A radius of 500m for Local Record Centre search of protected and priority species.
- Phase 1 Habitat survey- within 250m of the Proposed Development;
- Smooth newts surveys - within 200m of the Proposed Development;
- Badger surveys - within 250m of the Proposed Development;
- Otters surveys – all watercourses within 250m of the Proposed Development;
- Bat surveys;
- Driven transects -within 500m of the Proposed Development;
- Walked transects -within 250m of the Proposed Development;
- Habitat suitability assessment- within 250m of the Proposed Development;
- Ground based tree surveys within 100m of the Proposed Development;
- Breeding bird surveys – within 200m of the Proposed Development;
- Barn owl surveys– all potential trees within the Proposed Development; and,
- Wintering bird surveys – 500m wide corridor following the Proposed Development. Traditional Whooper swan sites within 5km of the Proposed Development were further assessed.

12. The width of the survey corridor was further extended for surveys carried out in 2012 to take account of changed land access criteria and to encompass potential construction access tracks and associated works.

13. Habitat surveys were initially undertaken between June and September 2005. As route and substation options were refined, surveys were carried out along potential alternative routes during July and September 2006, and June 2007.

14. Further habitat surveys were undertaken during September and October 2007, as the route was finalised. A further suite of habitat surveys was carried out in June-August 2012 covering more than 97% of land within 250m of the centre line of the Proposed Development in order to ensure that survey work was contemporary and in line with best practice.

15. Initial breeding bird surveys of the Proposed Development were carried out in June 2005, and July 2006. A further assessment of breeding bird populations was undertaken along the route of the Proposed Development in spring 2008. Further breeding bird surveys were undertaken in June 2011, and in May to July 2012. Survey work for winter birds was undertaken between November 2006 and March 2007, between January and April 2008, between October 2008 and March 2009, and between December 2010 and March 2011.

16. Mammal surveys to identify the presence of otters and badgers were first conducted in 2005, and were augmented as the options for the overhead line route were developed during habitat survey work (as described above). A final search for evidence of badger and otter activity was carried out between August and early October 2012 when access to more than 97% of land within 500m of the Proposed Development centre line was possible.

17. All bat survey results previously undertaken within the survey area (including the Proposed Development and surrounding zone of influence) are available in Appendix 10B. Methodologies in full are available in section 10.2.5 of this chapter but the following survey work has been undertaken:

- Activity surveys along the line route were undertaken (across the survey season, May-September) during 2009 and 2010;
- An assessment of mature trees along the line route for their BRP (bat roost potential) was undertaken in June 2009;
- Driven transects were completed during May, June, July and September 2011 within 500m of the line route for more than 90% of the route;
- Bat activity walked transects were undertaken between July and September for more than 90% of land within 250m of the Proposed Development in 2012; and,
- Thirty-two static automated monitors were used to collect bat data from the line route and associated access tracks on 215 survey nights during May and September 2012.

10.2.3 Legislative and Policy Context

10.2.3.1 General

18. Conservation of habitats and species in Northern Ireland is backed by a legislative framework at international, European and Northern Ireland levels. Conservation policy is largely based on the protection of sites that are notable for the habitats and/or species that they support. At the same time, legislation protects a wide range of species both within and outside these designated sites. Additionally, policies are described which must be taken into account when assessing the potential impact of a scheme on the local ecology. This section outlines the legislation, agreements and policies that must be considered when assessing the impact of a scheme on the local ecology. Guidance on the status of species and habitats of conservation concern is also set out.

19. The following account outlines the legislative and policy background in Northern Ireland only. Comparable legislation exists in the Republic of Ireland with regard to international and national protected sites within that jurisdiction. A small number of these sites are present within 30km of the Proposed Development and were thus scoped for potential impacts. They are included in 10.3.1 below. As they have all been scoped as having no impact from the Proposed Development, the Republic of Ireland legislation upon which their status is based is not detailed.

10.2.3.2 Protection of Species/Habitats under International Law/Agreements

The “Rio” Convention on Biological Diversity

20. The CBD was a dramatic step forward in the global perception of the need for the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources. A revised and updated Strategic Plan adopted at Aichi in 2010 provided targets to; at least halve and, where feasible, bring close to zero the rate of loss of natural habitats, including forests; establish a conservation target of 17% of terrestrial and inland water areas and 10% of marine and coastal areas; and restore at least 15% of degraded areas through conservation and restoration activities. The Convention provided the impetus for formulation of national Biodiversity Action Plans.

The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar, Iran, 1971)

21. The Convention, known generally as the Ramsar Convention, covers all aspects of wetland conservation and wise use. The Convention commits the signatories to include wetland conservation in their national land use planning and requires the promotion of the conservation and wise use of sites on the List of Wetlands of International Importance (Ramsar Sites). Ramsar sites within 10km of the proposed new infrastructure were considered for their potential to be affected by the Proposed Development.

Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA)

22. AEWA is an independent agreement arising out of the Bonn Convention (see below), calling for co-ordinated measures to be taken to maintain migratory waterbird species in a favourable conservation status, and to investigate problems that are posed or are likely to be posed by human activities and endeavour to implement remedial measures.

10.2.3.3 Protection of Species/Habitats under European Law

Council Directive 92/43/EEC (EC Habitats Directive)

23. Annex I of the EC Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna (the “Habitats Directive”) lists 169 habitats and Annex II lists 623 animal and plant species of community interest. Most of these species are also included under Annex IV, apart from the majority of the listed fish species. Annex IV(a) of the Directive lists animals that are strictly protected, including bat species and otters. The provisions of the Directive require Member States to introduce a range of measures including the protection of species listed in the Annexes, and the designation of protected sites (Special Areas of Conservation (SACs) within the Natura 2000 network) as required.

24. In addition, Article 10 of the Habitats Directive states that: *“Member States shall endeavour, where they consider it necessary, in their land-use planning and development policies and, in particular, with a view to improving the ecological coherence of the Natura 2000 network, to encourage the management of features of the landscape which are of major importance for wild fauna and flora. Such features are those which, by virtue of their linear and continuous structure (such as rivers with their banks or the traditional systems for marking field boundaries) or their function as stepping stones (such as ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species.”*

Council Directive 2009/147/EC (EC Birds Directive) (codified version of Council Directive 79/409/EEC on the Conservation of Wild Birds, as amended)

25. The Directive recognises that habitat loss and degradation are the most serious threats to the conservation of wild birds. It places great emphasis on the protection of habitats for endangered as well as migratory species (listed in Annex I), especially through the establishment of a network of Special Protection Areas (SPAs). Annex I lists bird species whose conservation requires the designation of SPAs.

The Convention on the Conservation of European Wildlife and Natural Habitats 1979 (the Bern Convention)

26. The Convention aims to protect the habitat of wild flora and fauna species. The Convention, which has an advisory status, gives special attention to the conservation of wild fauna species listed in Appendix II and to the protection of faunal species listed in Appendix III.

The Convention on the Conservation of Migratory Species of Wild Animals 1979 (the Bonn Convention)

27. The Convention recognises bats and migrant warblers as having an unfavourable conservation status that would benefit from international co-operation, and places the taxa in Appendix II. The UK has ratified four legally binding Agreements under the Convention, including the Agreement on the Conservation of Populations of European Bats (EUROBATS and the African-Eurasian Migratory Waterbird Agreement (AEWA).

The Agreement on the Conservation of Populations of European Bats 2000

28. The Agreement strengthens and amends the Agreement on the Conservation of Bats in Europe 1991 and calls upon the signatories to take appropriate measures to promote the conservation of bats.

Council Directive 2000/60/EC establishing a framework for the Community action in the field of water policy (the Water Framework Directive (WFD))

29. The main objective of the Directive is for all groundwater, surface water and coastal water bodies to achieve ‘good’ status by 2015. The Directive introduced new broader ecological objectives as well as aims to prevent deterioration of all water bodies. Article 1a has the objective of preventing further deterioration and protecting and enhancing the status of aquatic ecosystems and associated wetlands. The Directive must be considered in any scheme that has the potential to have an impact on any part of the water environment.

Council Directive 2006/44/EC on the quality of fresh waters needing protection or improvement in order to support fish life (the Freshwater Fish Directive [FFD])

30. The Directive requires member states to designate waters that support or are capable of supporting native fish species and to maintain or improve their biochemical status in order to support fish populations.

10.2.3.4 Protection of Species/Habitats under Northern Ireland Law

The Conservation (Natural Habitats etc.) Regulations (Northern Ireland) 1995, (as amended 2003, 2004, 2007, 2009, 2011)

31. The Regulations implement the Habitats Directive in Northern Ireland. Bats and otter are protected under Schedule 2 of the Regulations. The Regulations provide protection for any listed animal, prohibiting the deliberate damage or destruction of a breeding site or resting place. The Regulations also require that implications for a site of European importance are considered prior to authorisation for any project that is likely to have a significant effect on that site.

The Wildlife (Northern Ireland) Order 1985 (as amended)

32. The Order is the instrument that provides protection for animal and plant species in Northern Ireland. Under Section 10(1) and (4) of the Order, it is an offence to kill, injure or take intentionally any wild animal (including badger) in Schedule 5, or damage, destroy or obstruct access to any structure or place used for shelter or protection or disturb any such animal while it is occupying such a structure or place. Section 4 of the Order gives general protection to wild birds, their occupied nests, their eggs and dependent young, and makes it an offence to disturb any wild bird while it is building a nest or is in, on or near a nest containing eggs or young. Schedule 1 of the Order lists bird species that are protected by special penalties. Schedule 8 lists plant species that are specifically protected under Article 14(1)(a) and (2) of the Order.

The Wildlife and Natural Environment Act (Northern Ireland) 2011

33. The Act amended the Wildlife Order. Those provisions of the Order which created offences that require an intentional act are deemed to be relevant where they result from reckless actions. The Wildlife Order was amended to make it an offence to damage the nests of certain bird species that re-use their nests between years. Of potential relevance to the present proposal, barn owl is included in this list. The Act introduced a duty to conserve biodiversity, whereby it is the duty of every public body, in exercising any functions, to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions.

The Environment (Northern Ireland) Order 2002

34. The Order enables the Department of the Environment to designate Areas of Special Scientific Interest (ASSIs) by reason of their flora, fauna, geological, physiographical or other features. The Order requires public bodies to take reasonable steps to further the conservation and enhancement of designation features in relation to land included in an ASSI.

The Nature Conservation and Amenity Lands (Northern Ireland) Order 1985

35. The Order gives the Department of the Environment the power to acquire land for the purpose of conserving areas of natural beauty or amenity, and of establishing National Nature Reserves.

The Environmental Liability (Prevention and Remediation) Regulations (Northern Ireland) 2009

36. The Regulations implement Directive 2004/35/EC and require those carrying out certain activities to prevent, limit and remediate significant environmental damage to protected species, natural habitats, ASSIs, surface water, ground water and land. Operators of activities such as discharges to water sources and water impounding are liable for any significant environmental damage, regardless of whether or not they intended to cause the damage or were negligent.

Northern Ireland Policy with Regard to Conservation and Biodiversity

Northern Ireland Biodiversity Strategy

37. The Strategy illustrates the Northern Ireland Executive's commitment to take steps to protect and enhance biodiversity in Northern Ireland. It accepts the recommendations of the Northern Ireland Biodiversity Group (2000 – and a second report was produced in 2009) that Species and Habitat Action Plans (SAPs, HAPs) should be produced for listed Priority Species and Habitats in order to conserve the range of species and habitats present in Northern Ireland. A revision of the UK list of Priority Species for which SAPs would be required was agreed in 2007. Action Plan species potentially of relevance within the study area are otter, Irish hare, curlew, lapwing, song thrush, spotted flycatcher, starling, grasshopper warbler, skylark, house sparrow, tree sparrow, dunnock, lesser redpoll, linnet, bullfinch, and reed bunting. Habitats of potential relevance are wet woodland, ancient and/or species rich hedgerows, lowland meadows and fens.

Northern Ireland Sustainability Strategy

38. The Strategy sets out the Government agenda for ensuring that sustainable practice becomes an integral part of development policy in Northern Ireland. Strategic objectives include:

- To conserve our landscape and manage it in a more sustainable way;
- To protect and enhance the freshwater and marine environment; and,
- To protect and enhance biodiversity.

39. Steps in the Strategy designed to promote these targets include:

- Ensure full and timely implementation of the Northern Ireland Biodiversity Strategy and all national and international nature conservation legislation; and

Regional Development Strategy 2035 (RDS)

40. Policy RG11 of the RDS is to '*Conserve, protect and, where possible, enhance ...our natural environment.' Aims are to 'Sustain and enhance biodiversity in line with the objective of the Northern Ireland Biodiversity Strategy to halt the loss of indigenous species and habitats' and to 'Identify, establish, protect and manage ecological networks.'*

Planning Policy Statement 2 (PPS2): Planning and Nature Conservation

41. PPS2 sets out the approach of Planning Service to developments that have the potential to affect designated conservation sites - "*The Department will strive to ensure the effective conservation of wildlife and natural features as important elements of a clean and healthy natural environment whilst making adequate provision for development and economic growth."* Responses to development proposals take into account the level at which legislation affords them protection. PPS2 also states that any development likely to have an adverse effect on recognised sites of local nature conservation importance will not be approved unless there are reasons for the Proposed Development which outweigh the need to safeguard the intrinsic nature conservation value of the site. Where Sites of Local Nature Conservation Importance (SLNCIs) are identified in Area Plans, the plans will set out specific planning policies which will apply to development proposals on those sites. PPS2 states that careful consideration will be given to the potential impact of proposed developments upon trees. Where development involves the loss of trees, permission will normally be conditional on a replanting scheme with trees of appropriate numbers, species and size.

Planning Policy Statement 21(PPS21) Sustainable Development in the Countryside

42. This PPS aims to, "*Manage development in the countryside in a manner consistent with achieving the strategic objectives of the Regional Development Strategy for Northern Ireland 2025."* Objectives include to *"Conserve the landscape and natural resources of the rural area and to protect it from excessive, inappropriate or obtrusive development and from the actual or potential effects of pollution,"* and to *"Promote high standards in the design, siting and landscaping of development in the countryside."*

10.2.3.5 Guidance on Species/Habitats of Conservation Concern

UK Biodiversity Action Plan (UKBAP)

43. The UKBAP was launched in 1994 (latest review 2007) with the main aim *"To conserve and enhance biological diversity within the UK, and to contribute to the conservation of global biodiversity through all appropriate mechanisms."* The UKBAP comprises a series of Action Plans for 'priority' habitats and species, determined by the fact that they are either globally threatened or are rapidly declining in the UK. The action plans outline measures required to conserve these priority habitats and species.

Northern Ireland Priority Species (NIPS) and Species of Conservation Concern (SoCC)

44. NIEA has produced a list of Northern Ireland Priority Species (NIPS) and Species of Conservation Concern (SOCC), which includes Biodiversity Action Plan species and species that are rare in a Northern Ireland context

Ancient Woodland Inventory (AWI)

45. The AWI lists those sites, based on mapping, historical and ecological evidence, that have been continuously wooded since at least 1600AD (ancient woodland), or have been long-established, but for which there is insufficient evidence for continuity since 1600AD. Ancient or long-established woodland is of particular conservation importance because of the long-term continuous occupation of a site by woodland Areas of ancient woodland that have never been cleared or replanted are known as semi-

natural ancient woodland. Ancient and long-established woodlands are likely to retain a more diverse associated biodiversity than younger woodland, and recall an ancient wooded landscape.

Sites of Local Nature Conservation Importance (SLNCIs)

46. DoE Planning Service designate second-tier sites (i.e. of local rather than national importance) as SLNCIs, which will be of material consideration during review of planning applications. SLNCIs have been recognised in both the Dungannon and South Tyrone Area Plan 2010 and in the Armagh Area Plan 2004 (Alteration No. 1). Not all sites that are of SLNCI standard have been designated, and there may be unknown sites that are worthy of protection for their conservation value. The Issues Paper for the Armagh Area Plan 2018 recognises the possibility that further SLNCIs may be identified within the council area. The development of the Armagh Area Plan 2018 may also provide opportunities to recognise additional SLNCIs.

Local Biodiversity Action Plans (LBAPs)

47. Local Authorities have been able to employ Biodiversity Officers, with financial aid from NIEA, since 2004. Their duties include raising awareness of biodiversity issues within local areas, and the development of LBAPs as a means of conserving and enhancing biodiversity at a local scale.

Red Data Book

48. Vascular plant species that are rare and/or threatened on an all-Ireland or European scale have been identified as Red Data Book (RDB) species (Curtis & McGough, 1988).

Red and Amber Listed Birds

49. Population trends of breeding birds are monitored annually particularly through the BTO Constant Effort Scheme (CES) which monitors the breeding success of a wide range of UK species constant effort catching and ringing of all birds at the same sites between years. Those that have been found to be declining and have reached defined thresholds in terms of percentage decrease are Red- or Amber-listed as Birds of Conservation Concern. Lists have been produced for both the UK (Eaton *et al*, 2009) and the island of Ireland (Lynas *et al* 2007). Species with low population sizes or limited range, or species with unfavourable conservation status in Europe are also listed.

Important Bird Areas (IBAs)

50. Important Bird Areas have been selected by Birdlife International as a means of identifying conservation priorities for bird species. IBAs are key sites for conservation which:

- Hold significant numbers of one or more globally threatened bird species;
- Are one of a set of sites that together hold a suite of restricted-range species or habitat-restricted species; and/or
- Have exceptionally large numbers of migratory or congregatory species

BS 5837:2012

51. The British Standards Institution has produced BS 5837:2012, *Trees in relation to design, demolition and construction– Recommendations*, with the objective "*to achieve a harmonious relationship between trees and structures that can be sustained in the long term."* Factors that should be taken into account during works near trees include:

- the effect that construction requirements might have on the amenity value of trees, both on and near the site, including the effects of pruning to facilitate access and working space;
- the requirement to protect the overhanging canopies of trees where they could be damaged by machinery, vehicles, barriers or scaffolding, where it will be necessary to increase the extent of the tree protection barriers to contain the canopy;
- infrastructure requirements in relation to trees, e.g. easements for underground or above-ground apparatus; highway safety and visibility splays; and substations; and,

- all trees that are being retained on site should be protected by barriers and/or ground protection before any materials or machinery are brought onto the site, and before any development commences. Where all activity can be excluded from the Root Protection Area (RPA), vertical barriers should be erected to create a construction exclusion zone.

10.2.4 Indication of Any Difficulties Encountered

52. The long-term evolution of the Proposed Development led to the need to survey a number of alternative routes. As a consequence, initial surveys were spread over a number of years. Long lead in times have also meant that survey work has needed to be repeated and updated in subsequent years once the route had been finalised. This allowed data to be collected over a number of years producing historical records for the site. Variability in seasonality which can affect survey results was accounted for due to the increased time scale of the surveys.

53. The long lead in time and numerous surveys have however contributed to providing a robust assessment of the baseline which has been shown to be very similar between survey years and this has undoubtedly enabled accurate assessment of the baseline to be made.

54. A suite of habitat and protected species surveys have been undertaken in 2012 of the final Proposed Development to include all access tracks and stringing locations where access to more than 97% of the land within 250m of the Proposed Development centre line has been achieved and it has been this contemporary information which we have primarily used to base our assessment.

55. Eight landowners refused permission for access to their properties in 2012, which meant that field surveys were not possible on these lands. This accounted for 3% (75.48ha) of the total survey area (1,798 ha). However, the Phase 1 habitat survey methodology required by NIEA permits surveillance from a distance where habitat types can be reliably identified. As a result, only 0.4% of the area of lands for which habitat survey were proposed could not be described.

56. Badger surveys were proposed within the site boundary and a further 250m outside of the Proposed Development; this included land with restricted access. Restricted access limited the area available to carry out badger surveys resulting in 3% of the proposed badger survey area not being available to survey. However, much of this area was >100m from the proposed line route, substation site and access tracks and was therefore not significant in terms of potential impacts on badgers and any associated setts.

10.2.5 Survey Methodology

10.2.5.1 General

57. The methodology adopted involved both a desktop search and field surveys. Field surveys were undertaken to establish the baseline conditions for the various species groups that were thought likely to occur in the area of the Proposed Development. In line with the guidance, a number of different survey corridors were established based on survey type. Where study areas or survey corridors are defined, the distances are measured from the centre line of the overhead line and within the substation boundary (as shown on Figure 10.1).

58. In order to ensure that indirect effects of the Proposed Development were also assessed, surveys were extended to the limits of landholdings over which it was proposed the line would cross. Badger surveys were carried out within 500m of the Proposed Development, depended on the restrictions noted in 10.2.4 above. For the initial breeding bird survey, it was aimed to seek indications of breeding birds along a corridor around 200m wide. Traditional whooper swan sites within the general vicinity of the Blackwater River valley, to a distance of around 5km from the Proposed Development were assessed because of their wide ranging behaviour, and a corridor around 500m wide was searched for this species along the Proposed Development. The detailed methodology of bat surveys is set out in the relevant section, but in general covered likely potential feeding, breeding and commuting habitats.

10.2.5.2 Desk Study

59. The relevant statutory bodies were contacted to obtain ecological data for the study area. In particular, NIEA was consulted to comment upon methodologies prepared for ecological survey. Consultation with NIEA was undertaken from the early stages of the Proposed Development, and continued throughout. Consultation with NIEA took place in July 2006, November 2007, December 2008, August 2009, and November 2012. NIEA Natural Heritage sent detail relating to designated sites and survey requirements for flora and fauna. In addition, AECOM consulted pro-actively with NIEA with regard to changes in legislation and required survey methodologies. Ecological consultation responses are to be found in Appendix 10A.

60. Other statutory bodies such as Rivers Agency and DCAL, and voluntary bodies including the RSPB, the UWT and the IWSSG were consulted regarding the Proposed Development. The Northern Ireland Raptor Study Group was consulted for records of birds of prey within the study area. A desk study was conducted from 2006 with the aim of establishing the distribution and sensitivities of sites designated for their biodiversity / wildlife features and to obtain ecological records for the site and wider area which may be affected by the development. The desk study searched for records of statutory and non-statutory sites for nature conservation, protected species, or priority habitats and species for nature conservation listed in biodiversity action plans. The Centre for Environmental Data and Research (CEDaR) was approached for records of species of conservation concern in the Proposed Development and land within 0.5km. This consultation programme assisted in developing the depth of surveys required to inform the EIA process with regard to site ecology. The full list of consultees is provided in Chapter 6. Additional information was obtained from the following publically available sources:

- National Biodiversity Network (NBN) website was consulted to obtain species information within the Proposed Development and related 10km grid squares;
- Biodiversity Action Plans - The UK-Post 2010 Biodiversity Framework and the LBAP were consulted in respect of notable habitats and species; and
- The search radius for ecological records was based on the proposed centre line of the Proposed Development (demonstrated on Figures 10.3 and 10.4). The following searches were conducted:
    - A radius of 30km was used for internationally designated sites (SPAs, SACs and Ramsar sites);
    - A radius of 5km for ASSIs designated for habitat features;
    - A radius of 10km for ASSIs designated for bird features;
    - The qualifying features of all ASSIs within 30km were reviewed but not assessed in full detail due to the static nature of the site and proximity of the development;
    - A radius of 5km for Sites of Local Nature Conservation Importance (SLNCIs);
    - A radius of 10km for all Important Bird Areas (IBAs); and
    - A radius of 500m for all Ancient Woodland Inventory Sites (AWIs).

61. A lack of protected species records from consulted bodies and public sources does not necessarily confirm absence but may simply reflect that records of some species may not have been collected, survey for some species may not have been undertaken or records may not have been submitted to relevant record holders for that region or area. Biological records can be received from a wide variety of sources and may or may not be comprehensive and accurate. However, if assessed in conjunction with a range of habitat and species surveys, they can contribute to a robust ecological assessment of a site.

62. The specialist site survey work undertaken is summarised below and further detail provided in Appendices 10B – 10G.

10.2.5.3 Phase 1 Habitat Survey

63. Habitat survey work undertaken for the Proposed Development was based upon the widely used JNCC, (2010), Handbook for Phase 1 habitat survey - a technique for environmental audit. The Phase 1 Habitat Survey methodology is accepted by NIEA as the appropriate means of describing broad habitats in the wider countryside.

64. The erection of towers and installation of overhead lines leaves a small and localised footprint on the ground once in the operational phase. The route crosses open country, and the methodology was designed to identify all broad habitat types so that, in due course those features that are of greatest ecological value can be highlighted. An ecological walkover survey of the then proposed overhead line route was undertaken, initially in June and July 2005. In response to changes to the route alignment and potential substation site options. Further habitat surveys were undertaken of various parcels of land between September 2005 and July 2008 in the appropriate season for undertaking such survey work. Fields and hedgerows were assessed individually and a species list of plants found during the survey was maintained

65. Following final agreement of the Proposed Development a final survey corridor of land within 250m (1,798 ha) of the Proposed Development was undertaken in June-August 2012. This corridor, based solely on distance from the centreline, did not take account of actual field boundaries and potential habitats on the ground. The survey effort was extended then from the 500m survey corridor (1,798 ha) to an area of approximately 2,512 ha (see Figures 10.1 and 10.2) to encompass all possible access tracks, stringing locations and associated infrastructure to accommodate late changes to infrastructure boundaries.

66. Due to landowner refusal, approximately 75.48 ha was not accessed by the survey team – approximately 3% of the total study area (areas where access was not achieved are shown on Figure 10.2). This area of 75.48 ha was however surveyed and further reduced to 1.14 ha (0.4% of the total study area). This was achieved through the assessment of the land from adjacent accessible land and publicly accessible areas (roads & footpaths). This approach is in-line with the JNCC (2010) Guidelines for undertaking such survey work.

67. Any habitats identified by NIEA as Priority Habitats within the Northern Ireland Biodiversity Strategy were noted as were those for which a Habitat Action Plan (HAP) is included in a Biodiversity Action Plan applicable to the area.

10.2.5.4 Smooth Newt Survey

68. The initial habitat survey highlighted four sites within 200m of the proposed overhead line route that appeared to have the potential to support breeding populations of smooth newt. Habitat suitability and terrestrial linkage mapping survey work was undertaken for all four sites to augment the previous Phase 1 data. Survey work involved a walkover of the sites to assess areas of open water identified during Phase 1 habitat surveys and identify further areas that might be suitable as newt breeding habitat. The survey mapped the habitats in the vicinity of the water bodies and identified any terrestrial habitat features that could be used by dispersing or hibernating newts.

69. This survey work was undertaken in June 2009 and therefore the opportunity was taken by surveyors undertaking the habitat assessment to search for newt eggs at the time of the survey. All areas of water that supported submerged vegetation were searched for newt eggs.

70. Following the 2012 habitat survey which allowed access to a greater proportion of the 500m corridor than previously possible two further potential newt sites were recorded. The first was located approximately 200m and another at approximately 290m from the route. These two further sites were not subjected to further survey owing to the distance from the Proposed Development (95% of smooth newts are known to travel not more than 50m from their breeding site). Where smooth newts do occasionally range over larger distances they are known to favour linear habitats providing shelter or woodland or scrub habitats and the lack of suitable foraging or commuting habitat between the potential breeding site and the Proposed Development provide further justification from excluding these sites from further survey.

10.2.5.5 Badger Survey

71. Mammal surveys were first conducted in 2005, as part of an extended Phase 1 survey of the then proposed route of the overhead line route, and were augmented as the options for the overhead line route were developed (see section 10.2.2.2 above). Further surveys of approximately 51% of the line route were undertaken in 2011.

72. A final survey of 97% of the land within 250m of the Proposed Development was undertaken in August and September 2012. The methodology adopted for this survey followed the specific badger survey requirements outlined by NIEA as revised (NIEA 2012). All hedgerows, banks and scrub, wooded and planted areas were searched for signs of badger use. These signs included tracks, latrines, snuffle holes, hairs and trails as well as setts. Surveys took place on various dates during September and October 2012.

10.2.5.6 Otter Survey

73. Banks and channels of streams and rivers in the corridor and at the substation site were searched for evidence of otters during the extended Phase 1 habitat survey of 2005-2008. Signs that would indicate otter presence include footprints, spraints, anal jelly, paths along river banks, flattened vegetation, holts and ‘couches,’ and feeding remains. Watercourses were also searched for signs of otters during September and October 2012 following the methodology as described above, in conjunction with the badger survey undertaken at that time.

10.2.5.7 Bat Survey

74. Bat survey work commenced in 2009 and has continued in various formats each year since. The aim of the initial survey work was to evaluate the baseline in terms of activity and potential roost sites and in subsequent years this has been augmented with additional work aimed at identifying the pattern of bat activity within the Proposed Development and in the surrounding area up to 500m from the site boundary. Each additional survey has been designed to build a further layer of understanding into the ways in which bats use the Proposed Development area for foraging, commuting and roosting. Table 10.1 below summarises the bat survey work undertaken between 2009 and 2012 and the following paragraphs detail the methodologies used for each survey in more detail.

Table 10.1: Summary of bat survey work undertaken within the Proposed Development and surrounding lands between 2009 and 2012

Survey year and type	Reason for survey
Aerial photograph survey in 2008/2009	Desk based exercise using aerial photographs and background mapping to identify likely bat ‘hotspots’ to avoid during route planning and for further survey if required.
Tree roost assessment in 2009	Identify potential tree roost sites within Proposed Development.
Habitat assessment in 2009	Walked survey of Proposed Development identifying potentially valuable habitat features for further detailed survey.
Static point manned dusk activity survey 2009/2010	Static surveys at 56 point locations to identify roost sites, commuting routes and important foraging areas.
Walked transect dawn swarming/re-entry surveys 2009/2010	Repeat surveys of sites with greatest bat activity levels based upon dusk transects detailed above.
Driven transect 2011	56km driven transect was identified which passed through the Proposed Development repeatedly and passed within 500m of the majority of the Proposed Development. This survey was designed to provide a better understanding of the activity levels of bats across the wider countryside and included 20 listening stops within the Proposed Development.
Walked transect dusk survey 2012.	Transect surveys to identify roost sites, commuting routes and important foraging areas. A total of thirty transects were covered.
Automated monitor surveys 2012	Deployment of fixed point bat recording equipment for a minimum of five consecutive nights at 34 locations.

Aerial photograph survey and Habitat Assessment 2008/2009

75. An initial assessment of the potential use of habitat features by bats was undertaken along the route corridor and at the substation site during the early stages of the Proposed Development. The first stage in the survey methodology for bats was a review of aerial photographs to identify any potentially significant foraging areas, roosting sites or commuting routes for bats. These were then assessed on the ground during daylight hours.

76. Following the amendment of the Conservation (Natural Habitats etc.) Regulations (Northern Ireland) 1995 which occurred during 2009, a change in survey guidance meant that all Proposed Development required more information to be gathered pre-development on the use of a site by bats. In particular, bat roosts were to be identified through visual inspection and electronic monitoring of potential roost sites and the presence of significant commuting routes and foraging areas were to be identified through detailed crepuscular surveys. The methodology prepared and subsequently agreed with NIEA for assessment of potential impacts of the Proposed Development on bats is outlined below.

Daylight Tree Assessment and Bat Habitat Search

77. An initial daylight assessment of significant areas of vegetation likely to be used by bats was undertaken within the Proposed Development. The survey identified potential commuting routes and foraging areas for further detailed survey and made an assessment of mature trees. Mature trees in hedgerows were visited and an assessment made of their potential to be used by roosting/foraging bats following the methodology described in Table 10.2 (see Appendix10B for the results of this exercise).

Table 10.2: Tree features and field signs associated with bat occupation of trees

Feature of trees used as bat roosts	**Signs indicating possible use by bats**
Natural holes	Tiny scratches around entry point
Cracks / splits in major limbs	Staining around entry point
Loose bark	Bat droppings in, around or below entrance
Hollows / cavities	Audible squeaking at dusk or in warm weather
Dense epicormic growth	Flies around entry point
Bird or bat boxes	Distinctive smell of bats
	Smoothing of surface around cavity.

78. During the daylight assessment, significant areas of habitat including hedgerows and trees were identified as being of potential importance for bats. A total of 56 hedgerows and trees were identified and scheduled for initial dusk visits. Survey work commenced in 2009 with the first 20 potential roost sites visited between June and September and was completed in 2010 (between June and September) with a further 37 visits (one site was surveyed twice). Of the 2009 surveys, two were undertaken using remote detectors only. Two additional manned surveys were undertaken at the site of the proposed substation in June and September 2009. The positions and results of each survey can be found in Figures 10.61-10.69 and in Appendix 10B.

Manned Surveys 2009/2010

79. For manned surveys each surveyor was equipped with Pettersson D240x time expansion bat detector, Batbox duet (heterodyne and frequency division) bat detector, Bat Baton (frequency division) detector, digital recording devices, and/or Ranger night vision scope (with attached Mobile Player Recording to record night vision images) visiting each site at dusk. During each visit, records were taken of the number, species, flying height (wherever possible), and behaviour of any bats encountered and the weather conditions at the time of survey.

80. Sites visited in 2009 which exhibited high levels of bat activity or those assessed to have the potential to support roosting bats were followed up with a dawn visit to check for swarming and re-entry behaviour, again during either the 2009 or 2010 survey season.

Driven transect 2011

81. The aim of survey work for bats in 2011 was to evaluate the results of the 2009 and 2010 manned surveys with a survey of a larger area centred on the Proposed Development. The survey of a wider area would place the results obtained from within the Proposed Development into a local context. Ideally this survey would have been undertaken during the same years as the manned transect but is still useful in providing context for the results for a site with relatively low levels of bat activity.

82. Driven transects can be very useful as they can cover a large area much more quickly than walked ones, so long as vehicular access is possible. During design of the driven transect for this project a 500m buffer was placed around the overhead line; this constitutes the survey area for this survey. A route was then selected using minor roads, keeping within the 500m buffer as much as possible. The driven transect was then divided up into sections, primarily for analysis purposes, and to ensure that any bats which are recorded can be accurately located along the route. To augment the driven transect results twenty selected listening stops were all chosen to correspond to locations where minor roads along the transect route are to be over-sailed by the overhead line (i.e. directly underneath the line route). The single exception to this was the listening stop which was located immediately adjacent to the proposed substation site (rather than directly under the line). The driven transect was approximately 56km in length and involved continuous recording; both as the vehicle travels along the transect route as well as during each 3 minute listening stop. The route taken and listening stops are shown on Figure 10.61 – 10.69.

83. The methodology employed took cognisance of that described in the Bat Conservation Trust (BCT) Good Practice Guidelines (2007), but was adapted to suit local circumstances and recent technological improvement. The driven transect follows a predefined route at a steady speed of 15 mph (24 kph). Recording is continuous (other than the stopping and starting at each new transect section or listening stop to give different individual sound files). Sounds were recorded using a microphone or detector mounted on the roof of the car. The microphone is directed towards the roof of the car at a 45^{o} angle, with the roof acting as a large deflector plate which allows bat calls to be detected for almost 360^{o} around the vehicle. A full spectrum or frequency division detector (across different survey visits) was used to detect bat calls which were simultaneously recorded on to a compact flash card or digital recording device (for later analysis). The location of bat contacts could then be estimated by comparing the time for each bat call with the time record for the relevant transect survey session. During the survey, the ambient air temperature, cloud cover and wind speed were recorded. The transect was driven with dipped headlights and a speed of 15 mph was maintained to allow for recorded sound files to be analysed to species level (higher speeds can distort the recorded calls and wind noise can interfere with recordings). The use of full spectrum and frequency division bat detectors allows for the identification of bats to species level, in all but a few instances.

Manual ‘walked’ transects 2012

84. Site access permissions were not available during much of the early months (May/June) of the 2012 bat survey season. However, in order to ensure that up to date records of the bat population within the Proposed Development were available for the latest stage of the EIA process, bat surveys were carried out during the second half of the 2012 survey period, when access to 97% of the study area was available.

85. A series of walked transects (80km, combined length across 57 individual transects) were carried out between July and the end of September 2012. Access to 97% of the land within the Proposed Development was available and therefore the transect routes were chosen to incorporate both the overhead line route and associated access tracks and stringing locations. The transect routes were chosen to provide a representative sample of all habitat types within the Proposed Development but focussed on hedgerows to be removed and habitat which had recorded higher levels of bat activity in previous years survey. The purpose of this survey was to corroborate the bat activity records collected during earlier surveys and to fill any gaps in previous years data. Surveys which were conducted, took reasonable account of both the NIEA guidance (10/01/11 Bat Surveys – NIEA Specific Requirements) and the 2012 Bat Conservation Trust (BCT) Bat Surveys - Good Practice Guidelines.

86. Each walked transect was undertaken by a surveyor(s) carrying a broadband bat detector, walking at a constant speed along a pre-determined route, recording bat calls (as passes) for subsequent analysis. The data collected was used to provide an index of bat activity along each transect and thus along the

overhead line route. Surveys commenced at 30 minutes prior to sunset (to allow for the differing emergence times of bat species) and continued for 2 hours 30 minutes.

87. A pre-dawn survey was undertaken between towers 9 and 12 in September in response to dusk records potentially indicating a roost location. The pre-dawn survey commenced two hours before sunrise and was completed 30 minutes after sunrise. A series of listening points were identified along transects to divide the walked sections into comparable length and allow recording at habitat features with the greatest potential to support bats. Bat activity was recorded for at least 3 minutes at each listening point, as well as continuously between each of the points. The number of passes was recorded at each listening point and along each walked section, so that bat activity could be compared across the site. The location of walked transects and listening points is shown on Figures 10.61-10.69.

Automated monitoring 2012

88. During the 2012 survey work automated monitoring was used to complement the manual 'walked' transects. Automated monitoring commenced on the 30 May and continued until the 30 September. Monitors were set to record bats during the peak activity period; 30 minutes prior to sunset until 2 hours after and then again for 2 hours before sunrise until 30 minutes after. Two automated monitors were used simultaneously and they were moved to a different location (shown on Figures 10.61-10.69), approximately every 5 days (range 5-9 days). The units used were Pettersson D500x full spectrum ultrasound detectors which have been specially designed for this type of long term automated monitoring. Units were positioned at a variety of locations including where proposed tower locations (or overhead line over-sail) was in close proximity to mature hedgerows or trees. Data (sound files) is recorded on to CF cards which are replaced each time the units were moved to a different location. The data was then analysed at a later stage using BatSound sound analysis software.

10.2.5.8 Breeding Bird Survey

89. Census methods were based on the Breeding Bird Survey (BBS) methodology developed by the British Trust for Ornithology (BTO) as part of its programme for monitoring national bird populations. The methodology required two walkovers of the Proposed Development between April and the end of June. The transect method of bird census is accepted as the most efficient of all general methods in terms of data gathered per unit effort (Bibby et al 2000). The early survey ensured that those species that have peak song intensity early in the season are recorded, while the survey during the later part of this period ensured that summer visitors were recorded. Visits to any particular site were separated by a period of at least four weeks. All birds seen and heard were recorded, regardless of whether they showed territorial behaviour. Surveys were undertaken during the morning, beginning no later than 9am, with counts likely to be more productive the earlier the start. However, there is evidence that although the volume and frequency of song declines through the day, the number of detectable species and individual birds remains constant (Patterson 1995).

Initial breeding bird survey 2005-08

90. The initial survey (2005-08) was carried out along the various potential routes and sections of routes that had been identified by NIEA, including the route that is currently proposed. All birds seen or heard were recorded on 1:10,000 scale maps, using species codes based on those developed for the BBS by the British Trust for Ornithology. The survey of the evolving overhead line route was undertaken within the window required by the BBS methodology. A total length of 10.36km of the finalised route was surveyed for breeding birds in 2005 and 2006, with the survey of the remaining route undertaken in 2008. Breeding birds were also assessed at the proposed substation site in early July 2006. By late June and early July many birds have completed their breeding activities and have mobile families or have failed to produce young. Although song is still frequent in early July, song intensity declines rapidly for many birds. However early July lies within the optimum period for assessing the presence of breeding birds that was part of the methodology for the recent (2007-11) fieldwork for the BTO National Atlas project.

91. Bird survey work was not undertaken in heavy rain, poor visibility or strong wind. Bird song and any other behaviour (display, distraction behaviour, family groups) indicative of breeding were noted. All registrations were marked precisely on a site map and related to habitat features. This methodology

was modified to take into account the potential to record proven breeding into July, as is recognised in the methodology currently employed for recording breeding birds for the BTO National Atlas project.

<u>June 2011 survey</u>

92. The initial breeding bird survey was undertaken during the early stages of the Proposed Development, and so a repeat survey of the Proposed Development was undertaken in 2011. It was not possible to undertake the early visit that is required by the BBS methodology due to access restrictions, and only around 16.68 km (47%) of the Proposed Development could be surveyed at the time.

93. A single visit survey was therefore carried out over eleven dates in June 2011 following the methodology described above. Surveys were carried out between the hours of 05:30 and 09:30, in appropriate weather conditions. The proposed overhead line route was followed across those lands for which access permissions had been granted, and any birds seen or heard were noted. Records beyond the limits of the permitted route were also mapped where birds were heard or seen from within land for which access permission had been granted.

<u>May-July 2012 survey</u>

94. The aim of the 2012 survey was to augment the previous years survey data and provide a contemporary picture of breeding bird activity across the Proposed Development and wider area to give a context to the results from the Proposed Development. Access restrictions were again in force during the early part of the recording season and therefore an amended methodology was developed. However later in the survey season, access was available to 97% of the study area.

95. A two visit survey was carried out between May and the first week of July 2012 along public roads that crossed the proposed overhead line route and along contiguous roads that run sub-parallel with the proposed route. The majority of the surveyed routes were within 500m of the proposed line, but extended to around 800m from the line in places. The methodology followed that described above and was undertaken in suitable weather conditions.

<u>Barn owl survey</u>

96. Barn owl is currently a rare species in Northern Ireland, and its nest sites are specially protected under the amended Wildlife Order because of their continued use between breeding seasons. Potential nest sites for the species were assessed during the breeding bird surveys and subsequently during the Phase 1 habitat surveys. A single building that appears to offer a potentially suitable nest location is to be demolished (a stone built shed at the proposed substation site). This and trees along the proposed route were assessed for their potential as nest sites during habitat surveys.

10.2.5.9 Wintering Bird Survey

97. Overhead power lines are not known to have an adverse impact upon most bird species. Species for which collision is recorded are generally limited to large species that are the least manoeuvrable in flight such as geese, swans, larger ducks and waders, herons, storks and cranes. Collision is also a greater risk during nocturnal movements and movements during inclement weather when visibility is reduced. The retrofitting of reflective markers along existing overhead lines in areas of high collision rates has virtually eliminated this as an issue.

98. The main species of concern on which the construction of a new overhead line and substation was considered to have a potential impact are whooper swan, and possibly Bewick’s swan and goose species. These species are known to use traditional wintering sites for both foraging and overnight roosting. The IWSSG provided the location of the nearest wintering sites to the Proposed Development, and details of marked birds observed during surveys. Four aspects of swan distribution were addressed, following consultation with NIEA, IWSSG and the RSPB. These are;

- Use of Proposed Development route by foraging whooper swans;
- Use of Blackwater River valley as a commuting/migration route for whooper swans;
- Potential for whooper swans foraging in the Blackwater River valley to commute across the Proposed Development route; and,

- Potential for whooper swans using the Keady lakes to cross the Proposed Development route.

99. Dates of surveys are included in Appendix 10G.

Use of Proposed Development route by foraging whooper swans

100. The nature of the Proposed Development will without doubt not lead to any direct impacts upon either the Blackwater River or Keady Lakes complex. The focus of survey work was therefore to identify if any swans were regularly using the Proposed Development for foraging or commuting and if so what the origin of these swans was. Surveys were undertook within the Proposed Development and 500m buffer to identify feeding and commuting swans and this was augmented with visits to distant known swan feeding and roosting areas to provide a context for the locally collected data.

101. A corridor, approximately 500m wide, but wider where conditions appeared more suitable for the target species, was surveyed to establish whether swan feeding sites were present in the immediate vicinity of the Proposed Development. Surveys were conducted to identify important feeding sites, evaluate usage of the site, estimate population size and identify important flightlines. Feeding sites were identified where wet grassland or flooded areas with good visibility were present. The presence of other waterbirds often indicates the presence of good foraging resource. Survey was conducted partly from the road and partly from walkover where the corridor was not visible from the road. The corridor was surveyed on eleven occasions, between November 2007 and March 2008, between January 2008 and April 2008, during October and November 2008, and during March 2009. This survey was followed up with four roadside surveys during December 2010 and February 2011.

Use of Blackwater River valley as a commuting/migration route for whooper swans

102. The Blackwater River valley was surveyed, on eleven occasions spread through the winter months (of 2006-2007, 2007-2008 and 2008-2009) to evaluate the possible use made of the valley by swans as a route between roosting and feeding sites. A vantage point near the proposed crossing point of the valley was used to observe any swan movements along the valley during the two hours immediately after daybreak and during the three hours immediately preceding dusk. The vantage point also permitted viewing of the airspace to the south of the valley, and it was intended that an evaluation of the use of the valley compared with the local wider countryside would be made. The times of any swan movements, the numbers of birds involved, direction of flight and height of flight were all noted.

Potential for whooper swans foraging in the Blackwater River valley to commute across the Proposed Development route

103. The pattern of swan usage of the nearest traditional feeding sites to the proposed overhead line route over a winter was identified by visiting the well-known swan sites in the general vicinity of the Blackwater River valley. Sites were visited on six occasions in winter 2006-07, 5 occasions in winter 2007-08, three occasions in winter 2008-09 and 15 occasions in winter 2010-11. Counts of birds at traditional feeding sites that were considered to be possible sources or targets of birds that might use the valley as a route between feeding and roost sites, or that might commute between feeding and roosting sites on opposite sides of the proposed line route, are shown in Appendix 10G. The roosting behaviour of birds using traditional feeding sites was observed, particularly during 2010-11, when birds were followed as they fly between feeding sites and roosts.

Potential for whooper swans using the Keady lakes to cross the Proposed Development route.

104. During consultation the RSPB in particular commented on the possibility that birds using lakes in the vicinity of Keady might commute to roost sites across the proposed route of the overhead line. The potential for swan movements between traditional wintering sites at lakes in the vicinity of Keady and sites in the Blackwater River valley around Caledon and cross-border sites in the Blackwater catchment in Co Monaghan was addressed by undertaking counts of swans using the lakes and observing their feeding/roosting behaviour. Flightlines and roosting behaviour were recorded at both the Keady lakes and the Blackwater River valley during the survey periods noted above. These birds have the potential to cross the interconnector route when commuting between different feeding and roosting sites.

Other wintering bird species

105. In addition, movements of other bird species upon which the overhead line might have an impact were noted.

10.2.5.10 Other Species

106. A desktop study of the occurrence of other taxa of conservation concern was based on records held by CEDaR and a web data search. In particular, the National Biodiversity Network (NBN) website was interrogated for records of species of conservation concern for all of the 10km grid squares which the Proposed Development passes through.

10.2.6 Impact Assessment Methodology

107. The Impact Assessment has been undertaken with regard to the Institute of Ecology and Environmental Management (IEEM) 2006 Guidelines for Ecological Impact Assessment in the United Kingdom. The impacts, both potential and actual, of the Proposed Development were assessed according to the following criteria:

- The importance of a receiving habitat, defined by its position in a hierarchy of site importance and conservation value. This hierarchy extends from international (highest) importance to negligible (lowest) importance. This range of values is expressed in the protection afforded a site by international and national legislation, and in planning policy at a more local level (Table 10.3).

108. The biodiversity value of a site, as measured by such factors as:

- animal or plant species, subspecies or varieties that are rare or uncommon, either internationally, nationally or more locally;
- endemic species or locally distinct sub-populations of a species;
- ecosystems and their component parts, which provide the habitats required by the above species, populations and/or assemblages;
- habitat diversity, connectivity and/or synergistic associations (e.g. networks of hedges and areas of species-poor pasture that might provide important feeding habitat for rare species);
- notably large populations of animals or concentrations of animals considered uncommon or threatened in a wider context;
- plant communities (and their associated animals) that are considered to be typical of valued natural/semi-natural vegetation types, including examples of naturally species-poor communities;
- species on the edge of their range, particularly where their distribution is changing as a result of global trends and climate change;
- species-rich assemblages of plants or animals;
- typical faunal assemblages that are characteristic of homogenous habitats;
- the secondary value of a site as part of a corridor or a series of stepping stones that facilitate the migration, dispersal and genetic exchange of wild species, or as a buffer zone that protects a valued site from adverse environmental impacts; and,
- the magnitude of the impacts on the features during both construction and operational phases. The magnitude of ecological impacts considers the size of an impact, and is measured according to the criteria listed in Table 10.4. Using these criteria, Table 10.5 is used to determine the magnitude of an impact.

109. When assigning a value to habitats it is useful to use the Radcliffe Criteria for Assessing Nature Conservation Importance of 1977 which is based upon the following features of habitat types:

- **ize** In lowland Britain, semi-natural habitats tend to be highly fragmented and the value of a site usually increases with its size.
- **Diversity** The variety in number of both communities and species depends largely on the diversity of habitat. Diversity is also related to area and the number of both plant and animal species shows a marked tendency to increase with the size of the area.
- **Naturalness** Truly natural habitats, unmodified by man, are rare in Britain, and nature conservation deals largely with semi-natural habitats. Semi-natural habitats must nevertheless exhibit a level of quality marked by a lack of features which indicate gross or recent human modification. This criterion has to take into account the fact that some habitats, (e.g. grasslands, heathlands) are anthropogenic in origin.
- **Rarity** One of the most important purposes of nature conservation is to protect rare or local species and communities. The general principle is that the rarer the species or community, the greater the value for nature conservation. Rarity is related to the frequency of occurrence at national or county level.
- **Fragility:** Fragility reflects the degree of sensitivity of habitats, communities and species to environmental change and involves a consideration of intrinsic and extrinsic factors.
- **Typicalness:** It is necessary to represent the typical and commonplace within a field of ecological variation as well as the best examples of particular ecosystems.
- **Recorded History:** The extent to which a site has been used for scientific study and research is a factor of some importance.
- **Position in an ecological/geographical unit:** The relationship of a site to adjacent areas of nature conservation value. It is important to recognise the important and characteristic formations, communities and species of a district.
- **Potential Value:** Certain sites could, through appropriate management or natural change, develop a greater nature conservation interest.
- **Intrinsic Appeal:** The knowledge of the distribution and numbers of popular groups of species, such as birds, is greater than for obscure groups. Similarly, colourful wild flowers and rare orchids arouse more enthusiasm than liverworts. It is pragmatic to give more weight to some groups than to others.

110. Significance of impacts on sites of conservation interest, badgers, otters, bats and birds, based on their presence as determined by survey. Factors to be considered in significance assessment are outlined in Table 10.6. An ecologically significant impact can be defined as an impact (negative or positive) on a defined site or ecosystem and/or the extent or population of habitats or species within a given geographical area. The likelihood of predicted impacts should also be considered, and their significance assessed, taking into account the process described below.

Table 10.3: Criteria for Assessing Ecological Sensitivity

Site Importance	Site Description
Internationally important sites (very high conservation value)	World Heritage Sites identified under the Convention for the Protection of World Cultural & Natural Heritage, 1972; Biosphere Reserves identified under the UNESCO Man & Biosphere Programme; Wetlands of International Importance designated as Ramsar Sites under the terms of the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the Ramsar Convention) formulated at Ramsar, Iran, in 1971; Special Protection Areas (SPAs) designated in accordance with Council Directive *2009/147/EC*): (the Birds Directive. This Directive requires member states to take measures to protect birds, particularly rare or endangered species as listed in Annex I of the Directive, and regularly occurring migratory birds; Special Areas of Conservation (SACs and cSACs) designated in accordance with the 1992 European commission Habitats Directive 92/43/EEC (1992): the Habitats Directive. This Directive requires member states to establish a network of sites that will make a significant contribution to conserving habitat types and species identified in Annexes I and II.
Nationally important sites (high conservation value)	Areas of Special Scientific Interest notified under Section 28 of the Environment (NI) Order 2002, which represent the best national and regional example of natural habitat, physical landscape features or sites of importance for rare or protected species; National Nature Reserves (NNRs) and Marine Nature Reserves (MNRs) designated under the Environment Order; Sites maintaining viable populations of UK Red Data Book species that are listed as being either of unfavourable conservation status in Europe, of uncertain conservation status or of global conservation concern; Sites maintaining species listed in Schedules 1, 5 and 8 of The Wildlife (NI) Order 1985; Sites maintaining a viable population of species for which there is UK BAP or all Ireland SAP Ancient Woodland sites.
Regionally important sites (medium conservation value)	Sites that reach criteria for Local Nature Reserve but do not meet ASSI selection criteria; Sites of Local Importance for Nature Conservation (SLNCIs) recognised by DOE Planning Service and intended to complement the network of nationally and regionally important sites. SLNCIs receive special consideration in relation to local planning issues; Sites supporting viable areas or populations of priority habitats/species identified in the UK Biodiversity Action Plan or smaller areas of such habitat that contributing to the maintenance of such habitat networks and /or species populations; Sites maintaining habitats or species identified in Regional Biodiversity Action Plans on the basis of national rarity or local distribution: and Other sites of significant biodiversity importance (e.g. sites listed as priority under Local Biodiversity Action Plans).
Other sites with local conservation interest (lower conservation value)	Sites not in the above categories but with some biodiversity interest.
Negligible conservation value	Sites with little or no local biodiversity interest.

Table 10.4: Factors to be considered when assessing the Magnitude of Ecological Impacts

Parameter	Description
Extent	The area over which an impact occurs.
Duration	The period required for a feature to recover or be replaced following an impact. Duration of an activity may have a shorter duration than the impact of the activity.
Reversibility	A permanent impact is one from which recovery is unlikely. A temporary impact is reversible either through natural recovery or as a result of mitigation.
Timing and frequency	In some cases, an impact may only occur if it occurs during a critical season or part of a species' life-cycle, and may be avoided by careful scheduling of work activities. Frequency of an activity may also affect the magnitude of its impact by reinforcement of the impact.

Table 10.5: Determination of Magnitude of Impacts

Magnitude	Description
High	Major loss or alteration to key features of the baseline condition.
Medium	Loss or alteration to a key feature(s) of the baseline condition, such that the feature(s) will be partially changed.
Low	Minor but perceptible change to baseline conditions.
Negligible	Very slight or imperceptible change to baseline conditions.

10.6: Significance of impacts

Significance	Description
Positive	The Proposed Development has a positive impact on the defined site or ecosystem and/or the extent or population of habitats or species within a given geographical area.
Major Negative	The Proposed Development (either on its own or with other proposals) will affect the integrity of a European or nationally designated site, in terms of coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the population levels of species of interest, or is likely to adversely affect the numbers, distribution or viability of a species or population of conservation concern. A major change in a site or feature of local importance may also enter this category.
Moderate Negative	The Proposed Development will have an effect over a significant part of the habitat or affect a significant part of a population of species. The Proposed Development will lead to a significant effect upon the ecological baseline. Some small (spatial or temporal) effects may be moderate adverse where the receptor is of international value. The Proposed Development may adversely affect the integrity of a locally important conservation site, or may have some adverse effect on the numbers, distribution or viability of a species or population of conservation concern.
Minor Negative	Neither of the above applies, but some minor negative impact is evident. The distribution or extent of commonly occurring habitats or species may be affected but not sufficiently to adversely affect the status of such habitats or species at anything other than a local level.
Negligible	No observable impact in either direction.

10.3 Baseline Conditions

10.3.1 Sites of Conservation Importance

10.3.1.1 Sites of European and International Importance

111. SACs, SPAs and Ramsar sites within 30km of the proposed new infrastructure were considered for their potential to be affected by the Proposed Development. This included a total of thirteen internationally designated sites including two SPAs, seven SACs and four Ramsar sites. The site designations are summarised in Table 10.7 and the conservation objectives are set out in Appendix 10I.

Table 10.7: Internationally designated sites within 30km of development

Site Name	Designation Type	Distance from site boundary	Description of Site Importance
Peatlands Park	SAC	4km NE	Annex I habitats are the primary reason for selection of this site. Annex I habitats include degraded raised bog that is capable of natural regeneration and extensive bog woodland. Active raised bog and oakwood habitats are also present but not primary reasons for designation. The site is remote from the Proposed Development, upslope from the Blackwater River, and will not be affected by any potential impacts of the Proposed Development on the river waters. The site is therefore not considered further.
Lough Neagh and Lough Beg	SPA Ramsar	9kmNE	This site qualifies under Article 4.1 of the Directive (79/409/EEC) as an SPA by supporting internationally important numbers of the following species listed on Annex I of the Directive: During the breeding season; Common tern, 185 pairs representing 6.0% of the breeding population in Ireland. Over winter; Bewick's swan, 136 individuals representing 5.4% of the wintering population in Ireland (5 year peak mean 1991/2 - 1995/6) Golden plover, 5,298 individuals representing 2.6% of the wintering population in Ireland (5 year peak mean 1991/2 - 1995/6) Whooper swan 1,031 individuals representing 10.3% of the wintering population in Ireland (5 year peak mean 1991/2 - 1995/6) This site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: During the breeding season; Black-headed gull, 33,000 pairs representing 2.0% of the breeding Northwestern Europe - breeding population (1987) Great crested grebe 500 pairs representing at least 1.0% of the breeding Northwestern Europe - wintering population On passage; Great crested grebe, 2,440 individuals representing at least 1.6% of the Northwestern Europe - wintering population (5 year peak mean 1991/2 - 1995/6) Over winter; Goldeneye, 10,776 individuals representing at least 3.6% of the wintering Northwestern/Central Europe population (5 year peak mean 1991/2 - 1995/6) Great crested grebe , 1,821 individuals representing at least 1.2% of the wintering Northwestern Europe - wintering population Pochard, 26,341 individuals representing at least 7.5% of the wintering Northwestern/Northeastern Europe population (5 year peak mean 1991/2 - 1995/6) Scaup, 3,798 individuals representing at least 1.2% of the wintering Northern/Western Europe population (5 year peak mean 1991/2 - 1995/6) Tufted duck, 22,372 individuals representing at least 2.2% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6) The area qualifies under **Article 4.2** of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl. Over winter, the area regularly supports an assemblage of waterfowl totalling 99,221 individual waterfowl. The site is designated as a Ramsar site under criteria 1, 2,3,4,5,

Site Name	Designation Type	Distance from site boundary	Description of Site Importance
			6 and 7. Ramsar criterion 1: The site is the largest freshwater lake in the United Kingdom Ramsar Criteria 2: The site supports over 40 rare or local vascular plants Ramsar criteria 3: A large number of plants and animal species are confined or almost confined to this area within Northern Ireland. Ramsar criteria 4: The site supports an important assemblage of breeding birds including the following species with which occur in nationally important numbers: great crested grebe, gadwall pochard, tufted duck, snipe and redshank Ramsar criteria 5: Site supports an internationally important assemblage of waterfowl with a peak winter count of 86639 individuals over winter. Ramsar criteria 6: Supports populations of the following species occurring at levels of international importance; whooper swan, pochard, tufted duck, greater scaup and common goldeneye. Ramsar criteria 7: Supports a population of *Coregonus autumnalis*, one of the few locations in Ireland and one of the two known locations in the UK.
Slieve Beagh – Mullaghfad – Lisnaskea	SPA	23km SW	This site qualifies under Article 4.1 of the Directive (79/409/EEC) as an SPA by supporting internationally important numbers of breeding hen harrier. During the breeding season the area regularly supports 10 breeding pairs representing 5.5% of the all-Ireland breeding population. Given the overall distance between the site and the proposed line route, including a considerable distance of poor foraging habitats, there will be no impact on breeding hen harriers and the site is not considered further.
Montiaghs Moss	SAC	24km NE	Annex II species are the primary reason for selection of this site. The site hosts populations of marsh fritillary butterfly. It is not considered that the development will affect this population and so it is not considered further.
Magheraveely Marl Loughs	SAC Ramsar	24km W	Annex I habitats and Annex II species are the primary reason for selection of this site. Annex I habitats hard oligo-mesotrophic waters and alkaline fen habitat are present and are primary qualifying features for site selection, Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* are present but not a primary reason for site selection. Annex II species white clawed crayfish are present and a primary qualifying feature for site selection. Due to its distance from the proposed substation site, the site is hydrologically isolated from the Proposed Development, and is not considered further.
Slieve Gullion	SAC Ramsar	24km SW	Annex I habitats are the primary reason for selection of this site. Annex I habitat dry heath habitat is present and a primary feature for site selection. The site is designated as a Ramsar site as an example of one of the best blanket bog habitats in the United Kingdom. The site is in a different catchment to the works, is hydrologically isolated from the Proposed Development and is not considered further.
Upper Ballinderry River	SAC	26km NW	Annex I habitats and Annex II species are the primary reason for selection of this site. Annex I habitat 'Water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitrocho-Batrachion* vegetation' is present and a primary qualifying feature for site selection. Annex II species freshwater pearl mussel is present and a primary

Site Name	Designation Type	Distance from site boundary	Description of Site Importance
			qualifying feature for site selection. Due to its distance from the proposed substation site, the site is hydrologically isolated from the Proposed Development, and is not considered further.
Deroran Bog	SAC	29km NW	Annex I habitats are the primary reason for selection of this site. Annex I habitat raised bog is present and a primary feature for site selection. The site is in a different catchment to the works, is hydrologically isolated from the Proposed Development and is not considered further.
Black Bog	SAC Ramsar	30km NW	Annex I habitats are the primary reason for selection of this site. Annex I habitats include active raised bog habitats, and is one of the best examples of these in the United Kingdom. Due to its distance from the proposed substation site, the site is hydrologically isolated from the Proposed Development, and is not considered further.

10.3.1.2 Sites of National Importance

112. A desk based study was carried out to identify all ASSIs and NHAs within a 30km radius of the proposed site boundary. The impact on designated features potentially affected by the Proposed Development were considered for:

- All ASSIs with habitat designation features within 5km of the Proposed Development, and
- ASSIs with bird designation features within 10km of the Proposed Development.

113. The sites and features of interest are summarised in Table 10.8 and 10.9.

Table 10.8: ASSIs within 5km of the site boundary designated for habitat features

Site	Distance from site boundary	Description of site importance
Drumcarn	2.2km E	Designated as an ASSI for habitats and species. Habitats include water, swamp and fen habitats. It is one of the best sites in Northern Ireland for dragonflies and damselflies, and supports a number of other notable invertebrate species. There is little potential for the Proposed Development to affect the designated features of the site due to distance from the Proposed Development, and this site is not considered further.
Crossbane Lough	2.8km E	Designated as an ASSI for diverse habitat and plant assemblages. Notable species include bottle sedge, common cottongrass, devil's-bit scabious and marsh violet. The site supports a diverse invertebrate assemblage. There is little potential for the Proposed Development to affect the designated features of the site, and this site is not considered further.
Straghans Lough	3.1km E	Designated as an ASSI for wetland habitats and rich and diverse invertebrate communities. There is little potential for the Proposed Development to affect the designated features of the site, and this site is not considered further.
Caledon and Tynan	4km W	Designated as an ASSI for parkland and fen habitats. Parkland contains a significant number of open-grown veteran and ancient trees and shrubs. These support a high quality invertebrate fauna. Grassland and trees support a range of fungi including a number of rare species. There is little potential for the Proposed Development to affect the designated features of the site, and this site is not considered further.
Kiltubbrid Loughs	4.5km W	Designated as an ASSI for swamp and fen communities. These support a number of notable species including an unusual invertebrate community. There is little potential for the Proposed Development to affect the designated features of the site, and this site is not considered further.

Table 10.9: ASSIs within 10km of the site boundary designated for birds

Site	Distance from site boundary	Description of site importance
Lough Neagh	9km NE	Forms part of Lough Neagh and Beg SPA and Ramsar. Hosts internationally important numbers of wintering waterfowl with total population averaging 66,800. There are internationally important populations of whooper swans pochard, tufted duck, scaup, goldeneye, black-headed gull and nationally important populations of great crested grebe, cormorant, mute swan, Bewick's swan, shelduck, wigeon, gadwall, teal, mallard and coot and breeding populations of redshank, snipe, common tern, tufted duck, pochard, shoveler and gadwall. Other features for site selection include vascular plant, aquatic plant and invertebrate assemblages and fish species.
Lough Beg	9km	Forms part of Lough Neagh and Beg SPA and Ramsar. Hosts internationally important populations of wintering waterfowl. Hosts nationally important populations of breeding snipe, redshank and curlew. Important passage site for a number of waders.

114. Full citations for SPAs and SACs can be found on the JNCC website, ASSI citations can be found on the Department of Environment website.

115. The potential for impacts on other habitat/invertebrate ASSIs within 30km was also addressed including assessment of their qualifying features. These sites are listed below (Table 10.10), together with a Natural Heritage Area (RoI site of national importance) but are not considered further in any detail owing to the distance to the site and localised nature of potential impacts.

Table 10.10: Additional ASSIs within 30km of the Proposed Development:

Site	Distance	Designation feature(s)
Drumcrow	5km N	Fen
Knocknacloy	5.5km W	Species-rich dry grassland
Tullybrick Lough	5.5km W	Marl lake, fen
Annacramph Meadow	7km E	Lowland meadow
Rehaghy Wood	11.5km W	Oakwood
Black Lough	12km W	Fen, invertebrates
Selshion	14km E	Heath, invertebrates
Camlough	15km E	Mesotrophic lake
Drumlougher Lough	16km SE	Acid grassland, wet/dry heath, fen, invertebrates
Tullyard	17km SE	Species-rich hay meadow
Lough Gullion	17.5km E	Marl lake, fen
Moyrourkan Lough	19km E	Fen, invertebrates
Brackagh Bog	20km E	Fen, wet woodland, invertebrates
Glenmore Wood	21km W	Oakwood
Lurgan Lough	21km SE	Fen, invertebrates
Cashel Loughs	21km E	Fen, invertebrates
Fymore Lough	22km W	Fen meadow, mesotrophic lake, invertebrates
Derrycloony Lough	23km W	Fen, invertebrates

Site	Distance	Designation feature(s)
Loughaveely	23km SE	Fen
Levallymore	24km SE	Species-rich dry grassland
Lough na Blaney bane	25km W	Fen, mesotrophic lake
Lough McCall	27km W	Fen, invertebrates

10.3.1.3 Sites of Local Nature Conservation Importance (SLNCIs)

116. Only SLNCIs within 5km of the Proposed Development were considered due to the local nature of the SLNCI designation, and the essentially non-destructive nature of works associated with the proposed overhead line. These are listed below in Table 10.11.

Table 10.11: Sites of Local Nature Conservation Importance (SLNCIs) within 5km of the site boundary.

Site	Distance	Designation feature(s)
Milltown Benburb	1.2km W	SLNCI consists of a disused canal and adjacent broad-leaved woodland habitats.
Mowillin South West	2.4km E	Designated as a SLNCI for supporting good numbers of breeding waders.
Carryhugh Fen	2.7km E	Designated as a SLNCI for its fen communities.
Navan Fort	2.9km E	Designated as a SLNCI for its grassland communities which contain a number of notable species.
Derryore	3.5km E	Designated as a SLNCI for its extensive areas of diverse wetland communities
Carnagh Forest and Lakes	3.8km E	Designated as a SLNCI for areas of open water, woodland and heath habitats
Clay Lake	4.1km E	Designated as a SLNCI for being a large, diverse site, with swamp, fen, grassland, scrub and open water habitats.
Derryhubbert/Derryardy	4.5km NE	Designated as a SLNCI for its extensive cut-over bog with a variety of swamp and semi-natural woodland communities.

10.3.1.4 Important Bird Areas

117. IBAs within the general area of the Proposed Development, and which sustain bird populations that have a potential for interaction with the proposed new infrastructure, were considered. These are summarised below in Table 10.12.

Table 10.12: Important Bird Areas within 10km of the survey corridor.

Site	Distance	Designation feature(s)
The Lough Neagh/Lough Beg IBA	9km NE	Designated as an IBA for supporting the largest concentration of wildfowl in Northern Ireland. Some birds which use Lough Neagh/Lough Beg during part of their annual cycle may disperse through the study corridor.
Annaghroe, River Blackwater IBA	8km W	IBA comprises grazed, periodically flooded meadows situated alongside the river that are managed as part of the compensatory measures for the Blackwater drainage scheme, to provide flooded meadows for breeding waders and wintering wildfowl. This site is a traditional whooper swan feeding site (RB06, Appendix 10G), and is considered within the wintering bird survey.

10.3.1.5 Ancient Woodland Inventory

118. Potential remote impacts on woodland are relatively localised, and Ancient Woodland Inventory (AWI) woodland within 500m of the proposed overhead line route was considered. AWI woodlands identified within this area of search are summarised below in Table 10.13.

Table 10.13: Ancient Woodland Inventory Sites within 500m of the proposed line route

Site	Grid Reference	Description
1823 Mullyloughan House	H823495	Long-established woodland
1416 Knappagh	H813475	Long-established woodland
1388 Tynan	H798379	Possibly ancient woodland
1389 Leslie Hill	H801385	Long-established woodland

10.3.2 Habitat Survey Results

10.3.2.1 Overview

119. The habitats recorded are mapped and are shown in Figures 10.5 to 10.14. Significant target notes (TN[129] in the following accounts) are to be found in Appendix 10C. The plant species list for the corridor is in Appendix 10D. The following account deals with the proposed substation site, and then generally with the most frequent habitats present along the overhead line route corridor, highlighting habitats of conservation interest along the route corridor. The Figures above show the location of each habitat type recorded and Target Notes where relevant.

10.3.2.2 Substation Site Habitats

Phase1 habitat survey

120. Habitat types present at the proposed substation are summarised in Table 10.14.

Table10.14 Habitat types present at proposed substation site

Habitat Description	JNCC Habitat Classification	BAP Habitat Classification	Northern Ireland Priority Habitat
Improved grassland	B4	N.A	N.A
Rush-dominated neutral grassland	B2	N.A	N.A
Marshy semi-improved grassland	B5	N.A	N.A
Intact hedgerow – species-poor	J2.1.2	BAP habitat	NI Priority Habitat
Defunct hedge - species-poor	J2.2.2	N.A	N.A
Hedgerow with trees	J2.3.2	BAP habitat	NI Priority Habitat
Broadleaved Parkland/scattered trees	A3.1	N.A	N.A
Coniferous Parkland/scattered trees	A3.2	N.A	N.A
Land drains	G1	N.A	N.A
Coniferous woodland - plantation	A1.2.2	N.A	N.A

121. The site of the proposed substation is at present under grazed improved grassland or rush-dominated neutral grassland of low conservation value. A restricted area of marshy grassland in the extreme north-east of the site supports a low diversity residual wetland flora. Herb species present include lesser spearwort, celery-leaved buttercup, marsh woundwort and tufted forget-me-not.

122. Fields in the vicinity are separated by barbed-wire fences or hedgerows of low species-diversity that are often in poor condition. Hedgerows are dominated by hawthorn, protect a scant basal flora, and

[129] Highlighted in red for convenience.

are generally severely box-cut. A single mature pine species is present in one of these fields. A line of trees along the approximate position of the western edge of the substation site comprises three sessile oak, a horse-chestnut and two sycamores.

123. Drains that mark the boundaries of some fields generally contain either standing water or are dry. Drains are up to 1.5m wide, often with improved grassland to the channel edge. They retain common wetland plant species in places, including meadowsweet, brooklime and water-cress. Drains are often choked with grasses such as plicate sweet-grass.

124. An extensive area of marshy grassland to the north of, but outside, the proposed substation site retains good sedge populations, and supports the notable species common meadow-rue (TN1). This site was assessed for its suitability as a site for the substation, but was rejected because of its botanical and ornithological interest. A small dense young conifer plantation is present to the east of the site (TN2).

Northern Ireland Priority Habitats

125. Hedgerows were the only NI Priority Habitat noted in the substation site. Many hedgerows are relict features that have been largely replaced by barbed wire fences. Others, particularly along the roadside boundary and to the west of the site continue to be stock-proof and are effective field boundaries. However, no species-rich hedgerows (those with six or more woody species, excluding bramble, within 30m) are present, and most are dominated by a single species, generally hawthorn. Three mature ash trees are present in a roadside hedgerow. This hedgerow is separated from the road by a verge that is dominated by common grasses, but also supports frequent, mainly ruderal, herbs and locally frequent bracken

10.3.2.3 Overhead Line Route Habitats

Phase1 habitat survey

126. Habitat types present along the proposed overhead line route are summarised below in Table 10.16.

Table 10.16 Habitat types present at proposed substation site

Habitat Description	JNCC Habitat Classification	BAP Habitat Classification	Northern Ireland Priority Habitat
Improved grassland	B4	N.A	N.A
Semi-improved neutral grassland	B2.2	N.A	Some types of Semi-improved grassland are priority habitats. Area of lowland meadow is a Northern Ireland Priority Habitat
Cultivated/disturbed land - arable	J1.1	N.A	N.A
Neutral grassland	B2	N.A	N.A
Marshy semi-improved grassland	B5	N.A	N.A
Fen	E3	N.A	Northern Ireland Priority Habitat
Swamp	F1	N.A	N.A
Intact hedge - native species-rich	J2.1.1	BAP priority habitat	Species rich hedgerows are a Northern Ireland Priority Habitat.
Defunct hedge - species-poor	J2.2.2	N.A	N.A
Broadleaved Parkland/scattered trees (within hedgerow)	A3.1	N.A	N.A
Broadleaved woodland - semi-natural	A1.1	N.A	Area of oakwood and area of AWI mixed ash woodland both qualify as Northern Ireland Priority Habitat
Wet woodland	A1	BAP priority habitat	Small area of birch/willow carr qualifies as Northern Ireland Priority Habitat.
Orchard (Cultivated/disturbed land – arable)	J1.1	N.A	N.A
Scrub	A2	N.A	Area of willow scrub qualifies as wet woodland Northern Ireland Priority Habitat
Standing water (ponds)	G1	BAP priority habitat	N.A
Running water (streams and rivers)	G2	BAP priority habitat	N.A

Improved grassland

127. The greatest part of the proposed overhead line corridor habitats consists of agricultural grassland that has been improved to a variable extent. Improved grassland is generally dominated by a single grass species, usually perennial rye-grass, or by a small number of common grass species. The main variable is the relative proportion of agricultural grasses and rush species and this habitat includes rush pasture in which rushes, mainly soft rush, may be spatially dominant but where there is clear evidence of improvement in the past.

128. Herb species in improved grassland fields are common and of low diversity, and are restricted to those species that can tolerate high nutrient inputs and can compete with rapidly growing agricultural grasses. Examples of these species are creeping buttercup and dandelion. Many fields contain stands of tall herbs such as common nettle, broad-leaved dock and creeping thistle, indicating local enrichment by grazing animals.

129. Rush-dominated pasture is of scattered occurrence over much of the corridor, and is concentrated on the more poorly drained higher ground towards the south of the surveyed area. This habitat has clearly been improved in the past, as evidenced by the abundance of agricultural grasses, particularly perennial rye-grass.

130. Rushes generally increase in cover percentage with increasing soil moisture and declining management intensity, but rush-dominated pasture is rarely a dominant feature along the line route. The dominant rush is usually soft rush, but sharp-flowered rush may achieve high cover values, and hard rush is locally frequent.

Semi-improved neutral grassland

131. A small number of fields support relatively diverse grassland communities, and retain populations of herbs that give an indication of their former richness, with, occasionally, very small concentrations of yellow-rattle, tufted vetch and meadow vetchling. These communities may be relict, rather species-poor, hay meadow populations, or may reflect recent declines in nutrient input and revitalisation of local grassland communities (TN23), but their truncated species composition indicates that they have been adversely affected by agricultural activities in the past.

132. A small number of rush pasture fields also support a poor semi-improved grassland herb flora. Herbs may be frequent but are generally of low diversity, and species composition reflects the ambient high water table. Wetland herbs may therefore be present and may include marsh ragwort, lesser spearwort, ragged-robin and marsh thistle, but creeping buttercup is in most cases the most abundant herb species. Although perennial rye-grass is generally the dominant grass species marsh foxtail, sweet vernal-grass and Yorkshire-fog may also be frequent. Species such as greater bird's-foot-trefoil, selfheal and common cat's-ear may be found in this situation.

Arable

133. A small number of fields along the proposed overhead line route were under arable cultivation and were of low conservation value. Fields are almost invariably cultivated to the field edge, and where field margins persist they generally consist of a narrow band of grass-dominated communities with occasional stands of ruderal herbs. Arable weeds were sparse and of low diversity.

Unimproved Neutral grassland

134. Few fields support grassland vegetation that suggests low intervention agricultural practices. A single field located 10m to the north of Tower 92 supported a good range of common grasses and a species-rich forb community (TN25) although this will not be impacted by the Proposed Development.

Marshy grassland

135. An area of marshy grassland that is part of a mosaic of wetland habitats in a small bog that has been modified by past draining and continuing eutrophication, is botanically more interesting, and occurs towards the northern end of the proposed route (TN4). A field approximately 9m to the east of Tower 26 may also be a modified bog that now supports relatively species-rich marshy grassland (TN7)

136. A field located 20m from Tower 43 (and separated by a hedgerow and drain) supports a mosaic of species-poor rushy improved grassland and relatively species-rich marshy grassland. Drains in the field are frequently choked with emergent vegetation and lack standing open water (TN12). This field will not be impacted by the Proposed Development.

137. Marshy grassland occurs infrequently in restricted patches in otherwise improved grassland fields, particularly towards the south of the proposed overhead line route. An example is described in (TN27). A more extensive area of marshy grassland, rather species-poor, is present 80m north of Tower 80 (TN20) and will not be impacted by the Proposed Development.

Fen

138. Two areas of fen, generally grading or deteriorating into marshy grassland were identified in the route corridor. A complex of habitats in a basin 225m east of Tower 71 includes a small fen that is drying out, dominated by great reed-mace, and supports a low diversity of wetland herb species (TN17). An extensive basin that supports a mosaic of wetland habitats begins approximately 20m east of Tower 71 and may also include fen habitats, but upon the advice of the landowner was not completely accessed due to safety considerations (TN4). An area of marshy grassland that may once have supported valley mire communities, but has now largely dried out, still retains some herbs and sedges typical of fen habitats (TN16). Wetter parts retain stands of reed canary-grass and yellow flag, with locally frequent wetland herbs such as marsh cinquefoil and ragged-Robin although standing open areas were not present. The location of an area of rather species-poor marshy grassland in a topographic basin suggests that it formerly supported fen vegetation types. It is now great reed-mace and rush-dominated (TN15) and has been modified and degraded to a species-poor form due to eutrophication.

Swamp

139. Swamp occurs to a limited extent as part of a wet woodland/marshy grassland/fen mosaic immediately to the east of the proposed location of Tower 13 (TN4). Swamp areas are generally dominated by water horsetail or reed canary-grass, with locally frequent great reed-mace, yellow flag, and branched bur-reed.

140. A discrete area of swamp is present 165m to the south-east of Tower 102, within a damp improved grassland field. The swamp is almost entirely populated by a stand of yellow flag. This habitat will not be impacted by the Proposed Development.

Hedgerows and tree lines

141. Hedgerows within the study area vary in their conservation value, with species diversity of woody plants and management regime the most important discriminants. Hedgerows dominated by a single species are frequent, but most functional hedgerows contain four or more woody species, with blackthorn, hawthorn, dog-rose, ash and holly the most frequently occurring species. Eight hedgerows within the study corridor meet the criterion (six or more woody species, excluding bramble, within 30m) for an ancient and/or species-rich hedgerow, as defined in the Final Draft Habitat Action Plan for Species-rich Hedgerows (EHS 2003). Other species commonly present include hazel, grey willow, goat willow, alder and gorse, and overall 27 woody species were recorded in hedgerows along the corridor. Species-rich hedgerows in close proximity to proposed tower locations are described in (TN3) and (TN8).

142. Hedgerows with a rich basal flora are also included in the Habitat Action Plan for Species-rich Hedgerows, but are infrequent in the general area of the route corridor. Hedgerows and field banks may act as refuges for woodland herbs, but the herb communities within the corridor were generally of low diversity.

143. Management of hedgerows in the route corridors varies from severe box-cutting, most frequent adjacent to improved grassland fields, to neglect. A small number of hedgerows have been removed in recent years to increase the size of improved grassland fields or have been replaced with fences. The absence of management or inappropriate management has led to deterioration of many hedgerows. Here trees are the more significant element of the hedgerow, and the hedge is often defunct as a stock barrier. Some former hedgerows in these circumstances have been reduced to a skeletal line of poorly maintained trees but have been assessed as such for the purposes of this Chapter.

144. Well-grown mature trees are a frequent feature of hedgerows along the proposed overhead line route. The most frequent tree species are ash and alder, but crack willow, white willow sycamore, beech and oak spp. are also present. Occasionally, neglected hedgerows have developed into tree lines, most frequently towards the southern end of the Proposed Development.

Woodland

145. All semi-natural broadleaved woodland is of conservation value in that Northern Ireland probably has the lowest native woodland cover in western Europe, at 1.7% of the land surface (Cooper 2002). All woods noted during the survey in the immediate vicinity of the proposed overhead line were of restricted extent (<2 ha) and were either floristically poor or were in poor condition as a result of current management practices. The location of streamside woodland on steep slopes at H788303 (TN26), with much multi-stemmed hazel and a range of woodland herbs, suggests that woodland may have occupied this site over a long period, and has a potentially enhanced conservation value as a result.

146. Semi-natural woodland is infrequent in the general area of the proposed overhead line route and is generally confined to wooded ribbons along stream banks (TN11), although a railway embankment and cutting has also developed wooded cover (TN14). A broader streamside, hazel-dominated woodland is present near the proposed location of Tower 43 (TN13). An area of more extensive wet woodland is present towards the north of the corridor (TN6). Woodland on the AWI is rare along the line route, although the proposed overhead line route passes woodlands on the AWI at H823495, H813475, H798381 and H801385, at distances of around 300m, 500m, 25m (TN19) and 140m (TN18) respectively. An area of woodland with veteran oaks to the east of Tower 81 may also be of ancient origin (TN21). The woodland strip at Artasooly (TN10), between Towers 39 and 40, is notable for its dominance by even-aged mature sessile oak, although woodland structure and species diversity are

poor in the vicinity of the proposed overhead line route. Much of the woodland is therefore likely to have been planted, but the presence of veteran oak within the woodland suggests that woodland may have been present here for a considerable period of time.

Orchards

147. A total of fourteen orchard fields, in two parcels, are present towards the northern end of the proposed overhead line route. None of these supported a diverse herb flora.

Scrub

148. There are occasional areas of scrub along the proposed overhead line route, with examples of willow scrub (TN7 and TN9), but gorse scrub is more frequent. Bramble occasionally forms small scrubby stands.

Running water

149. The proposed overhead line route crosses a major regional drain, the River Blackwater. Local terrestrial habitats in the vicinity of the river are of low conservation value, and are dominated by agricultural grassland. The river is designated as salmonid under the Freshwater Fish Directive. The route also approaches a meander of the Ballymartrim Water, which is also classified as salmonid.

150. Elsewhere, watercourses within the line route corridor consist mainly of minor streams and field drains. These features are generally less than 1m wide, and are often marked by hedgerows or banks of bramble. Occasionally banks support linear woodland. Common wetland species such as floating sweet-grass and brooklime are locally frequent. Two more significant streams, up to 4m wide, cross the proposed route towards the south of the corridor (TN22 and T24). The banks of watercourses frequently act as refuges for species that have been eradicated from surrounding agricultural land, although most plant communities are dominated by rank grasses and/or herbs.

Standing water

151. Ponds are scarce along the proposed overhead line route. A 0.3ha pond near Tower 22 is located in an improved grassland field, and has limited semi-natural vegetation around its banks (TN5). A 0.1ha pond to the south of Tower 6 is heavily shaded by surrounding planted trees.

Northern Ireland Priority Habitats

Hedgerows

152. Hedgerows are ubiquitous along the length of the proposed overhead line route and within the development envelope for the proposed substation. They vary widely in their conservation value. Hedgerows most frequently consist of a small number of woody species, although these are generally locally native. The most frequent non-native woody species are sycamore and beech. Many hedgerows are dominated by a single species, generally hawthorn. Perhaps the majority of hedgerows are no longer completely stock-proof, having become open at the hedge bottom and having developed gaps of varying lengths. However, a high proportion of hedgerows remain effective stock barriers.

153. A small number of hedgerows conform to the criterion for species-rich hedgerows (six or more woody species, excluding bramble, within 30m), which may indicate an ancient origin. The proposed overhead line route passes over a number of townland boundary hedges and ditches, which are considered to be the most likely locations for ancient hedgerows (EHS 2003).

154. Also included in the definition of species-rich hedgerows are those that support a rich basal herb flora, which may be a relic of former woodland cover. The great majority of grassland fields along the Proposed Development are devoted to improved pasture, with agricultural grasses dominant to the field boundary. No herb-rich hedgerows were found along the Proposed Development, although a small number supported a restricted flora that sometimes included common dog-violet, foxglove and primrose.

Fens

155. Fens as defined by the fens HAP (EHS 2005) encompass a wider range of habitats than those described in JNCC 2010, and includes basin and floodplain fens, valley mires, quaking bogs, springs

and flushes in the lowlands, swamps and marshy grassland on deep peat. The priority habitat may therefore include Phase I habitats described as marshy grassland or swamp above.

156. The most extensive area of fen HAP habitat along the proposed overhead line route occurs immediately to the east of the Tower 13 location (TN4). This peaty basin supports a range of wetland habitats, including marshy grassland, transitional fen/marshy grassland, swamp and wet grassland dominated by meadowsweet on deep peat, all of which are included in the fens HAP.

157. A small area of yellow flag-dominated swamp is present to the south-east of Tower 102.

158. A field to the east of Tower 71 is now rush-dominated, but the presence of sparse herbs – occasional lesser stitchwort, common marsh-bedstraw – suggests that this may once have supported a more diverse fen habitat. The high water table is reflected in the encroachment of alder into the field, where it forms a stand of wet woodland.

159. An oversailed field between Towers 64 and 65 is now rush-dominated. This small eutrophic fen supports some common reed-mace, with occasional willow scrub, and sparse herbs include occasional lesser stitchwort and common marsh-bedstraw (TN15).

160. An area of damp grassland near Tower 69 that has now largely dried out still retains some herbs and sedges typical of fen habitats (TN16).

Lowland meadow

161. Lowland meadow is defined by EHS (2005a) as grasslands which have:-

- a high percentage cover (>30%) of fine-leaved grasses;
- absence or very low percentage (<5%) cover of *Lolium* species;
- a minimum of 10 higher plant species in a representative 4m^2 quadrat; and,
- <25% cover of scrub or dwarf shrub.

162. A single field along the proposed overhead line route, immediately to the north of the proposed location of Tower 92 conformed to these criteria (TN25). Fine-leaved grasses dominated the graminid community, and perennial rye-grass was scarce. Herb species were frequent and diverse, and there was no evidence of encroachment by scrub or dwarf shrubs. The presence of a number of wetland herb species and localised rushes, mainly sharp-flowered rush, indicates that this is a transitional, wetter grassland type.

Oakwood

163. Oakwood is characterised by a dominance of native oak species and downy birch in the canopy, with varying amounts of holly, rowan and hazel in the understorey. To qualify as oakwood priority habitat in Northern Ireland, a woodland must meet the following criteria (EHS 2005b):

- Woodland area greater than 0.5 ha;
- 20% or more canopy cover, or the potential to achieve this in the case of newly planted stands;
- A canopy composed of 50% or more site-native trees or shrubs (or will be at canopy closure in the case of younger stands). Site native trees are those which are native to the locality and capable of growing naturally on the site; and/or
- Support a typical woodland ground flora (which may be under non-native tree species such as beech).

164. A strip of planted woodland which is oversailed by the proposed overhead line between Towers 39 and 40 has an area of approximately 0.8ha and is dominated by even-aged mature oak (TN 31). Woodland structure and species diversity are poor but this planted woodland conforms to the oakwood HAP criteria.

Scrub

165. Willow/alder scrub, around 2ha in extent, is oversailed by the proposed line immediately to the east of Tower 26 (TN7). A small area of willow scrub (approximately 0.8ha) along the bank of a minor stream approximately 103m to the north-east of Tower 31 supports a wetland ground flora in its restricted, wetter parts (TN9).

Wet woodland

166. Wet woodland comprises a diverse range of woodland types, usually dominated by willow species, alder or downy birch, but also sometimes includes ash or oak spp. on the drier riparian areas or margins of flushes. An area of woodland of around 1ha, located 140m to the east of Tower 25 is mainly birch/willow carr, with birch becoming dominant on drier ground (TN6). Alder woodland of around 0.8ha occupies a damp field, possibly formerly a fen, to the east of Tower 71.

167. To qualify as the wet woodland priority habitat, these woodland types must conform to the following criteria:

- Woodland area greater than 0.5 ha;
- 20% or more canopy cover or the potential to achieve this in the case of regenerating or newly planted stands;
- A canopy composed of 50% or more site-native trees or shrubs (or will be at canopy closure in the case of younger stands); and/or
- Support a typical wet woodland ground flora.

168. The priority habitat therefore includes much of the scrub habitat that is part of the Phase 1 survey classification at Para 163.

Mixed ashwood

169. Mixed ashwoods occur_on base-rich soils in the north and west of Ireland, often in riparian or flush locations, and are generally, but not exclusively, dominated by ash. To qualify as the mixed ashwood priority habitat, a woodland must conform to the following criteria (EHS 2005c):

- Woodland area greater than 0.5 ha;
- 20% or more canopy cover or the potential to achieve this in the case of regenerating or newly planted stands;
- A canopy composed of 50% or more site-native trees or shrubs (or will be at canopy closure in the case of younger stands); and/or,
- Typical woodland ground flora (which may be under non-native tree species such as beech or sycamore).

170. An area of woodland of around 1ha extent to the east of Tower 74 is classified by the Ancient Woodland Inventory as planted long-established woodland and retains a typical ashwood ground flora (TN18). This wood is separated from the tower location by the Maddan Road. A patch of rather wet woodland of around 0.25ha, with a canopy largely dominated by ash, has developed on an abandoned railway embankment in the vicinity of Tower 49 (TN14).

10.3.3 Protected and Notable Species Survey Results

10.3.3.1 Breeding Bird Survey Work

Desk Results

171. In addition to records derived from surveys carried out in relation to the Proposed Development, records of breeding raptors were acquired from the Northern Ireland Raptor Study Group (NIRSG). Exact locations of NIRSG records are confidential. Two pairs of peregrine are known to breed in the general vicinity of the proposed overhead line, with nest sites >5km from the line route. Merlin breed >10km from the line route. A single site for long-eared owl is known, >3km from the line route, and two barn owl sites are between 1.5 and 6km from the overhead line. Red kite has been recorded approximately 4km to the east of the proposed line route.

Field Survey Results

Initial breeding bird survey 2005-08

172. Woodland passerine species were well represented throughout the survey area, occurring in the more structurally diverse hedgerows as well as in broadleaved woodland fragments. These included the most abundant species, which, in declining order of abundance, were wren, robin, willow warbler, blackbird, dunnock and chaffinch. Typical farmland birds were represented by thinly distributed finch species, and the main grassland species (meadow pipit) was more or less confined to the larger, less intensively improved fields. Wetland birds were limited by the low incidence of their favoured habitats, but damp grassland, swamp and rush pasture supported occasional reed buntings and sedge warblers, and a single grasshopper warbler was detected. Birds of prey were infrequent, apart from buzzards, which in 2008 held at least 5 territories along the survey corridor. Occasional sightings of sparrowhawk probably referred to locally breeding birds. Waders were very sparsely present, with only three sites potentially occupied by pairs of curlew and single lapwing families were noted at different, but barely separated, sites in 2006 and 2008. A wet grassland field adjacent to the proposed substation site possibly supported three pairs of snipe and five snipe were found at a further single site in 2008.

173. No breeding bird ‘hotspots’ were noted, birds rather being well-dispersed throughout the wider countryside. However, an area of wet grassland (H808400) around 200m to the east of the proposed overhead line route that had grasshopper and sedge warblers and reed bunting was locally notable.

174. This survey confirmed that the range of habitats over the proposed route supported mainly common species with a Green List conservation status (see Appendix 10F for conservation status criteria). However, a small number of bird species of conservation concern were also present along the route (Appendix 10F).

June 2011 breeding bird survey

175. It was not possible to undertake an early visit to the route in 2011, as is required for the standard BBS methodology. It is likely, therefore, that some earlier breeding species are under-represented in the present study. On the other hand, the survey was carried out towards the end of the standard BBS survey period, and many of the records obtained may be of birds that were undertaking dispersive movements from their breeding sites. Birds become more mobile following the fledging of their young, or after failed breeding attempts, so that an unknown proportion of the birds recorded during this survey may have bred elsewhere. As a corollary, some birds that bred in the immediate vicinity of the Proposed Development route may have departed from the survey area. The proportion of each category present in a study area on a particular day cannot be known.

176. A total of 43 species were recorded. Eleven species recorded in earlier surveys were not observed during the present survey, while four species were recorded in 2011 that were not previously recorded. The most frequent passerine species encountered, in declining order of frequency were wren, willow warbler, blackbird, chaffinch, robin and swallow. Swallow was not considered in the 2005-2008 survey report because registrations for this species may refer to distant nest sites, but is included here for completeness. Species apart from swallow were also among the most frequent in the 2005-2008 survey. Dunnock was among the most frequent species in 2005-2008, but was less frequently encountered in this survey. This species sings intermittently, and most frequently early in the season, and multiple visits are more likely to produce a realistic number of registrations per transect. Nearly all

species present use nest sites in cover, principally hedgerows and wooded belts in the study area, and birds of open habitats were notably scarce.

177. No particularly rare or notable species were recorded during the survey, and the range of species recorded is comparable with that in the 2005-2008 survey. The majority of species recorded (33, or 77%) are Green-listed as species of low Irish conservation concern (Lynas et al 2009). Ten species are Amber-listed and two are Red-listed, generally because of population declines over the past 25 years. One of these species, lesser black-backed gull, is a non-breeder in the survey area. The causes of declines in the recorded species vary and may interact. Principal factors affecting decline are likely to be large-scale habitat loss, mainly due to agricultural improvement, changes in agricultural practice and, for migrant species, conditions on migration routes and in wintering areas. There is also evidence that climate change may cause a mismatch between availability of food supplies and the timing of nestling emergence.

May-July 2012 breeding bird survey

178. A total of 42 species were recorded. No species new to this study were recorded, while eleven species that had previously been recorded were not found in 2012. Bird communities were generally comparable across the three surveys, as were densities of likely breeding populations for most species. Records from this survey may be interpreted as providing evidence for changes in some bird population sizes (Baillie *et* al 2010). After adjustment to take account of differences in survey transect length, examples of likely population changes between surveys include: an increase in buzzard territories which is in line with the current expansion of the Irish breeding population; an increase in goldfinch records which is in line with a long-term population increase; and an increase in blackcap records which reflects an ongoing increase in the Irish population of this species, and an expansion into farmland habitats. Bird records for the surveyed corridor are summarised in Appendix 10F and summarised on Figures 10.30 – 10.48. Scientific names of all species recorded and their conservation status are also listed in Appendix 10F. A summary of priority species recorded during the surveys is provided in Table 10.17.

Table 10.17: Priority bird species recorded during bird surveys 2005-2008, 2011 and 2012

Species	Number of sightings			Habitat	Comments
	2005-08	2011	2012		
Kestrel*	1	-	1	Open countryside	Overhead only
Lapwing** R	2	-	-	Grassland	2 family parties
Curlew**	3	-	1	Rush pasture	Possible breeding locations
Common snipe*	1	-	-	Rush pasture	Possibly breeding but not recorded in 2012
Skylark* R	2	1	-	Grassland	Possibly breeding but not recorded in 2012
Sand martin*	-	2	-	Pond	Feeding at single location
Swallow*	NC	28	63	Dwellings/farmsteads	Occasional overhead
House martin*	-	2	10	Dwelling	Probably breeding outside site
Grasshopper warbler* R	1	-	-	Wet grassland	Territory only recorded once
Spotted flycatcher* R	2	1	2	Hedgerow	Probable territory
Starling* R	NC	9	35	Dwellings/farmsteads	Probable nest sites outside of survey area
House sparrow* R	NC	3	44	Dwellings	Probable nest sites outside of survey area
Tree sparrow*R	9	1	4	Hedgerow	Possible territories
Linnet* R	12	3	7	Hedgerow	Probably breeding in scrubby areas

(R) Red List Species of Least Concern according to World Conservation Union (IUCN) criteria. ** red listed and * amber listed under Birdwatch Ireland and RSPB list of priority species for conservation action in an all-Ireland context

10.3.3.2 Wintering Bird Survey

Use of Proposed Development route by foraging whooper swans

179. Fields in the neighbourhood of the proposed overhead line route were surveyed in order to determine their potential as swan feeding grounds. The survey area is shown on Figure 10.49. The only site outwith the traditional sites listed that held swans on survey days was at IGR H864577, within 1km of the proposed substation site. There were nine birds here on 05.12.06, and 19 on 29.01.09. Traditional feeding grounds of whooper swans are well known, and any sites outwith these that are used by whooper swans are likely to be used for short periods of time only. Use of non-traditional sites may result from random events, such as adverse weather conditions encountered during migration, or ephemeral floods, which could occur almost anywhere.

Use of Blackwater River valley as a commuting/migration route for whooper swans

180. The main concern initially expressed by NIEA with regard to swan use of the Blackwater River valley in the vicinity of the proposed river crossing was that birds might preferentially use the valley as a route between roost and feeding sites, resulting in a concentration of birds flying along the valley in the vicinity of the proposed crossing and a consequent increase in collision risk. A total of 9 birds were seen on a single date (01.11.06) from a total of 11 observation dates. The small number of birds seen using the valley in the vicinity of the river crossing as a route (Appendix 10G) suggests that this part of the valley at least is of low importance for swan navigation between roosts and feeding sites. The few birds recorded at the crossing occurred in November, and may have been birds moving to their wintering sites from staging sites to the north. The records may reflect a possible radial dispersion of birds from Lough Neagh, the major roost/staging site in the area, resulting in generally north to south movements, that is, sub-parallel with the proposed overhead line route in the vicinity of the river crossing. Swans heard but not seen on 05.12.06 were also probably moving southwards, perhaps following the line of the Ballymartrim River floods.

181. The low relief in the area to the south of Lough Neagh is unlikely to present a significant obstacle to swan movements, and the east to west alignment of the river around the proposed crossing point is not sufficiently attractive to cause most swans to deviate from a preferred north – south flight direction. Following the low level of swan activity recorded during this survey, consultation with NIEA concluded that any putative significant use of the valley as a leading line in the vicinity of the crossing was unlikely. Further surveys of the crossing were therefore considered to be of limited value.

Potential for whooper swans foraging in the Blackwater River valley to commute across the Proposed Development route.

182. A number of traditional whooper swan feeding sites in the general vicinity of the Blackwater River valley were highlighted by the Irish Whooper Swan Study Group (IWSSG) and NIEA through the consultation process as potential sources of swans at risk of collision with the proposed overhead line. Bewick's swan also occurs occasionally at some sites in the vicinity of the Blackwater valley. Both species are specially protected as Annex I species of the Birds Directive. The use of some sites as feeding grounds appeared to be determined largely by the presence and extent of flood waters, while at others the presence of floods as safe roost sites was likely to be a factor in the number of birds using traditional feeding grounds. The maximum number of swans using the Blackwater River valley feeding grounds was 177 birds on 15.11.10, when birds were dispersed among four sites in the valley. This is a small proportion of the wintering population centred on Lough Neagh/Lough Beg, where the highest winter count has been 1,803 in February 2010. It is likely that rather more birds use this site over a winter, as birds move on to or return from wintering sites elsewhere in Ireland. None of the individual feeding sites has supported numbers (a minimum of 130 birds) that are of all-Ireland or international significance in recent years (Holt et al 2012). However, it should be noted that the importance rating depends on counts over five consecutive winters, and numbers between winters are likely to fluctuate,

depending on a variety of factors that include breeding success, disturbance, extent and duration of floods, weather conditions and off-site factors.

183. Whooper swans using feeding grounds at Caledon/Kedew Road were seen to use Lough Enagh regularly as a roost during 2010/11. With freezing conditions, birds were diverted to floods at Annaghroe, where some open water remained, although many birds apparently roosted on ice at this site. Annaghroe also attracted some birds from the south as waters froze, presumably from feeding grounds in Co Monaghan. Birds continued to roost at Annaghroe through the hard weather of January 2011, but as ice cover at Lough Enagh began to break up in early February, birds began to use the latter roost site again. For a short time both sites were used, but evidently Lough Enagh was the preferred site, and with the return of open water, Lough Enagh was used exclusively towards the end of the winter. Birds using this southern part of the valley may be regarded as a distinct sub-population, both feeding and roosting within the area, although joined by small numbers of additional birds at times. Birds using this part of the valley are therefore unlikely to approach the proposed overhead line route during their diurnal winter cycle.

184. In the northern part of the valley, swans also used sites at Derryscollop and Clonbeg as feeding grounds. Short-lived floods at Derryscollop also functioned as a roost at times. The floods retained 77 feeding birds on 15.11.10 that had been feeding during the day, and were joined by a further 16 birds at dusk (total 93 swans). The flood-dependent site at Derryscollop is likely to attract birds from the population centred on Lough Neagh, since records of marked individuals show that there is a direct link between the two areas (Robinson et al 2004). Flightlines between Lough Neagh and Derryscollop are to the east of the proposed overhead line, and there is unlikely to be a conflict between the line location and swan utilisation of the Derryscollop site. Birds occasionally also use wetlands at Clonbeg, around 2km to the north-west of Derryscollop, between the Blackwater River and the proposed substation site. These birds are also likely to be based on Lough Neagh, exploiting floods as they occur, and flightlines again are located to the east of the proposed works.

Potential for whooper swans using the Keady lakes to cross the Proposed Development route.

185. Whooper swans also traditionally use lake sites in the vicinity of Keady (Appendix 10G). There is little information available on the potential interchange of wintering swans between these sites and the Blackwater. As well as the sites monitored for this study, there is a potential for birds using the Keady lakes to commute to sites in the Blackwater catchment in the Republic of Ireland, around 20km to the west. The Monaghan site supports small numbers of whooper swans annually, with a peak count of 55 noted by Crowe (2005). Robinson et al (2004) indicate that the Keady lakes may support regularly around 20 birds, and in winter 2008-09 up to ten birds regularly foraged and roosted at Clay Lake. The pattern of regular attendance at the lakes was disrupted in winter 2010-11, when birds were not present during a prolonged period of snow cover and freezing conditions. Following the thaw, up to 48 birds were present at the lakes (04.03.11). These are likely to have included birds returning northwards, as a maximum of 12 birds was recorded towards the end of the month.

186. Previous observations have shown that swans may commute between several of the lakes in the Keady area, and birds using the area appear to be site-faithful over prolonged periods. However, records of ringed birds indicate that some may travel further afield (Table 10.18, 10.19). Bird KPZ appears to have used wintering sites to the west of the proposed line route during at least the first two winters after being ringed in Iceland. Subsequently the bird has used sites to the east of the proposed line route on at least seven of the last eight years. Although there is no direct evidence that the bird remained at a particular site or general area throughout each winter, these records support the idea of considerable site faithfulness between winters. Bird 55J shifted its wintering area from Martin Mere to Northern Ireland, and spent at least three of the subsequent four winters in the Armagh/Monaghan area. Sightings of this bird are restricted to sites to the east of the proposed line route in both Northern Ireland and the RoI. The availability of suitable feeding and roosting sites to the east of the proposed overhead line route indicates that birds using the Keady lakes can be accommodated within an extensive corridor that does not require movements across the line route. Regular within-winter movements of swans between the Keady and Monaghan sites, across the route of the proposed overhead line, may therefore be infrequent.

Table 10.18: Bird KPZ Yellow (ring no A5364) Sightings

Status	Date	Location	Co-ordinates
Ringed	07/08/1999	Miklavatn, Skagafjordur,Iceland	65°42.00'N 19°34.98'W
Sighting	05/03/2000	Mullanary Lough South, Co. Monaghan, Ireland	54°5.52'N 6°58.02'W
Sighting	14/01/2001	Lough Corby, Upper L.Erne, Co. Fermanagh, Northern Ireland	54°10.98'N 7°24.00'W
Sighting	27/10/2001	Blackbrae, L.Foyle, Co. Londonderry, Northern Ireland	55°3.48'N 7°12.00'W
Sighting	24/01/2003	Kiltybane Lough, Co. Armagh , Northern Ireland	54°7.02'N 6°37.98'W
Sighting	19/12/2003	Darkley Lough, Co. Armagh, Northern Ireland	54°12.78'N 6°40.92'W
Sighting	31/10/2004	Broglasco, Lough Foyle, Co. Londonderry, Northern Ireland	55°3.78'N 6°58.98'W
Sighting	07/11/2004	Lomond Road, Myroe, Co. Londonderry, Northern Ireland	55°4.68'N 6°58.20'W
Sighting	13/03/2005	Gentle Owens Lake, Co. Armagh, Northern Ireland	54°12.00'N 6°46.02'W
Sighting	27/01/2007	Darkley Lough, Co. Armagh, Northern Ireland	54°12.78'N 6°40.92'W
Sighting	22/12/2007	Tullynawood Lake, Co. Armagh, Northern Ireland	54°12.00'N 6°40.98'W
Sighting	01/02/2009	Oram, Co.Monaghan, Ireland	54°9.18'N 6°42.66'W
Sighting	20/11/2010	Tullynawood Lake, Co. Armagh, Northern Ireland	54°12.00'N 6°40.98'W
Sighting	17/02/2011	Tullynawood Lake, Co. Armagh, Northern Ireland	54°12.00'N 6°40.98'W

Table 10.19: Bird 55J Yellow (ring no W03596) Sightings

Status	Date	Location	Co-ordinates
Ringed	19/11/2003	WWT Martin Mere, Lancashire, England	53°37.50'N 2°52.02'W
WWT Centre	22/03/2004	WWT Martin Mere, Lancashire, England	53°37.50'N 2°52.02'W
WWT Centre	09/02/2005	WWT Martin Mere, Lancashire, England	53°37.50'N 2°52.02'W
WWT Centre	31/10/2005	WWT Martin Mere, Lancashire, England	53°37.50'N 2°52.02'W
Sighting	27/01/2007	Darkley Lough, Co. Armagh, Northern Ireland	54°12.78'N 6°40.92'W
Sighting	22/12/2007	Tullynawood Lake, Co. Armagh, Northern Ireland	54°12.00'N 6°40.98'W
Sighting	21/12/2008	Tullynawood Lake, Co. Armagh, Northern Ireland	54°12.30'N 6°40.68'W
Sighting	01/02/2009	Oram, Co.Monaghan, Ireland	54°9.18'N 6°42.66'W
Sighting	15/01/2010	Tullynawood Lake, Co. Armagh, Northern Ireland	54°12.30'N 6°40.68'W
Sighting	177/02/2011	Tullynawood Lake, Co. Armagh, Northern Ireland	54°12.30'N 6°40.68'W

Other wintering bird species

187. Bewick's swan is a designation feature of the Lough Neagh and Lough Beg SPA that also occurs within the survey area for the Proposed Development. However, numbers of this species using the designated site no longer reach the threshold for all-Ireland importance (Holt et al 2012), and the reduction in this species wintering in Ireland is reflected in the paucity of records arising from this study. Six birds were on floods at the formerly regular site of Derryscollop on 29.01.06, and 2 were present at the same site on 10.02.11.17.02.11. Declines in Ireland are likely to be due to larger numbers wintering on the near continent than in past years, together with low productivity leading to an overall population decline. The small numbers now reaching Northern Ireland indicate that significant impacts on this species are unlikely from any local source.

188. Three Greenland white-fronted geese were present at Annaghroe (site RB06) on 16.01.08 and again on 11.11.08. This site was formerly used by a significant number of this species, but the site has been relatively little-used in recent years. The species is specially protected under Annex 1 of the Birds Directive, and is also the subject of a draft action plan under the AEWA (Stroud et al 2012). The species is Amber-listed because more than 20% of the NW European non-breeding population occurs in the UK and more than 50% of the non-breeding population occurs in 10 or fewer sites. It has previously been shown that birds from Annaghroe commute to Slieve Beagh (to the west of the proposed overhead line route) to roost (I. Enlander, NIEA, pers. comm.) and these movements would not therefore bring birds into the immediate vicinity of the proposed overhead line.

189. Records of other species that use the airspace likely to be occupied by the proposed overhead line include a flock of I9 greylag geese which was present with the swan flock at site RB05 on 04.01.07. 33 greylag geese were present at this site on 29.01.07 and 51 were present at site RB06 on 16.01.08. A reported movement of a small number of geese across the Blackwater River valley in December 2006, in the vicinity of the proposed river crossing, supports the hypothesis that movements in this area are not generally topographically controlled.

190. Herons use the Blackwater River in the vicinity of the proposed river crossing as a feeding area. Occasional, mainly isolated, birds were seen to move from feeding station to feeding station along the river during the dawn and dusk vantage point watches. Cormorants also use the river in this area as a food source, and were occasionally seen following the course of the river at heights of less than 20m.

191. Small numbers of gulls, mainly black-headed gulls, with occasional herring gulls and lesser black-backed gulls were seen to follow the line of the Blackwater in the vicinity of the proposed crossing during the winter months. 62 black-headed gulls moved westwards on 07.03.08 often at heights below 50m.

192. A westward movement of lapwings on 29.01.08 occurred to the north of the Blackwater river valley crossing point, and was clearly not constrained by the local topography, as the movement took place at a height of around 100m. A total of 290 birds were observed over the five hours of the dawn and dusk vantage point watches, and the movement was likely to be weather-related.

10.3.3.3 Bat Survey

Desk Results

193. The Northern Ireland Bat Group (NIBG) was consulted and bat records obtained along a 5km wide corridor (2.5km either side of the line route see Figures 10.4). A total of 51 bat records occurred within this survey area, several of which are of substantial roosts containing 100+ individuals (see Appendix 10B). The closest recorded roost lies 326m to the north-west of the line route near the Moy Road. This is a historical Leisler's bat roost and may be the source of some of the individuals recorded from the substation site.

Field Results

194. Tables 10.20, 10.21 and 10.22 refer to the bat results which have been collected between 2009 and 2012. Table 10.20 below contains the results of the 2009 – 2010 transect surveys which concentrated on the areas surrounding the proposed tower locations.

Table 10.20: 2009 – 2010 Bat Survey Results

Date of Survey	Tower Number	Species encountered & bat passes	Total Number of bat passes recorded
07.09.09	1	Pipistrelle spp. (13) Leisler's bat (6) Soprano pipistrelle (2) Common pipistrelle (2) Daubenton's bat (1)	24
13.06.09	1	Leisler's bat (2)	2
14.07.10	3 - 4	Pipistrelle spp. (6) Leisler's bat (43) Soprano pipistrelle (42) Common pipistrelle (18)	109
07.09.10	3 – 4	Pipistrelle spp. (10) Leisler's bat (2) Common pipistrelle (2) Soprano pipistrelle (1)	15
07.09.09	6	Daubenton's bat (199) Soprano pipistrelle (32) Common pipistrelle (11)	242
14.09.10	11 - 12	Leisler's bat (12) Soprano pipistrelle (5) Nathusius' pipistrelle (1) Pipistrelle spp. (3)	21
24.06.10	13	Pipistrelle spp. (11) Leisler's bat (87) Soprano pipistrelle (14) Common pipistrelle (6) Myotis spp. (2)	120
22.07.09	15	Soprano pipistrelle (12) Leisler's bat (6) Pipistrelle spp. (18) Common pipistrelle (6)	42
20.05.10	16	Leisler's bat (1) Common pipistrelle (12) Pipistrelle spp. (4) Unknown (12)	29
03.06.10	18	Common pipistrelle (9) Leisler's bat (13) Soprano pipistrelle (11)	33
02.06.10	19 - 20	Common pipistrelle (3) Leisler's bat (5) Soprano pipistrelle (1)	9
22.06.09	23	Common pipistrelle (11) Leisler's bat (2) Soprano pipistrelle (2)	15
25.05.09	26	Common pipistrelle (15) Leisler's bat (3)	18

Date of Survey	Tower Number	Species encountered & bat passes	Total Number of bat passes recorded
03.06.10	28	Leisler's bat (5)	5
17.08.09	29	Common pipistrelle (5) Soprano pipistrelle (5) Pipistrelle spp. (3) Nathusius' pipistrelle (1)	14
17.09.09	32 - beside Blackwater River	Leisler's bat (88) Soprano pipistrelle (28) Daubenton's bat (4)	120
07.09.10	33 - 34	Soprano pipistrelle (2) Pipistrelle spp. (3) Common pipistrelle (7) Leisler's bat (1)	13
24.06.09	39	Pipistrelle spp. (30) Common pipistrelle (25) Leisler's bat (26) Soprano pipistrelle (9)	90
25.05.09	39	Pipistrelle spp. (82) Common pipistrelle (20) Leisler's bat (6) Soprano pipistrelle (20) Myotis spp. (8)	136
25.05.09	39	Pipistrelle spp. (66) Common pipistrelle (24) Leisler's bat (3) Soprano pipistrelle (14) Myotis spp. (10)	117
05.07.10	42	Common pipistrelle (37) Soprano pipistrelle (14) Leisler's bat (5) Pipistrelle spp. (2) Unidentified (2)	60
05.07.10	43	Common pipistrelle (17) Nathusius' pipistrelle (2) Pipistrelle spp. (9) Leisler's bat (1)	29
07.09.10	46 – 47	Leisler's bat (5) Common pipistrelle (33)	38
14.09.09	49	Common pipistrelle (3) Leisler's bat (5) Pipistrelle spp. (4)	12
14.09.09	51	Soprano pipistrelle (6) Common pipistrelle (1) Leisler's bat (27) Pipistrelle spp. (7)	39
14.09.09	53	Common pipistrelle (2) Leisler's bat (8) Pipistrelle spp. (3)	13

Date of Survey	Tower Number	Species encountered & bat passes	Total Number of bat passes recorded
07.09.09	54	Myotis sp. (1) Soprano pipistrelle (5) Leisler's bat (2) Pipistrelle spp. (2)	10
18.08.09	55	Leisler's bat (2) Pipistrelle spp. (4)	6
18.08.09	56	Common pipistrelle (14) Soprano pipistrelle (2) Daubenton's bat (2) Pipistrelle spp. (2)	20
19.07.10	58 – 60	Common pipistrelle (47) Soprano pipistrelle (10) unidentified (1)	58
02.08.10	58 – 60	Leisler's bat (21) Soprano pipistrelle (5) Pipistrelle spp. (8) Common pipistrelle (22)	56
19.07.10	60	Leisler's bat (4) Soprano pipistrelle (4) Pipistrelle spp. (5) Common pipistrelle (51) Nathusius' pipistrelle (8)	72
02.08.10	60	Leisler's bat (14) Soprano pipistrelle (6) Common pipistrelle (11)	31
09.06.10	63	Leisler's bat (4)	4
02.06.10	64	Soprano pipistrelle (1)	1
09.06.10	64	Common pipistrelle (1)	1
21.08.09	68	Leisler's bat (5) Pipistrelle spp. (1) Soprano pipistrelle (1) Myotis sp. (1)	8
21.08.09	72	Common pipistrelle (4) Leisler's bats (1) Pipistrelle spp. (3) Natterer's bat (1)	9
21.08.09	75	Common pipistrelle (6) Leisler's bat (6) Pipistrelle spp. (3) Soprano pipistrelle (1)	16
29.07.10	76	Common pipistrelle (2) Leisler's bat (3)	
24.08.09	80	Pipistrelle spp. (11) Leisler's bat (1) Common pipistrelle (4) Soprano pipistrelle (2)	23

Date of Survey	Tower Number	Species encountered & bat passes	Total Number of bat passes recorded
20.07.10	80	Leisler's bat (1) Myotis sp. (1)	2
22.06.10	82	Pipistrelle spp. (2) Common pipistrelle (14) Soprano pipistrelle (6)	22
29.07.10	82	Pipistrelle spp.(4) Common pipistrelle (33) Soprano pipistrelle (2) Leisler's bat (10) Natterer's bat (4)	53
24.08.09	83	Daubenton's bat (2) Common pipistrelle (16) Soprano pipistrelle (4) Pipistrelle spp. (6)	28
22.06.10	87	Pipistrelle spp.(4) Soprano pipistrelle (10) Common pipistrelle (2) Leisler's bat (1)	17
22.06.10	88 - 89	Common pipistrelle (1) Leisler's bat (1) Soprano pipistrelle (1)	3
24.08.09	90	Common pipistrelle (2) Soprano pipistrelle (1)	3
08.09.10	91	Soprano pipistrelle (19) Pipistrelle spp. (15) Common pipistrelle (1)	35
02.06.10	93	No bats recorded.	0
15.06.10	93 - 94	No bats recorded.	0
15.09.10	95 - 96	Pipistrelle spp. (2) Common pipistrelle (7) Leisler's bat (2)	11
08.09.10	97 – 98	Pipistrelle spp. (5) Leisler's bat(4) Common pipistrelle (11)	20
15.09.10	100 – 101	Nathusius' pipistrelle (1) Soprano pipistrelle (1) Daubenton's bat (1) Common pipistrelle (2) Natterer's bat (1) Myotis spp. (2)	11
15.09.10	102 - 103	Pipistrelle spp. (3)	3
Bat Pass Total			1887

195. Table 10.21 gives a summary of the bat species and number of bat passes recorded during the 2011 driven transect surveys.

Table 10.21: 2011 results of driven transects

	Survey Dates								
Species	**27.05.2011**	**16.06.2011**	**21.06.2011**	**20.07.2011**	**21.07.2011**	**14.09.2011**	**20.09.2011**	**27.09.2011**	**Totals**
Common pipistrelle	8	9	23	0	4	8	6	21	79
Soprano pipistrelle	2	0	3	5	19	0	15	1	45
Pipistrelle Spp.	2	3	3	22	23	11	7	9	80
Leisler's Bat	1	12	7	0	0	7	1	2	30
Bat Passes	**13**	**24**	**36**	**27**	**46**	**26**	**29**	**33**	**234**

196. Table 10.22 details the results from the 2012 walked transect surveys.

Table 10.22: 2012 Bat walked transect results

Date	Species						
	Common pipistrelle	Leisler's Bat	Myotis Spp.	Pipistrellus spp.	Soprano pipistrelle	Unidentified bat	Survey total
20.08.2012	36	5	-	10	52	-	103
21.08.2012	17	4	-	18	9	2	50
22.08.2012	6	9	-	8	2	1	26
29.08.2012	-	5	-	1	1	9	16
30.08.2012	10	1	-	22	20	12	65
04.09.2012	20	4	-	7	3	-	34
05.09.2012	20	1	3	1	10	-	35
12.09.2012	4	-	-	1	-	-	6
15.09.2012	2	-	-	-	3	-	5
27.09.2012	3	2	-	1	-	2	8
05.10.2012	-	2	-	-	22	-	24
Species Total	**118**	**33**	**3**	**69**	**123**	**26**	**372**

197. During the 2012 survey season, static monitoring was also undertaken. Table 10.23 details the results of the static monitoring.

Table 10.23: 2012 Static Monitoring Results

Site No.	Date		Common pipistrelle	Leisler's bat	Myotis spp.	Nathusius pipistrelle	Natterer's bat	Pipistrellus spp.	Soprano pipistrelle	Whiskered bat	Total bats
	Out	In									
1	30.05.12	30.06.12	1	6	0	0	0	0	0	0	7
2	30.05.12	04.06.12	0	4	0	0	0	0	0	0	4
3	04.06.12	13.06.12	0	429	0	0	0	3	5	0	437
4	04.06.12	13.06.12	0	8	0	0	0	0	1	0	9
5	13.06.12	20.06.12	4	40	0	0	0	0	0	0	44
6	13.06.12	20.06.12	0	0	0	0	0	0	0	0	0
7	20.06.12	26.06.12	0	6	0	0	1	0	1	0	8
8	20.06.12	26.06.12	0	5	0	0	0	0	0	0	5
9	26.06.12	04.07.12	33	31	0	0	0	5	23	0	92
10	26.06.12	04.07.12	35	39	0	27	0	2	11	0	114
11	04.07.12	11.07.12	44	501	0	0	0	0	1	0	546
12	04.07.12	11.07.12	2	32	0	0	0	0	10	0	44
13	11.07.12	19.07.12	9	3	0	0	0	0	2	0	14
14	11.07.12	19.07.12	0	0	0	0	0	0	0	0	0
15	19.07.12	25.07.12	3	30	0	0	0	102	27	0	162
16	19.07.12	25.07.12	0	3	0	0	0	0	0	0	3
17	25.07.12	02.08.12	0	1	0	0	0	0	0	0	1
18	25.07.12	02.08.12	77	13	1	4	1	14	8	31	149
19	02.08.12	08.08.12	0	0	0	0	0	0	0	0	0
20	02.08.12	08.08.12	22	3	0	0	0	0	14	3	42
21	08.08.12	14.08.12	0	2	0	0	0	0	0	0	2
22	08.08.12	14.08.12	9	1	0	0	0	2	1	0	13
23	14.08.12	22.08.12	0	0	0	0	0	0	0	0	0
24	14.08.12	22.08.12	0	0	0	0	0	0	0	0	0
25	22.08.12	30.08.12	0	1	0	0	0	0	0	0	1
26	30.08.12	07.09.12	0	0	0	0	0	0	0	0	0
27	30.08.12	07.09.12	33	3	0	0	0	2	10	0	48
28	07.09.12	12.09.12	1	1	1	0	0	2	1	0	6
29	10.09.12	18.09.12	0	2	0	0	0	0	0	0	2
30	12.09.12	18.09.12	6	0	0	0	0	1	0	0	7
31	18.09.12	09.10.12	0	1	0	0	0	0	0	0	1
32	18.09.12	09.10.12	0	0	0	0	0	0	4	0	4
Species total			**279**	**1165**	**2**	**31**	**2**	**133**	**119**	**34**	**1765**

198. Details of all bat surveys which have been undertaken along the route of the Proposed Development are presented in Appendix 10B. They include locations of bats recorded and transect, listening stop and static monitoring locations.

199. No historical (previously recorded by NIBG) bat roost will be impacted upon by the construction of the proposed overhead line (or substation).

200. The 2009 surveys revealed a number of foraging locations. Several 'hotspots' for foraging bats were noted; however, no confirmed roosts were found close to the line route, although a number of potential night roosts or advertising posts were suspected. Hot spots included a minor road near the proposed substation, an unnamed river to the west of the substation in the townland of Drumanuey, the Blackwater River and the woodland at Artasooly. These locations are shown on Figures 10.61-10.69.

201. During the 2011 driven transect surveys, foraging behaviour was encountered both at points where the proposed line route crossed the transect, and along intermediate lengths of the driven route. Foraging bat passes were recorded at eight line crossing points, These locations were:

- To the south-east of the substation;
- The span between towers 7 and 8;
- The span between towers 9 and 10;
- The span between towers 17 and 18;
- The span between towers 47 and 48;
- The span between towers 51 and 52;
- The span between towers 65 and 66; and;
- The span between towers 85 and 86.

202. On the intermediate driven sections of the transects, foraging bat passes were recorded at five locations:

- The span between towers 14 and 18;
- The span between towers 44 and 48;
- The span between towers 47 and 52;
- The span between towers 65 and 69, and;
- The span between towers 73 and 80.

203. Table 10.24 details the number of foraging bats recorded in the vicinity of each tower location during the 2012 walked transects

Table 10.24: Foraging bat recordings in relation to tower locations

Tower Locations	Common pipistrelle	Leisler's Bat	Pipistrelle Spp.	Soprano pipistrelle	Unidentified Bat	Total
T13	1	-	-	-	-	1
T26	1	-	-	-	-	1
T27	1	-	-	-	-	1
T39	-	-	-	3	-	3
T40	1	-	-	-	-	1
T41	4	2	-	-	-	6
T61	-	1	-	-	-	1
T63	-	-	12	-	-	12
T75	1	-	2	-	-	3
T76	-	-	-	2	-	2
T78	-	-	-	14	-	14
T80	-	-	-	4	-	4
T82	-	-	-	3	-	3
T85	1	-	-	-	-	1
T86	1	-	-	1	-	2
T96	-	-	1	6	-	7
T98	2	-	-	-	-	2
T99	-	-	4	2	-	6
T128(part of the RoI oversail)	3	1	-	-	2	6
Total	**16**	**4**	**19**	**35**	**2**	**76**

204. To summarise, the field surveys reveal that several species of bat are frequently encountered along the proposed route. These included common pipistrelles, soprano pipistrelles and Leisler's bats. At the time of survey, none of the commuting routes encountered were considered to be of particular importance to bats. Potential roosting sites for bats were identified and assessed during 2009/2010 surveys, this included 56 potential sites which may have been used as temporary night roosts. During the 2012 survey period, no further ground based tree inspections took place. During the survey periods, there have also been encounters with various *Myotis* species; where the bat species could not be identified, it has been recorded as "unidentified bat".

10.3.4 Badger Survey

205. The survey of the substation site and Proposed Development carried out in May and June 2011 found no evidence of badger activity within 100m of the proposed substation site. Badger activity was recorded at 20 locations along the overhead line route. A total of six setts were found on land surveyed along the overhead line route, within the zone of ecological influence of the project. A comprehensive badger survey carried out in September and October 2012 again found no evidence of badger activity within 100m of the proposed substation site. A total of 32 setts (of which 27 showed some degree of activity) were found on land surveyed along the overhead line route. In addition, one site was judged to be not active in 2011, but active in 2012, while another sett, active in 2011, was apparently not used in 2012. Twelve setts were within 100m of a tower location, although six of these were not occupied. The closest active setts, a single hole outlier, and a three-hole sett with a single hole in recent use, were 25m from tower locations.

206. Of the 32 setts identified along the proposed overhead line route, four setts were apparently main setts at some time, with either fresh or old discarded bedding present, and an additional long-abandoned sett had probably been a main sett. Three setts had the characteristics of annex setts, with associated trails leading away from the overhead line route. An abandoned sett was likely to have been subsidiary to the abandoned main sett. The function of a further abandoned sett and two active setts, both >250m from the nearest tower, could not be ascertained.

207. Additional evidence of likely badger activity, particularly mammal trails, was found at further locations along the overhead line route. There was evidence of human interference at a number of setts along the proposed overhead line route.

208. The occupied setts found within 100m of tower locations, the focus of the most intensive disturbance during the construction phase of the project appear to be subsidiary or outlier setts. Further details of the badger surveys are included in Appendix 10E. The exact locations of badger setts are not reported here in order to prevent disturbance of this protected species, or damage to their setts.

10.3.5 Otter Survey

209. A survey of otter populations in Northern Ireland carried out for Environment and Heritage Service (now NIEA) in 2001/02 (Preston 2004) found that otters particularly favoured wider streams (over 2m wide). CEDaR provided 11 records of otter from the Blackwater River and local tributaries within 500m of the proposed overhead line. Records were from between 1980 and 2002, and included records from surveys from the Northern Ireland 2001/02 otter survey. The otter survey was repeated in 2010, when it was found that otter numbers had increased significantly in Northern Ireland, particularly in the Lough Neagh Basin, and including the Blackwater catchment (Preston and Reid 2011).

210. Watercourses that cross the proposed overhead line route were examined for indications of usage by otters during the extended Phase 1 habitat survey of 2005-2008. Mammal trails that are likely to have been used by otters were found in the more open stretches of river bank within 100m of the proposed river crossing site. The line corridor crosses the Blackwater River, a major regional drain, but apart from this river only two streams over 2m wide (at H798377, H798357) occur along the proposed route. Otters are widespread in the Blackwater catchment, and the EHS otter survey found that the species occur in the general area of the Proposed Development in south Armagh. It is therefore likely that the species occurs on the smaller streams in the vicinity of the overhead line corridor, as well as on the Blackwater River. No additional signs of otter activity were found during a survey carried out of the same watercourses during September and October 2012. Figures 10.50 - 10.60 show the location of all surveyed watercourses.

10.3.6 Smooth Newt Survey

211. Wetland sites identified at TN locations (TN4, 15, 17) were searched for indications of use by smooth newts on 9 June 2009 and complied with the NIEA guidance on newt surveys. Open water was very limited in extent at these sites, and was dominated by tall, dense emergent vegetation, which effectively shaded any water. Searches for newt eggs, carried out in June 2009, were unproductive, and there was no indication that newts were present at these sites. Open water was present at (TN4), where the water body is an artificial drain with steep sides and newts would be unable to get in and out of the drain. The nearest tower to this water body is Tower 13, which is located in an improved agricultural field.

212. The fen at (TN15) did not contain any suitable open water and was dominated by tall, dense emergent vegetation, in fact the surveyor was able to walk across the fen and the vegetated matt which made up the surface of the fen was likely to be impenetrable to newts. Land drains at the site of (TN15) will be crossed by the overhead line, but will not be affected by the construction of Tower 64 or 65, located in improved grassland fields. They are therefore unlikely to support newts during their terrestrial phase.

213. A small wetland at (TN17) is around 200m from the nearest tower (70) and is separated from it by improved grassland fields. This small fen is completely choked with vegetation and the surveyor was able to walk across the surface of the fen. No open water was recorded and this site was therefore deemed to be unsuitable for newts.

214. In addition to the three wetlands described above a pond is located adjacent to the study area 118m south of Tower 22. The nearest tower is in an arable field that is regularly ploughed and is unlikely to support dispersing newts. This pond was considered and was also discussed with NIEA, it was considered to be of low potential for breeding newts as it was an ornamental pond and contained fish.

215. A drain near Tower 63 was found in 2012 to have potentially suitable habitat for smooth newt (TN28). However, the presence of a significant amount of standing water here may be a reflection of the very wet preceding months, and the site may not provide suitable breeding habitat every year. This site was not found to provide such habitat during previous surveys, and combined with the distance from the Proposed Development was therefore not further assessed for the presence of newts.

216. A drain in the wider survey corridor, to the south of Tower 8, was also found to have potentially suitable newt breeding habitat (TN29). However, this site is around 290m from the nearest tower, and is not further considered.

10.3.7 Other Taxa

Irish hare

217. Irish hare was the subject of an annual survey between 2002 and 2010. One of the long transects used for each survey lies in the general area of the proposed overhead line, running from Lough Neagh to near the border with the Republic of Ireland. The surveys indicated that the species shows considerable variation in density both over time and between locations. The 2010 survey suggested that Irish hare density in Co Armagh was the second highest of the six counties (Reid et al 2011). CEDaR provided records of single hare at Derryscollop and Moy.

218. Hares were seen at five locations along the proposed overhead line route during the habitat survey, the largest number being five at one location. Irish hare is a Northern Ireland Priority Species.

Fish species

219. Salmon and brown trout (both NI Species of Conservation Concern) occur in the River Blackwater (DCAL 2009). Salmon is listed in Annex II of the Habitats Directive as a species of Community Importance, and the Blackwater is designated as salmonid under the Freshwater Fish Directive. Salmon is Red-listed as Vulnerable (King et al 2011). The Ballymartrim River, also designated as salmonid, approaches to within 100m of the proposed overhead line route.

220. European eel also occurs within the Blackwater River catchment (Brady Shipman Martin et al 1997). The species is the subject of a European Regulation to establish an eel management plan (DCAL 2010), in the face of a dramatic decline of the species throughout the EU, and is classified as Critically Endangered (King et al 2011). It is considered that the production of eels from rivers and lakes upstream of Lough Neagh is now a relatively minor component of the population passing through the lough (DCAL 2010).

White-clawed crayfish

221. White-clawed crayfish has been recorded in the Blackwater River catchment, around 2km upstream of the proposed river crossing point for the overhead line (NBN Gateway). The species is relatively frequent in the upper reaches of the catchment, and has the potential to colonise other parts as water quality improves (AERC 1998). White-clawed crayfish (a NI Priority Species) are highly mobile, and may occur within the stretch of the river in the vicinity of the proposed crossing (Anon 1998).

Freshwater pearl mussel

222. Freshwater pearl mussel, a Habitats Directive Annex II species, has disappeared from the Blackwater River catchment (Early 2010) and is not further considered.

Insect species

223. Devil's-bit scabious, the food plant of the marsh fritillary butterfly, was found within 100m of Tower 43. The butterfly is listed on Annex II of the Habitats Directive and is the subject of a Northern Ireland Species Action Plan (EHS 2005a). The food plant area is separated from the tower location by a stream and tree line, and is therefore will not be affected by the Proposed Development. The population is outwith the zone of influence of the Proposed Development; the NIEA does not consider that the line route or proposed tower locations are adjacent to habitat features used for breeding purposes by this species (Appendix 10A). The species has been scoped out of the assessment and is therefore not further considered.

224. A large number of moth species listed as Northern Ireland Priority Species have been recorded by Butterfly Conservation within the 10km squares through which the proposed overhead line will pass. Thirty-nine moth Northern Ireland Priority Species have been recorded in square H85, Thirty-four of these have also occurred in the neighbouring square (H84), together with an additional two species. Narrow-bordered bee hawk-moth, a species also restricted by the distribution of devil's-bit scabious as its food plant, has been recorded near the international border in squares H82 and H83.

225. The CEDaR database does not contain any records of invertebrate species of conservation concern from within the route corridor.

10.4 Evaluation of Receptors

226. All ecological receptors have been assigned a value based upon the criteria described above. The receptors have been split between the substation site summarised in Table 10.25 and the overhead line route which is summarised in Table 10.26 below.

Table 10.25 Evaluation of Receptors for the Substation area

Internationally and Nationally Designated Statutory sites			
Site name	**Evaluation rationale**	**Reason**	**Value**
Lough Neagh and Lough Beg SPA/Ramsar/ IBA	Internationally important site for nature conservation designated under Article 4.1 of the Directive (79/409/EEC) as an SPA by supporting internationally important numbers of bird species listed on Annex I of the Directive. These include breeding, overwintering and passage birds occurring in internationally important numbers. Qualifies under a number of criteria as a Ramsar site by supporting freshwater habitats, vascular plants and important populations of birds.	SPA and Ramsar site designated for supporting internationally important numbers of bird species listed on Annex I of the Directive, important freshwater habitats and vascular plants	Very High
Lough Neagh ASSI	Hosts internationally important numbers of waterfowl. Nationally important vascular plant, aquatic plant and invertebrate assemblages and fish species.	ASSI designated as a nationally important site for species.	High
Lough Beg ASSI	Hosts internationally important numbers of waterfowl.	ASSI designated as a nationally important site for species.	High
Non-statutory sites			
Site name	**Evaluation rationale**	**Reason**	**Value**
2 SLNCIs within 5km radius taken forward for nature conservation	Milltown Benburb – designated for disused canal and adjacent broad-leaved woodland habitats.	Locally important site for habitats	Medium
	Mowillin South West - designated for supporting good numbers of breeding waders.	Locally important site for species	Medium
4 Ancient woodlands within 500m of the site	Site 1823 Mullyloughan House (IGR H823495) Long-established woodland of national importance	Qualifies as ancient woodland under the Ancient Woodland Inventory	Medium
	Site 1416 Knappagh (IGR H813475) Long-established woodland of national importance	Qualifies as ancient woodland under the Ancient Woodland Inventory	Medium
	Site 1388 Tynan (IGR H798379) Possibly ancient woodland of national importance	Qualifies as ancient woodland under the Ancient Woodland Inventory	Medium
	Site 1389 Leslie Hill (H801385) Long-established woodland of national importance	Qualifies as ancient woodland under the Ancient Woodland Inventory	Medium
Habitat within the substation site			
Habitat type	**Evaluation rationale**	**Reason**	**Value**
Improved grassland	Areas of habitat common throughout the UK	A habitat with little conservation value	Negligible
Rush-dominated pasture	Areas of habitat common throughout the UK	A habitat with little conservation value	Negligible
Marshy semi-improved grassland	Supports wetland flora Potential to support ground nesting birds	A habitat with little conservation value	Low
Hedgerows	Low species diversity, in poor condition	Northern Ireland priority habitat	Low
Scattered trees	Areas of habitat common throughout the UK feature which enriches local areas habitat resources.	Enriches local areas habitat resources. Potential roost site for bats.	Low

Drains	Support common wetland plant species	A habitat offering little conservation value	Negligible
Species within the substation site			
Receptor	**Evaluation rationale**	**Reason**	**Value**
Breeding birds	Woodland passerine species were well represented throughout the survey area, occurring in the more structurally diverse hedgerows as well as in broadleaved woodland fragments. Abundant species included robin, willow warbler, blackbird, dunnock, chaffinch, wren, and swallow. Finches and meadow pipits confined to larger, less intensively improved fields. Restricted to using nest sites in hedgerows, trees and buildings. Wetland birds were limited due to limited suitable habitats. Raptors were infrequent. 5 territories held by buzzards between 2005-2008. NI Raptor Study Group record breeding peregrine, merlin, long eared owl and short eared owl in close proximity to the site and have sited red kite within 4km. Waders were rare, 3 sites had potential for hosting curlew and lapwing. A notable area was identified for hosting grasshopper warbler, sedge warbler and reed bunting.	An assemblage of nationally common species	Low
Wintering birds	Whooper swans use traditional sites for overwintering which are within close proximity of the development. These sites include populations that are of international and national importance. Swans recorded using areas outside of the traditional sites on occasions. Ringing records show movement of swans between sites. Bewicks swan occasionally recorded in Blackwater valley. Low numbers of greenland white-fronted geese and greylag geese. Herons and Cormorants use the Blackwater River and gulls follow the line of the river. Large numbers of Lapwing recorded on one occasion (related to adverse weather).	An assemblage of swans and geese occurring in nationally and internationally important numbers within close proximity of the substation site.	Very High
Bats	Common pipistrelle, soprano pipistrelle and Leisler's bats were all commonly recorded along the line. Daubenton's and Natterer's bats occasionally recorded. No roosts confirmed during surveys. A number of potential night roosts recorded.	An assemblage of protected bat species recorded along the route (close to the substation site).	High
Otter	Populations of otter identified in the Lough Neagh Basin, and Blackwater catchment during Environment and Heritage Service in 2001/02 and 2010 (Preston and Reid 2011).	Presence of a protected species within the Blackwater catchment over flown (close to the substation site).	Medium

Table 10.26 Evaluation of Receptors for the Proposed Development (excluding Substation area)

Internationally and Nationally Designated Statutory sites			
Site name	**Evaluation rationale**	**Reason**	**Value**
Lough Neagh and Lough Beg SPA/Ramsar/ IBA	Internationally important site for nature conservation designated under Article 4.1 of the Directive (79/409/EEC) as an SPA by supporting internationally important numbers of bird species listed on Annex I of the Directive. These include breeding, overwintering and passage birds occurring in internationally important numbers. Qualifies under a number of criteria as a Ramsar site by supporting freshwater habitats, vascular plants and important populations of birds.	SPA and Ramsar site designated for supporting internationally important numbers of bird species listed on Annex I of the Directive, important freshwater habitats and vascular plants	Very High
Lough Neagh ASSI	Hosts internationally important numbers of waterfowl. Nationally important vascular plant, aquatic plant and invertebrate assemblages and fish species.	ASSI designated as a nationally important site for species.	High
Lough Beg ASSI	Hosts internationally important numbers of waterfowl.	ASSI designated as a nationally important site for species.	High
Non-statutory sites			
Site name	**Evaluation rationale**	**Reason**	**Value**
2 SLNCIs within 5km radius taken forward for nature conservation	Milltown Benburb – designated for disused canal and adjacent broad-leaved woodland habitats.	Locally important site for habitats	Medium
	Mowillin South West - designated for supporting good numbers of breeding waders.	Locally important site for species	Medium
4 Ancient woodlands within 500m of the site	Site 1823 Mullyloughan House (IGR H823495) Long-established woodland of national importance	Qualifies as ancient woodland under the Ancient Woodland Inventory	Medium
	Site 1416 Knappagh (IGR H813475) Long-established woodland of national importance	Qualifies as ancient woodland under the Ancient Woodland Inventory	Medium
	Site 1388 Tynan (IGR H798379) Possibly ancient woodland of national importance	Qualifies as ancient woodland under the Ancient Woodland Inventory	Medium
	Site 1389 Leslie Hill (H801385) Long-established woodland of national importance	Qualifies as ancient woodland under the Ancient Woodland Inventory	Medium
Habitats within the Proposed Development (excluding Substation area)			
Habitat type	**Evaluation rationale**	**Reason**	**Value**
Improved grassland	The greatest part of the proposed overhead line corridor habitats consists of agricultural grassland that has been improved to a variable extent. Areas of habitat common throughout the UK	A habitat with little conservation value	Negligible
Semi-improved grassland	A small number of fields support relatively diverse grassland communities. Habitat common throughout the UK.	A habitat with little conservation value	Negligible
Rush-dominated pasture	Occurs over much of the corridor, and is concentrated on the more poorly drained higher ground; habitat common throughout the UK.	A habitat with little conservation value	Negligible

Hedgerows	Most hedgerows of low species diversity, in poor condition. A few species rich hedgerows.	Northern Ireland priority habitat	Low
Arable	A small number of fields along the proposed overhead line route; habitat common throughout the UK.	A habitat with little conservation value	Negligible
Neutral grassland	Few fields supported grassland vegetation that suggested low intervention agricultural practices.	A habitat with little conservation value	Negligible
Marshy grassland	An area of marshy grassland that is part of a mosaic of wetland habitats in a small bog that has been modified by past draining and continuing eutrophication.	A habitat with little conservation value	Negligible
Fen	Two areas of fen, generally grading or deteriorating into wet grassland	Northern Ireland priority habitat	Low
Swamp	Swamp occurs to a limited extent as part of a wet woodland/marshy grassland/fen mosaic	A habitat with little conservation value	Negligible
Woodland	A variety of woodlands including ancient woodlands identified in the AWI. All woodlands identified were small, species poor, and in poor condition. Low % cover of woodland across NI.	Limited conservation value	Negligible
Orchards	14 orchard fields, none of which support a diverse herb flora and are of low nature conservation value.	A habitat with little conservation value	Negligible
Scrub	Occasional areas of willow, gorse and bramble dominated scrub.	A habitat with little conservation value	Negligible
Watercourses	Proposed Development crosses the River Blackwater, designated for salmonids. Several minor streams of less than 1m wide, 2 streams of 4m wide.	Major watercourses are a habitat which supports Annex II species therefore of conservation value. Minor water courses have low conservation value	Very high
Ponds	Limited number of small ponds with low conservation value.	A habitat with little conservation value	Negligible
Lowland meadow	A single field along the proposed overhead line route with rich and diverse herb community (TN23 Paragraph 130).	Northern Ireland priority habitat	Medium
Oakwood	A strip of planted woodland of approximately 0.8ha dominated by even-aged mature oak (TN 31). Woodland structure and species diversity are poor.	Northern Ireland priority habitat	Low
Wet woodland	Several small areas of wet woodland dominated by birch, willow and alder.	Northern Ireland priority habitat	Low
Mixed ashwood.	1ha woodland classified by the AWI. A 0.25ha wet woodland dominated by ash.	Northern Ireland priority habitat	Low
Species within the Proposed Development (excluding Substation area)			
Receptor	**Evaluation rationale**	**Reason**	**Value**
Breeding birds	Woodland passerine species were well represented throughout the survey area, occurring in the more structurally diverse hedgerows as well as in broadleaved woodland fragments. Abundant species included robin, willow warbler, blackbird, dunnock, chaffinch, wren, and swallow. Finches and	An assemblage of nationally common species	Low

	meadow pipits confined to larger, less intensively improved fields. Restricted to using nest sites in hedgerows, trees and buildings. Wetland birds were limited due to limited suitable habitats. Raptors were infrequent. 5 territories held by buzzards between 2005-2008. NI Raptor Study Group record breeding peregrine, merlin, long eared owl and short eared owl in close proximity to the site and have sited red kite within 4km. Waders were rare, 3 sites had potential for hosting curlew and lapwing. A notable area was identified for hosting grasshopper warbler, sedge warbler and reed bunting.		
Wintering birds	Whooper swans use traditional sites for overwintering which are within close proximity of the development. These sites include populations that are of international and national importance. Swans recorded using areas outside of the traditional sites on occasions. Closest record is 1km away from proposed line. Ringing records show movement of swans between sites. Bewicks swan occasionally recorded in Blackwater valley. Low numbers of greenland white-fronted geese and greylag geese. Herons and cormorants use the Blackwater River and gulls follow the line of the river. Large numbers of Lapwing recorded on one occasion (related to adverse weather).	An assemblage of swans and geese occurring in nationally and internationally important numbers located within 9km of the Proposed Development.	Very High
Bats	Records of several roosts within 5km. Closest records is of a Leisler's roost within 326m of the proposed line. Common pipistrelle, soprano pipistrelle, and Leisler's bat were all commonly recorded along the line. Daubenton's and Natterer's bat occasionally recorded. No roosts confirmed during surveys. A number of potential night roosts recorded. Poor quality hedgerows and grassland provide poor foraging opportunities. Native trees support invertebrate fauna providing good bat foraging habitat	An assemblage of protected bat species recorded along the route.	High
Badger	Badger surveys in 2011 and 2012 record activity along the proposed power lines including 32 setts during 2012, 27 of these active. 6 active sets present within 100m of the proposed tower locations, 3 setts within 15-90m of new access tracks and 5 within 100m of existing tracks.	Moderate levels of activity of protected species.	Medium
Otter	Populations of otter identified in the Lough Neagh Basin, and Blackwater catchment during Environment and Heritage Service surveys in 2001/02	Presence of a protected species within 100m of the Proposed Development. Activity level is low.	Medium

	and 2010 (Preston and Reid 2011). Evidence of activity recorded during extended phase 1 habitat survey 2005-2008 within 100m of a proposed river crossing.		
Irish hare	Hares recorded at 5 locations along the proposed line	Small population of a NI priority species	Low
Fish	Salmon, brown trout and European eel use River Blackwater.	Populations of NI species of conservation concern (salmon and brown trout) Population of Annex II species of community importance (salmon). Population of critically endangered species (European eel)	High
Smooth newt	A number of ponds with potential to support smooth newt. No populations identified during survey work	Potential to support protected species	Low
White-clawed crayfish	Recorded in Blackwater River 2km upstream of proposed river crossing.	Population of protected species with potential to colonise habitats within the development site	Medium
Invertebrates	Large number of NI priority species of moth recorded by Butterfly Conservation within the 10km squares through which the proposed overhead line will pass.	Population of priority species	Medium

10.5 Impact Magnitude

10.5.1 Substation site

10.5.1.1 Construction Phase

227. The construction of the proposed substation will require 25862m^2 land take of grassland habitats of negligible conservation value. Habitat loss has been assessed in the construction phase and will not be considered again during operation. Construction activity is scheduled to take 3 years. Hedgerows that will be removed during construction of the substation (535m) are frequently gappy, are species-poor and of low conservation value. A tree line which consists of mature oak, horse-chestnut and sycamore will be removed resulting in the permanent loss of 6 mature trees. The grassland habitats that will be permanently lost are widespread and are of low conservation value. Hedgerows on the site are unlikely to be used regularly as nest sites by breeding birds, because of the poor structural quality of the hedgerows. The better-structured roadside hedgerows (see Figure 10.5) will be retained. The magnitude of effects is summarised in Table 10.27 below.

<u>Designated sites</u>

228. The nearest European sites designated for their conservation importance are the Lough Neagh and Lough Beg SPA/Ramsar site (9km to the north) and the Peatlands Park SAC (4km to the northeast). A draft Test of Likely Significance (Appendix 10H), as required by Article 6 of the Habitats Directive, was carried out to assess the potential impacts of the Proposed Development on the conservation objectives (Appendix 10I) and designation features of the European sites. It was concluded that there are no pathways between construction activities at the proposed substation site and these or more remote European designated sites that are likely to result in significant effects on their conservation objectives or designation features. During this process the only pathway identified with potential to be affected was that of water and pollutant run-off from the Proposed Development and Lough Neagh 9km north-east of the site. This potential linkage is discussed in detail in Chapter 8 of this ES but summarised below.

229. It is anticipated that runoff from new impermeable surfaces may contain low quantities and concentrations of particulates, oils, heavy metals and organic debris. This will be collected via filter drains and combined with intercepted field drainage before being passed through oil interceptors into a storage and settling wetland / pond. This pond will overflow into a small drainage ditch, which flows north and ultimately into the River Rhone approximately 300m away. The proposed drainage system will provide multiple barriers to treat runoff before it is discharged from the site. In the event of an extreme flood event, the location of the pond will not be subject to high velocity flood waters as, due to the distance from the main rivers the floodplain function is primarily for storage, therefore, the potential for any mobilisation is minimal. In addition, the impact from the pond in a 1-in-100 year flood event is considered to be insignificant. If material was mobilised under storm conditions, the receiving watercourse will also be in spate and will have elevated suspended sediment concentrations. Any contaminants that are mobilised from the treatment wetland / pond will be rapidly dispersed, short term and are very unlikely to become bio-available to aquatic organisms.

230. It is considered that because the construction traffic does not meet any of the criteria for an air quality assessment and the traffic impacts will be temporary in nature, there are no likely significant air quality effects to the designated ecological sites and the assessment has therefore been scoped out (see Chapter 6 of this ES). The nearest designated site from the Proposed Development is 4km and therefore there is no potential for point emissions from vehicle movements to have any impact upon designated sites.

231. A single ASSI, Peatlands Park (see above) is around 4km from the proposed substation site, and Drumcrow ASSI is around 5km to the north of the site. There are no pathways between the proposed substation site and these or more remote national designated sites that are likely to result in significant effects on their conservation objectives and designation features. There are no SLNCIs within 5km of the proposed substation, and there will be no impact on these conservation sites.

Habitats

232. The only HAP habitat present within the footprint of the proposed substation consists of hedgerows, all of which are species poor and of low ecological value. All of the hedgerows in the footprint of the proposed substation site will be removed.

Species

Breeding birds

233. Breeding birds at and in the vicinity of the proposed substation site are generally those that use nest sites in hedgerows, trees and buildings. The frequently poor quality of hedgerows is reflected in the low densities of breeding birds within the substation site. The greatest density of breeding birds in the vicinity of the site was found in the habitats peripheral to the development area, and the habitats used by these birds will remain. No ground nesting birds were recorded breeding within the site. Damp grassland may be used by ground nesting species on occasion, although none was noted during the breeding bird survey.

234. There are no records of breeding raptors in the immediate vicinity of the proposed substation (NIRSG), although buzzards are likely to breed nearby, since typical breeding density in this area is 1-2 pairs per 1-2km^2.

Wintering birds

235. No notable groups of wintering birds were recorded feeding or roosting within the substation site or surrounding areas. Wet grassland in the vicinity of the site does have potential to support assemblages of wintering birds and construction activity may have an effect upon any wintering birds using this area.

Bats

236. During the course of the bat surveys, bats have been encountered using the substation site. The impact associated with the development of the substation is considered to be of low magnitude because of the amount of similar habitat which is present and undisturbed in the surrounding area. The construction of the substation will result in the removal of trees. One of which was identified having roost potential during the 2010 daytime tree inspection and confirmed as an occasional night roost for a single bat during the 2010 part of the 2009/2010 transect surveys.

237. Mature trees may also provide roosting opportunities for individual bats. Activity transects did not identify significant activity of any bat species that would be indicative of a maternity roost but occasional roosts and night roosts may be present. Security lighting during construction may also affect the behaviour of some bat sensitive species in the vicinity of the construction area.

Badger

238. The loss of pasture may remove a large area of habitat potentially suitable for badger foraging. However, no indication that the affected fields are used by this species was noted during the field survey, and pasture land is plentiful in the wider area with large areas of additional contiguous foraging areas available.

Fish species

239. There is potential for contamination of nearby watercourses from run-off of pollutants and sediments.

Table 10.27 Sub-station - Potential effects during construction phase in the absence of mitigation

Receptor	Value	Effect	Magnitude	Significance
Lough Neagh and Lough Beg SPA/Ramsar/ IBA	Very high	Potential for permanent loss of supporting habitat for breeding and migratory birds. Potential effect on designated features of site as an SPA, Ramsar site and IBA.	Negligible	Negligible
Lough Neagh ASSI	High	Potential for permanent loss of supporting habitat for breeding and migratory birds. Potential effect on freshwater habitat and vascular plants.	Negligible	Negligible
Lough Beg ASSI	High	Potential for permanent loss of supporting habitat for breeding and migratory birds.	Low	Negligible
Hedgerows	Low	Removal of species poor hedgerows within the vicinity of the substation.	Low	Minor Negative
Scattered trees	Medium	Removal of scattered trees within hedgerows within the vicinity of the substation.	Low	Minor Negative
Bats	High	Loss of foraging and commuting corridors.	Low	Minor negative
Breeding birds	Low	Removal of potential nesting and foraging habitats due to removal of species poor hedgerows.	Low	Minor negative
Badgers	Low	Removal of pasture resulting in loss of potential foraging habitat. No badgers recorded in immediate area.	Negligible	Negligible
Fish	Medium	Potential for sediment release into adjacent watercourse	Low	Minor negative

10.5.1.2 Operational Phase

Habitats

240. The habitats lost due to land take will be permanently removed from the site during the construction phase. The hedgerows within the sites (the only habitat for which there is a HAP) are of low ecological value.

Species

241. The impacts noted on mammal and bird species during the construction phase, arising from the effect of the Proposed Development on present habitats, will continue into the longer term. There is no additional operational effects as limited maintenance and site activity is planned and there is no operational lighting planned.

Table 10.28 Sub-station - Potential effects during operational phase in absence of mitigation

Receptor	Value	Effect	Magnitude	Significance
Lough Neagh and Lough Beg SPA/Ramsar/ IBA	Very high	Habitat loss effect described under construction effects and no further effects are expected during operation.	Negligible	Negligible
Lough Neagh ASSI	High	Habitat loss effect described under construction effects and no further effects are expected during operation.	Negligible	Negligible
Lough Beg ASSI	High	Habitat loss effect described under construction effects and no further effects are expected during operation.	Low	Negligible
Hedgerows	Low	Loss of hedgerows described under construction effects and no further effects are expected during operation.	Low	Minor Negative
Scattered trees	Medium	Loss of trees is described under construction effects and no further effects are expected during operation.	High	Moderate Negative
Bats	High	Habitat loss described under construction effects and no further effects are expected during operation. No operational lighting is planned.	Low	Minor negative
Breeding birds	Low	No further effects upon breeding birds during operation of substation.	Low	Minor negative
Badgers	Low	No further effects upon badgers during operation of substation.	Negligible	Negligible
Fish	Medium	Potential for sediment release into adjacent watercourse during regular maintenance. Potential for sediment release into watercourse during storm water events.	Negligible	Negligible

10.5.1.3 Mitigation and Residual Effects

242. The construction of the proposed substation will result in the permanent loss of a small area of low value ecological land. This land is common in the wider area and this loss will be negligible at a landscape scale. Mitigation planting of native trees and scrub, SuDS pond and provision of bat roosting opportunities on new buildings and trees will result in an overall minor positive effect on biodiversity after construction and establishment of new habitat.

243. The residual effects of the construction and operational effects of the substation after mitigation are summarised in Table 10.29 below. A full section on mitigation measures to be employed for the Proposed Development as a whole (to include access tracks, stringing locations, tower locations and the substation site) are included at section 10.6 below.

Designated sites

244. As noted above, there are no sites designated for their conservation value that will be affected by construction activities at the proposed substation site. There will be no observable impact on these sites, and the construction of the substation site will therefore not contribute to any cumulative impacts on designated sites arising from developments in the wider countryside.

Habitats

245. Hedgerows at the substation site are part of the network of hedgerows that provide a degree of diversity to the local habitat mosaic. The habitats lost due to land take will be permanently removed from the site. Habitat creation at the substation site (as detailed in Chapter 5 of the ES) as part of the landscape scheme and as a result of SuDS pond construction will contribute to an increase in the area of semi-natural habitats in the wider countryside outside protected sites, as recommended in the Habitats Directive.

246. The provision of compensatory scrub and hedgerow habitats will ensure that the potential availability of nesting sites for the species of breeding bird known to be present, will be at least sufficient to maintain current local populations and will likely lead to additional nesting opportunities after establishment. Landscape proposals are shown on Figure 5.7.

247. The effects noted on habitats during the construction phase will continue in the long term but this will be more than compensated for by the additional landscape planting.

Species

Breeding birds

248. The low population levels of breeding bird species, arising at least in part from the low diversity, mainly agricultural habitats at the site indicate that displacement of breeding birds will have relatively little effect upon the areas breeding bird assemblage. The new wetland habitats around the SuDS pond will provide nesting opportunities for a number of passerine species, including meadow pipit and sedge warbler. Common snipe have been recorded in the adjacent fields in the breeding season (TN 1) and the presence of a permanent pond will increase feeding opportunities for this species, particularly during dry summers.

Wintering birds

249. Provision of a SuDS pond at the substation site will provide wetland habitats that may be attractive to a range of bird species. In particular, duck species, mainly mallard and teal, that currently use the Blackwater River floodplain during winter, may be attracted to the feature. Whooper swans also occasionally use the floodplain in the general vicinity of the substation site (Appendix 10G), but are unlikely to be attracted to a relatively small body of water close to the operational substation.

Fish species

250. There is a potential for sediments that have lodged in the SuDS pond to be flushed in storm conditions into the adjacent receiving drain, and thence into the Blackwater River, with its sensitive salmonid fish populations. Sediment-laden water will have been subject to a number of interception processes prior to discharge into the pond, (see Chapter 8 Water Environment), so that the level of silts/sediments entering the pool will be small and as such will limit the potential for remobilisation during storm events greater than the designed 1 in 100 year frequency. The risk of pollutant mobilisation during a flood event is also a low risk due to the location and low velocity of flood waters in this location. Regular maintenance will be carried out to ensure blockages of outlet pipework will not occur, and to remove excessive deposits of sediments.

Bats

251. While there are structures in the form of disused barns with incomplete roofs which may provide occasional shelter or night roosts for bats within the substation site, there is no evidence that these are used by roosting bats. Results from field surveys show that bats use the general area of the substation site for foraging; however the removal of vegetation at the substation site will not remove a significant foraging habitat. Roosting opportunities will be provided to enhance the site for bats in the form of four roosting boxes fixed at suitable locations (to be agreed after construction with a suitably qualified and experienced ecologist) on the outside of the substation buildings or security fence.

Badger

252. There is no evidence of use of the substation site by badgers, and significant alternative foraging areas are present in the wider area.

Fish species

253. Significant sediment or pollutant release from the SuDS pond at the substation is unlikely to occur, and therefore a potential impact on fish species downstream in the Blackwater River catchment is very unlikely.

Table 10.29 Summary of mitigation and residual effects for the substation area

Receptor	Value	Description of Potential Effect	Ecological Impact Significance without Mitigation	Environmental Measure (M) / Compensation (C) / Enhancement (E)	Residual Magnitude	Ecological Impact Significance with Mitigation
Substation						
Lough Neagh and Lough Beg SPA/Ramsar/ IBA	Very high	No potential for permanent loss of supporting habitat for wintering and migratory birds. No potential effect on designated features of site as an SPA, Ramsar site and IBA.	Negligible	None	Negligible	Neutral
Lough Neagh ASSI	High	No potential for permanent loss of supporting habitat for wintering and migratory birds. No potential effect on freshwater habitat and vascular plants.	Negligible	SuDS pond will act as intercept for silt and pollutants to prevent direct spillage. CEMP will ensure best practice are adhered to during construction minimizing potential for spills in line with the framework of mitigation measures set out of this ES.	Negligible	Neutral
Lough Beg ASSI	High	No potential for permanent loss of supporting habitat for breeding and migratory birds.	Negligible	None	Negligible	Neutral
Hedgerows	Low	Removal of majority of hedgerows within the vicinity of the substation. All hedgerows removed are species poor and of low ecological value. Better structured roadside verges will be retained.	Minor Negative	Works in the vicinity of trees will conform to *BS 5837:2012, Trees in relation to design, demolition and construction–* Recommendations Minimal lengths of hedgerow should be removed where this is essential, and gaps should be replanted with native species following the works. Wherever possible, hedgerow trees will be pollarded rather than removed, New hedges of equal length planted where hedgerows removed (or donation made to conservation charity to plant replacement trees).	Negligible	Neutral

Receptor	Value	Description of Potential Effect	Ecological Impact Significance without Mitigation	Environmental Measure (M) / Compensation (C) / Enhancement (E)	Residual Magnitude	Ecological Impact Significance with Mitigation
Scattered trees	Low	Removal of scattered trees within hedgerows within the vicinity of the substation.	Minor Negative	Works in the vicinity of trees will conform to *BS 5837:2012, Trees in relation to design, demolition and construction–Recommendations* Replacement trees to be included in the landscape proposals.	Negligible	Neutral
Bats	High	Loss of foraging and commuting corridors	Minor negative	A dusk and dawn bat survey will be carried out at potential roosts immediately prior to demolition/felling. I f bats are found work will be suspended until consultation with NIEA. If bats are found after/during demolition/ felling work must be stopped until consultation with NIEA. Felling of potential roosting trees will be carried out in the presence of a licensed bat worker following best practice guidelines. 8 new bat boxes provided to mitigate for loss of potential tree roosts. Hedgerow replacement to compensate for loss of foraging habitat	Negligible	Neutral

Receptor	Value	Description of Potential Effect	Ecological Impact Significance without Mitigation	Environmental Measure (M) / Compensation (C) / Enhancement (E)	Residual Magnitude	Ecological Impact Significance with Mitigation
Breeding birds	Low	Removal of limited nesting and foraging habitats due to removal of poor quality hedgerows.	Minor negative	Any removal/reduction of hedgerow trees, cutting of hedgerows and clearing of scrub will take place outside the bird-nesting period, which in Northern Ireland is generally taken as March to August inclusive. This will apply to both the construction and operational phases. Potential bird nesting habitat in close proximity to works that take place between March and August will be checked by a competent ecologist to ensure that there will be no adverse impact on protected bird species. Replacement, improved habitat for breeding birds provided around the sub station	Negligible	Neutral
Badgers	Low	Removal of pasture resulting in loss of potential foraging habitat. No badgers recorded in immediate area	Negligible	Any excavations left unattended overnight will be either covered or ramped in at least one location to allow mammals to avoid becoming trapped. Repeat badger surveys will be carried out within 100m of the development immediately prior to the commencement of work. If setts are found work will be suspended until consultation with NIEA.	Negligible	Neutral

Receptor	Value	Description of Potential Effect	Ecological Impact Significance without Mitigation	Environmental Measure (M) / Compensation (C) / Enhancement (E)	Residual Magnitude	Ecological Impact Significance with Mitigation
Fish	Medium	Potential for sediment release into adjacent watercourse	Minor negative	A SuDS pond will be established in the early stages of substation construction, in order to minimise the potential for sediment release into the adjacent watercourse. The contractor will be required to provide a CEMP designed to prevent adverse impacts on rivers and other watercourses in line with the framework of mitigation measures set out of this ES.	Negligible	Neutral

10.5.2 Overhead Line Route and Towers

10.5.2.1 Construction Phase

254. The Proposed Development is described in detail in Chapter 5 however the summary below describes those aspects of the development most pertinent to ecology.

255. The proposed erection of 102 new towers will require permanent land take which is specific to the ground conditions at each tower location which will not exceed 20m x 20m (400m^2) at any location. This will lead to direct habitat loss, however each tower site will require a footprint that is small in relation to the extensive habitats along the line route. During the construction phase each tower base will require a maximum working area of 35m x 35m (1225m^2). In addition to the tower bases and working areas there will be a need to construct 36,104m of temporary access tracks relating to a temporary land take of 108,187m^2 (this includes the entire area of the proposed access tracks and so includes existing stone and concrete tracks) and further land take will be required for the 61 stringing locations identified along the route (a further 24,400m^2).

256. Working areas will allow the temporary storage of plant, foundation materials and excess spoil so that no additional temporary lay-down or storage areas are required. All of the permanent and temporary infrastructure is shown on Figures 5.8.

- The construction phase has the potential to impact upon biodiversity in the following ways:
- Permanent habitat loss;
- Temporary habitat loss;
- Habitat modification through trimming of hedgerows and individual trees;
- Soil compaction through use of heavy machinery;
- Indirect effects through disturbance (noise, visual, lighting); and,
- Indirect effects through spillage or run-off of pollutants and sediment.

257. Table 10.30 below summarises the impact magnitude and significance as determined using the methodology described above at section 10.2 of this chapter.

<u>Designated sites</u>

258. The nearest European sites designated for their conservation importance are the Lough Neagh and Lough Beg SPA/Ramsar site (9km to the northeast) and the Peatlands Park SAC (4km to the northeast). A draft Test of Likely Significance (Appendix 10H), as required by Article 6 of the Habitats Directive, was carried out to assess the potential impacts of the Proposed Development on the conservation objectives or designation features of the European sites. It was concluded that there are no pathways between construction activities along the proposed overhead line route and these or more remote European designated sites that are likely to result in significant effects on their conservation objectives or designation features during the construction phase.

259. Five ASSIs (Table 10.31) designated for habitat features are within 5km of the overhead line route, and two for bird features (Table 10.31) within 10km. There are no pathways between construction activities relating to the proposed overhead line and these or more remote national designated sites that are likely to result in significant effects on their designation features.

260. There are eight SLNCIs within 5km of the proposed overhead line route; there will be no impact on these conservation sites as a result of construction of the overhead line.

Habitats Hedgerows and Standard Trees within Hedgerows

261. The construction of the Proposed Development will lead to the permanent loss of 296m of hedgerow and a further temporary loss of 1616m[130] to accommodate access tracks, working areas and stringing locations (in the context of a 34,000m line route). The majority of towers will be placed in open habitats but towers will be located in five hedgerows, with resultant loss of restricted lengths of hedges. None of the hedges affected are species-rich hedgerow. Hedgerows will be cut to 2m in height where overhead line conductors pass over them. The construction of the overhead line will also require some cutting back of hedgerow trees. The major impact will be on mature trees, which may require lopping or removal, thus reducing locally the structural diversity of affected hedgerows. Removal of mature hedgerow trees will have an adverse impact on local habitat diversity, and in those areas where hedgerows are the only remaining features of significant conservation value, the significance of the impact will be greater.

262. Placement of towers and associated temporary infrastructure will require the removal of short stretches of some hedgerows. Hedgerows act as wildlife corridors for dispersing and feeding birds and mammals, and this function will be unimpaired, when considering the mobility of the species potentially affected. Wherever possible, tower bases will consist of separate supports for each tower corner member, permitting the construction to arch over existing hedgerows. In these circumstances, hedges will be cut to approximately 1m height, and hedgerow continuity will be maintained. Where working conditions require removal of a hedgerow, these will be replaced once construction has been completed. For a small number of hedgerows, ground conditions may require that a tower is supported by a single concrete platform, and in this case it may not be possible to maintain hedgerow continuity. A short length of hedgerow (up to 20m) may need to be removed, and the hedgerow replaced over this distance by fencing.

263. The species composition of species-rich hedgerows will not be affected by the proposed overhead line. The impact on the hedgerow network will be insignificant in terms of the length of hedgerow affected by construction works in relation to the availability of alternative habitat in the vicinity of the Proposed Development.

Fens

264. Proposed tower locations are on the periphery of areas of wet grassland, fen and swamp, and the towers and all associated temporary infrastructure will avoid these habitats. Where potential indirect impacts occur, these will be restricted to disturbance of habitats during construction work and indirect effects through spill of pollutants and/or mobilisation of sediments. Where tower locations are in low-lying ground, de-watering of excavations may be necessary, and this will most likely require discharge consent from the Water Management Unit of NIEA. Until detailed ground investigation works are undertaken the extent of this will not be known.

Lowland meadow

265. A single lowland meadow field has been identified along the proposed line route. The nearest tower (Tower 92) will be separated from this site by a mature hedgerow and drain, and the magnitude of impact on this habitat will be negligible.

Oakwood

266. A mature planted oakwood occupies low lying ground between Towers 39 and 40. The line route has been directed through a relatively narrow part of the woodland, and the height of the line at this point, determined by the location of the nearest tower on high ground, requires that the upper limbs of trees will need to be lopped. No bat roosts have been identified in this woodland although the area is used by foraging bats. The extent of woodland will remain the same but the magnitude of impact will be of minor negative.

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[130] Please see Chapter 5 – Section 5.6.5.4 and 5.6.5.6 for clarification of the approach to vegetation clearance.

Wet woodland

267. Small, mainly willow-dominated wet scrub woodland in offline locations in the vicinity of the proposed overhead line will not be affected during the construction phase. An area of willow/alder woodland to the north and east of Tower 26 will require limited lopping to enable stringing of the line, but woodland extent and structure will persist. The magnitude of impact on this habitat is considered to be negligible.

Ashwood

268. The proposed overhead line will over-sail one small ash-dominated woodland that has developed on an abandoned railway embankment in the vicinity of Tower 49. There will be a requirement to lop trees in the vicinity of the tower in order to facilitate stringing works. However, woodland extent and structure will persist and no bat roosts will be impacted. Elsewhere, the line route avoids small wooded stands, and the magnitude of impact on this habitat is considered to be negligible.

<u>Species Breeding birds</u>

269. Hedgerow removal and trimming of trees and hedgerows will alter the local availability, structure and shape of hedgerows. Nest sites may be lost in hedgerows that are to be removed and managed stretches may become unsuitable as suitable nest sites for some species of birds, by, for example, removing song posts. Hedgerow treatments will take place outside the bird breeding season, but habitat loss will result in an overall low magnitude impact on breeding birds.

270. Breeding birds may also be impacted by noise and visual disturbance during construction rendering potential nest sites and foraging areas in the vicinity of construction works unsuitable for short periods of time. This impact will be localized and short term and therefore of low magnitude.

271. No breeding waders (lapwing, curlew, snipe) were found in habitats that will be affected by the construction process. Impacts on these species are considered to be negligible.

272. There are no known barn owl nest sites in the immediate vicinity of the overhead line, and the magnitude of impact on this species as a result of construction works is therefore negligible.

Wintering birds

273. Whooper swans winter in significant numbers in the Lough Neagh Basin, and use traditional feeding sites in the Blackwater River valley. Since the proposed tower sites and the overhead line route avoid known traditional feeding grounds, disturbance of the birds is unlikely to occur, and the magnitude of impact of the construction phase on wintering swans is likely to be negligible

Bats

274. Mature trees may function as bat roosts, and could be of local importance to bat populations. Potential tree roosts assessed during 2009/2010, which involved surveying for presence of potential features which can be used by roosting bats. The felling of a tree used by bats will result in their displacement and death if not soft felled. Only one Individual tree was identified as confirmed roost during 2009/2010 surveys and one further tree was recorded as having features suitable to support potential night roosts. No trees with features that could support more than very small numbers of bats were identified. The features of the two trees recorded flaky bark in small area and a very small crack in a limb of less than 50mm diameter which may provide individual night roosts or advertising posts. Current knowledge suggests that the Proposed Development will not significantly disrupt bat flightlines, and that potential feeding areas over woodland and other habitats will not be affected. Due to the transient nature of tree roosts it is not possible to define with certainty prior to construction which trees (if any) of the small number identified with features suitable to support roosting bats will be in use at the time of removal. For the purposes of assessment we have taken a precautionary assessment that both trees with potential will be in use by small numbers of bats and there is potential for transient tree roost loss during the construction phase. The magnitude of impact of the Proposed Development during construction is therefore of medium magnitude.

Badger

275. A number of badger setts (six) that are known to be in use are present within 100m of proposed tower locations. None of these setts are main setts; these appear to be characteristic of subsidiary setts which are located along the route corridor and are used intermittently and/or at low rates of occupancy.

Three setts will be between 15m and 90m from new access tracks, while five will be within 100m of existing tracks that will be used to gain access to tower locations. A sett that does not appear to be in regular use will be around 25m from a stringing location. An abandoned sett will be around 30m from works associated with guarding works.

276. There is a potential for works to disturb badgers due to their proximity to occupied setts although no setts will have access affected by the works. All setts within 100m of tower locations are subsidiary setts, and any disturbance is likely to be of low magnitude. Badgers using setts within close proximity to existing tracks are likely to be habituated to vehicle movements. New access tracks across fields will use routes already used by farm vehicles, and a degree of habituation to vehicles is also likely in this case. Overall, it is likely that the magnitude of the impacts on badgers resulting from construction works will be minor negative.

Otter

277. Otters have been known to abandon territories that have been subjected to sharp increases in disturbance. However, tower construction works will not approach to within 100m of the Blackwater River, the watercourse that is most likely to support regular otter activity. There will be some disturbance of riparian habitats during stringing of the overhead line, and construction of the proposed overhead line may have an overall low magnitude impact on the species.

Irish hare

278. The grassland habitats that this species requires will remain available, with minor losses of improved grassland at tower sites and associated temporary infrastructure. There may be some disturbance of animals during the construction process, but with abundant alternative foraging areas for this mobile species, it is likely that there will be, at most, a low magnitude impact on Irish hares.

Fish

279. Stringing of lines across watercourses will not affect habitats that are important for fish reproduction, foraging or migration. Fish species will not be affected by the construction of the Proposed Development and the impact magnitude on these species will be negligible.

Smooth newt

280. The proposed overhead line will approach wet areas that have the potential to support smooth newt populations. Lines will oversail across these areas, and there will be no physical impacts on the wetland from the stringing works (i.e. no ropes on the ground during the operation). Habitats surrounding the wetlands are dominated by improved grassland, which is likely to be unattractive to dispersing newts, and the location of towers in these circumstances will have no impact on the species. The magnitude of impact on smooth newts will be negligible.

White-clawed crayfish

281. Aquatic invertebrates will not be affected by the construction of the Proposed Development, due to the use of guarding works, which will prevent physical contact of overhead lines with the water surface, and the distance of tower locations from watercourses that have the potential to support the species. The impact magnitude on this species will be negligible.

Insect species

282. The moths of conservation concern that have been recorded in the general vicinity of the proposed overhead line route generally require widespread and common larval food plants and their distribution will not be affected by works carried out during the construction phase. A small number of the species rely on plants with a more restricted distribution. These are the narrow-bordered bee hawk-moth (devil’s-bit scabious), Haworth’s minor (cottongrass), oblique carpet (bedstraw), grass rivulet (yellow rattle) and red carpet (lady’s-mantle). Construction of the overhead line will not affect the distribution or local occurrence of these food plants. The food plants, although relatively patchily distributed, are frequent at a regional scale, and the construction of the overhead line will have a negligible impact on moth species of conservation concern.

Table 10.30: Overhead line and Towers - Potential effects during construction phase in absence of mitigation

Receptor	Value	Effect	Magnitude	Significance
Lough Neagh and Lough Beg SPA/Ramsar/ IBA	Very high	No permanent loss of potential supporting habitat for breeding and migratory birds. No potential disturbance of SPA/Ramsar species feeding in potential supporting habitat.	Low	Negligible
Lough Neagh ASSI	High	No permanent loss of potential supporting habitat for breeding and migratory birds. No potential disturbance of bird species feeding in potential supporting habitat.	Low	Negligible
Lough Beg ASSI	High	No permanent loss of potential supporting habitat for breeding and migratory birds. No potential disturbance of bird species feeding in potential supporting habitat.	Low	Negligible
Hedgerows and scattered trees	Low	Loss of a limited number of species poor hedgerows all of low conservation value. Cutting back of tall trees within hedgerows.	Low	Minor Negative
Fen	Low	Run-off of pollutants or mobilized sediment.	Low	Negligible
Lowland meadow	Low	Loss of small areas of habitat to access tracks and temporary construction infrastructure	Low	Negligible
Oakwood	Low	Loss or modification of habitat to access tracks and temporary construction infrastructure. Lopping of small number of tall trees.	Low	Negligible
Wet woodland	Low	Loss or modification of habitat to access tracks and infrastructure Lopping of tall trees.	Low	Negligible
Mixed ashwood	Low	Loss of habitat to access tracks and temporary construction infrastructure. Lopping of tall trees.	Low	Negligible
Breeding birds	Low	Loss of nest sites and foraging habitat by removal and modification of hedgerows to accommodate access tracks and infrastructure. Disturbance of breeding birds nesting close to construction activity.	Low	Minor Negative
Wintering birds	Very High	Disturbance to winter birds feeding close to construction areas.	Low	Negligible
Bats	High	Loss of potential roosts, foraging habitat and commuting corridors through felling of mature trees and removal of hedgerows.	Medium	Moderate negative
Badgers	Medium	Disturbance of setts, loss of foraging areas.	Low	Negligible
Otter	High	Disturbance of individuals through noise and visual disturbance.	Low	Minor negative
Irish hare	Low	Loss of foraging habitat on improved grasslands. Disturbance of individuals during construction through noise and visual impacts.	Low	Negligible
Fish	Medium	Run off of sediments or pollutants during construction.	Low	Negligible
Smooth newt	Low	Run off of sediments or pollutants during construction.	Low	Negligible
White clawed crayfish	Medium	Run off of sediments or pollutants during construction.	Low	Negligible
Insects	Medium	Loss of habitat.	Low	Negligible

10.5.2.2 Operational Phase

283. Permanent habitat loss will be restricted to the footprint of the proposed towers and will be a maximum of 625m^2 at each tower with a total area of 63,750m^2. Removal of haul routes will permit grassland vegetation to recover, although soil compaction may result in a protracted recovery time, and an altered species composition. However, most fields are cultivated to a varying extent, and the cultivation process will reduce this impact. The majority of fields support a low species diversity of common and

widespread plant species, and the, magnitude of the operation of the proposed overhead line on grassland habitats is assessed as low.

284. It should be noted that access to towers and overhead lines may be required to address plant failures in emergency situations. However, this occasional access will not be significantly different from the existing farming regime and is considered to be of negligible magnitude.

285. A summary of magnitude and significance is provided below in Table 10.31.

Magnitude of impacts

Designated sites

286. The potential for the Proposed Development to have an adverse impact on the conservation objectives and designation features of European protected sites has been considered in line with Regulation 43 under the Habitats Directive. European sites within 30km of the Proposed Development have been screened for the potential impacts of the new infrastructure. A total of nine sites within Northern Ireland, together with three contiguous sites in RoI, were assessed.

287. A draft Test of Likely Significance (Appendix 10H) for the Proposed Development concluded that there would not be any significant adverse impact on the designation features of any of the sites, and no further assessment was therefore required in this regard. Findings of the Test are outlined below.

288. The nearest European sites designated for their conservation importance are the Lough Neagh and Lough Beg SPA/Ramsar site (9km to the northeast) and the Peatlands Park SAC (4km to the northeast). There is a potential for collision of wildfowl that are a designation feature of the Lough Neagh and Lough Beg SPA/Ramsar site with the operational overhead line. The potential impacts on whooper swans (the likely most vulnerable species) and other designation species are considered in greater detail in Appendix 10G. It is concluded that the feeding and roosting sites of whooper swans are sufficiently remote from the overhead line route, and that flightlines between them do not cross the route, for there to be little opportunity for collisions to occur at these stages of the swans' diurnal cycle. It is also concluded that there is some risk of collision during migration and dispersion from staging points to traditional wintering grounds. The magnitude of this risk is assessed to be negligible, since migrating birds generally fly at greater heights than the proposed towers (Griffin et al 2010).

289. The presence of the operational overhead line will have no impact on the conservation objectives designation features of European sites elsewhere, and the magnitude of potential impacts of the overhead line on these sites is assessed to be negligible.

290. There are 26 ASSIs and one NHA within 30km of the proposed overhead line route. There are no pathways for the overhead line to have impacts on ASSIs that are designated for their habitat, plant or invertebrate species features. Magnitude of impact on these sites is therefore assessed to be negligible. Lough Beg and Lough Neagh ASSIs have similar avian designation features to the Lough Neagh and Lough Beg SPA, and comments above apply to both the European and the national site.

291. There are eight SLNCIs within 5km of the overhead line route. Mowilllin South West has been identified for its breeding wader interest. The typical territory size of the species of interest, lapwing, is localised around the nest site, and birds are unlikely to approach the line route. There are no pathways between the proposed overhead line and terrestrial habitats in the SLNCIs and the magnitude of impacts on these sites is assessed to be negligible.

Habitats Hedgerows and Scattered Trees within Hedgerows

292. Overhead line maintenance will require that any hedgerow trimming will be of a recurrent nature over a 5 year cycle, but hedgerow presence will be retained, and the habitat will continue to function as an ecological entity. The major impact on hedgerows will be on lopped or removed mature trees, reducing the structural diversity of affected hedgerows in the longer term. Hedgerows act as wildlife corridors for dispersing and feeding birds and mammals, and as commuting corridors for bats, and these functions will be unimpaired. The species composition of species-rich hedgerows will not be affected by the Proposed Development. Overall the impact magnitude on this habitat is considered to be low.

Fens

293. Tower locations are distant from fen habitats, and the proposed overhead line oversails these habitats; there will be no impact on fen habitats and impact magnitude is therefore considered to be negligible.

Lowland meadow

294. There will be no impact on the single field that has been identified as supporting lowland meadow habitat, and impact magnitude on this habitat is therefore considered to be negligible.

Oakwood, wet woodland, ashwood

295. Maintenance of trees during the operational phase may allow increased light penetration and consequent changes in the woodland floor flora. However, local landform configurations will allow for limited lopping of trees, and it is unlikely that, as already mature trees adjust to this management regime, enhanced light values at ground level will have a significant impact on an already frequently impoverished floristic composition. Overall, the small scale of the affected woodland habitat indicates that the impact magnitude on woodland is considered to be low in the longer term.

Species

Breeding birds

296. The retention of hedgerows along the length of the proposed overhead line, minimal impacts on wooded habitats, and the currently very low bird populations of open habitats indicates that the long term impact magnitude on breeding birds will be negligible.

297. The operational overhead line will not affect any known barn owl breeding sites. There is a potential for barn owls from elsewhere to disperse across or to winter in the vicinity of the overhead line route. However, barn owls typically fly below 4.5m when hunting, although they may fly at considerable heights when commuting between foraging areas and nest sites (Shawyer 2011). In the absence of local nest sites, it is likely that any birds that may use the overhead line area will use predominately airspace lower than the height of the line. It is estimated from ring recovery data that around 3% of barn owl deaths are the result of collision with overhead lines (Barn Owl Trust). Since the majority of the species flying time is spent at low flight heights, it can be assumed that most of this mortality is the result of collision with low voltage or other low-lying lines. In the absence of known breeding sites in the overhead line corridor, the magnitude of any potential impacts on this species is therefore assessed to be negligible.

298. Breeding waders are scarce or absent in the general vicinity of the proposed overhead line. A pair of curlew was present for a short time in close proximity to the route in May 2010, but did not breed. Possible breeding locations recorded for this species in 2005-2008 are distant from the proposed location of the overhead line. A snipe was present in suitable habitat in 2006, but this site has since been drained and no birds were found there in 2012. A pair of lapwings was found breeding in the vicinity of the overhead line route in 2005-2008, but there was no indication of this species' presence during the 2011 survey. The magnitude of the potential impact of the Proposed Development on this species group is considered to be negligible.

299. Known records of breeding raptors of other species are distant from the proposed line route and it is unlikely that these species would be affected. Known peregrine nest sites are >5km from the proposed line route, and since few prey items are taken beyond 6km from the nest (Hardey 2007), it is unlikely that this species will be at risk during the breeding season. Hunting ranges of barn owl is generally within 1km of the nest site, and known breeding birds are unlikely to reach the vicinity of the proposed overhead line (Taylor 1994). Long-eared owls may hunt in excess of 2.5km from the nest site (Cramp 1985), and the known breeding birds may therefore approach the proposed line route. However, NIRSG note that buzzard, peregrine and red kite collisions with power lines have all been recorded on island of Ireland, and there is therefore the potential for individual birds to be adversely affected by the presence of new power lines. This is most likely to be the case in the non-breeding season, when breeding birds and their offspring may be more widely dispersed, and transient and migrant birds may also occur. The potential impact of the operational overhead line on breeding raptors is therefore assessed to be of low significance.

Wintering birds

300. Whooper swans may pass through the general area of the Proposed Development as they disperse to wintering sites elsewhere in Ireland and return northwards towards the end of winter, and during movements between feeding and roost sites. The species is particularly susceptible to collision with overhead wires because of their large size, relatively poor manoeuvrability and poor forward visibility. However, small numbers of birds cross the line of the Proposed Development in the vicinity of the crossing of the river. It has been shown that birds using traditional feeding sites in the Blackwater River valley also roost in the valley, and therefore there is no significant collision risk for these birds. The small numbers of swans using the Keady lakes; the use of the lakes as both feeding and roosting sites; and the apparent use of an extended wintering area by some birds that does not require a crossing of the overhead line route indicates that the collision risk for birds using the lakes is also negligible.

Bats

301. Ongoing maintenance (and associated disturbance) of mature trees may reduce the number of potential roost sites available to bats for short term shelter however the magnitude of impacts through habitat loss have been considered in construction impacts and will not be considered further. Hedgerows, where maintenance coppicing is required under the overhead lines, will be retained at a height of more than 2m, and the Proposed Development will not disrupt bat commuting routes or foraging areas. Potential feeding areas over woodland, which may also provide roost sites and mating sites, will not be affected. The magnitude of impacts on bats during the operation of the Proposed Development is negligible.

Badger

302. There will be a reduction in the amount of potential foraging habitat available to badgers due to the provision of tower bases. This impact will be indiscernible in practice, because of the extensive nature of the grassland habitats that towers will occupy and the low observed density of badgers within the Proposed Development area. No setts will be lost as a result of the Proposed Development. The magnitude of impact on badgers as a result of the operation of the Proposed Development will be negligible.

Otter

303. There will be no loss of feeding or breeding habitat for otters, and there will be no impediment to dispersal of otters along watercourses. There will be no regular disturbance of watercourses as a result of regular or emergency maintenance works and the magnitude of impact of the operation of the Proposed Development on otters is assessed as negligible.

Irish hare

304. The total area of the grassland habitats used by this species that will be lost to tower bases is insignificant both in total and at a local scale. It is therefore assessed that the magnitude of impact of the operation of the Proposed Development on Irish hares will be negligible.

Fish

305. There will be no long term impact on rivers or lesser watercourses as a result of the operation of the overhead line, nor will there be a long term impact on riparian species, including fish. Impact magnitude of the operation of the Proposed Development on river habitats and species is considered to be negligible.

Smooth newt

306. Tower locations will be located so as to avoid watercourses and water bodies, and potential smooth newt breeding sites will therefore not be affected by the new operational infrastructure. Towers will largely be placed in uniform, mainly improved grassland, habitats that are unattractive to newts during terrestrial phases of their annual cycle. The sites that have been identified as potential smooth newt habitat, and therefore sources of animals using nearby terrestrial habitats, have been shown to either not support newts, be remote from newt habitats, or to be separated from towers by hostile habitats. The magnitude of impact on smooth newt arising from the Proposed Development is therefore considered to be negligible.

White-clawed crayfish

307. There will be no short or long term impact on the Blackwater River as a result of the operation of the overhead line, and impact magnitude of the operation of the Proposed Development on white-clawed crayfish is therefore considered to be negligible.

10.5.2.3 Significance of Impacts

Designated sites

308. It has been shown that there is a limited potential for individuals of a designation species of the Lough Neagh/Lough Beg SPA, whooper swan, to collide with the proposed overhead line once it is operational. However, in the light of the distance of swan feeding and roosting sites from the line route, the likely height of migrating birds above the overhead line, and the increasing population wintering in Ireland (Trinder 2012) the significance of any impacts on the designation species is likely to be negligible.

309. Since the magnitude of impacts on the designation features of other European sites, ASSI/NHAs and SLNCIs will be negligible, the significance of operational impacts of the overhead line on them will also be negligible.

Habitats

Hedgerows

310. Ecological function and integrity is likely to be maintained, although there may be local impacts on hedgerow continuity. Significance of the impact on the habitat is considered to be minor negative.

Fens

311. Tower locations are marginal to fen habitats, which will be most affected during stringing of overhead lines. The significance of the impact of the Proposed Development on these habitats along the overhead line route is considered to be negligible

Lowland meadow

312. Towers will avoid the limited amount of this habitat that is present along the proposed overhead line route; the significance of the impact of the Proposed Development is therefore considered to be negligible.

Oakwood, wet woodland, ashwood

313. Semi-natural woodland is scarce along the route and the proposed works will not affect site integrity or extent, but may locally have limited effects on woodland ecological function. Significance of the impact on these habitats is considered to be minor negative.

Species of conservation concern

Breeding birds

314. The structure of some hedgerows may be modified as a result of tower emplacement and line maintenance, but it is likely that the significance of the impact on farmland passerine breeding birds will be negligible. Significance of impact on peregrine, merlin, barn owl, long-eared owl and wader species is also considered to be negligible because of the current low population densities of these species across much of Co Armagh and south Co Tyrone as a whole. There may be a greater potential for buzzard collisions because of their relatively high population density, but the significance of any impact is likely to be negligible at a population level.

Wintering birds

315. Studies undertaken for this project indicate that it is unlikely that whooper swans wintering in the general vicinity of the proposed overhead line will cross the line in significant numbers. There is some potential for migrating or dispersing birds which are not tied to local foraging and roosting sites to cross the line, although this may occur at a variety of heights and long distance flights are likely to be at greater heights than the proposed tower heights. Although the lines are unlikely to adversely affect

local populations of these species to a significant extent, it is inevitable that collisions will occur at times, adding to the existing mortality arising from this cause. Recent increases in the breeding populations of whooper swan, the species of conservation concern most likely to be at risk of collision, indicate that any additional mortality arising from collision is unlikely to have a significant adverse effect at a whole population level (Trinder 2012). The significance of impact on this species is likely to be negligible at a population level.

316. Substantial numbers of Bewick's swan no longer winter in Northern Ireland, and are therefore no longer available for collision to have a significant impact on this species. Greenland white-fronted goose is also scarce as a wintering species in the vicinity of the overhead line route, and is also therefore unlikely to be available for significant impacts as a result of collision. The significance of impact on these species is likely to be negligible at a population level.

Bats

317. All of the surveys undertaken on the Proposed Development site have confirmed usage by bats. They have been identified throughout the study area and have been encountered both commuting across the site and foraging. Due to the type of impact expected (primarily hedge removal and to a lesser extent mature tree removal) the significance of impact on the bat population is considered to be minor negative.

Badger

318. No badger setts will be lost as a result of the Proposed Development and the loss of foraging area for the species will be negligible in terms of available suitable habitat. The significance of impact on this species will be negligible at a population level.

Otter

319. Otter habitats will remain as they are at present, as all watercourses will be retained and any maintenance of the new overhead line infrastructure will be periodic and of short duration. Significance of impact on otter populations is considered to be negligible

Irish hare

320. Irish hare habitats will be substantially retained, and significance of impact on the species is considered to be negligible.

Fish

321. Watercourses will retain their current characteristics, and significance of impact on fish species is considered to be negligible.

Smooth newt

322. The new infrastructure will not affect the availability of potential breeding sites for newts, and there will be no loss of habitats that are likely to be used by the species during its terrestrial phase. Significance of impact on the species is considered to be negligible.

White-clawed crayfish

323. Watercourses will retain their current characteristics, and significance of impact on white-clawed crayfish is considered to be negligible.

Table 10.31 Overhead line and Towers - Potential effects during operational phase in absence of mitigation

Receptor	Value	Effect	Magnitude	Significance
Lough Neagh and Lough Beg SPA/Ramsar/ IBA	Very high	Collision risk with overhead cables of birds using the site and birds passing over the site. Effect on designated features of site as an SPA, Ramsar site and IBA.	Low	Minor negative
Lough Neagh ASSI	High	Collision risk with overhead cables of birds using the site and birds passing over the site.	Low	Minor negative
Lough Beg ASSI	High	Collision risk with overhead cables of birds using the site and birds passing over the site.	Low	Minor negative
Hedgerows and scattered trees	Low	Permanent loss of species poor hedgerow and scattered trees.	Low	Minor negative
Fen	Low	No loss of habitat and negligible potential for pollution during maintenance.	Negligible	Negligible
Lowland meadow	Low	No loss of habitat and negligible potential for pollution during maintenance.	Negligible	Negligible
Oakwood	Low	Permanent modification through lopping of small areas of habitat.	Low	Minor negative
Wet woodland	Low	Permanent modification through lopping of small areas of habitat.	Low	Minor negative
Mixed ashwood	Low	Permanent modification through lopping of small areas of habitat.	Low	Minor negative
Breeding birds	Low	Permanent loss of nest sites and foraging habitat. Collision risk with overhead cables of birds using the site and birds passing over the site.	Low	Negligible
Wintering birds	Very High	Collision risk with overhead cables of birds using the site and birds passing over the site.	Low	Minor negative
Bats	High	Loss of potential roosts, foraging habitat and commuting corridors through lopping and removal of mature trees and permanent removal of hedgerows.	Medium	Minor Negative
Badgers	Medium	Permanent loss of small areas of potential foraging habitat.	Low	Negligible
Otter	High	No loss or disruption of riparian habitats will occur during operation.	Negligible	Negligible
Irish hare	Low	Permanent loss of small areas of suitable foraging habitat.	Low	Negligible
Fish	Medium	No loss or disruption of riparian habitats will occur during operation.	Negligible	Negligible
Smooth newt	Low	No loss of habitat and negligible potential for pollution during maintenance.	Low	Negligible
White clawed crayfish	High	No loss or disruption of riparian habitats will occur during operation.	Negligible	Negligible

10.5.2.4 Residual Effects and Mitigation

Designated sites

324. The increase in the length of overhead line resulting from the project will reduce the volume of safe airspace available to bird species that are vulnerable to collisions with these obstructions. This applies in particular to the heavier species such as swans which have poor manoeuvrability and relatively poor forward vision. Any increase in mortality of whooper swans that are part of the designation population of Lough Neagh/Beg SPA/Ramsar site arising from collision with the operational overhead line will therefore have a cumulative impact on this species. However, as noted above (10.4.2.3) and in Appendix 10G swan movements in the vicinity of the overhead lines are minimal and mitigation measures in the form of bird deflectors are very effective at reducing collisions even in poor visibility and therefore no adverse effects are expected on whooper swans.

Habitats/species

325. Although individually small in extent, the footprints of the towers will cumulatively increase the area that is no longer available to wildlife. However, the spread of this loss over a wide area means that there will be little impact on the connectivity of habitats and on the movement of animal species arising from this loss.

326. The increase in the length of overhead line resulting from the project will reduce the volume of safe airspace available to bird species that are vulnerable to collisions with these obstructions. This applies in particular to the heavier species such as swans and geese which have poor manoeuvrability and relatively poor forward vision. Although the lines are unlikely to adversely affect local populations of these species to a significant extent, it is inevitable that collisions will occur at times, adding to the existing mortality arising from this cause. However, recent increases in the breeding populations of whooper swan and greylag goose, the two species most likely to be at risk of collision, indicate that any additional mortality arising from collision is unlikely to have a significant adverse effect at a whole population level. Measures to render the overhead line more visible in those parts considered to present the greatest risk will be implemented and will reduce the likelihood of collisions.

10.6 Mitigation Measures

10.6.1 Overview

327. The purpose of what is broadly classed as mitigation is to maintain the conservation value of a development site as far as is possible, and to exploit opportunities to enhance the site's conservation value wherever possible. This can be achieved by (IEEM 2006):

- avoiding negative ecological impacts - especially those that could be significant;
- reducing negative impacts that cannot be avoided; and,
- compensating for any remaining significant negative ecological impacts.

328. Avoidance and impact reduction techniques relate to reducing the footprint of the new infrastructure and any ancillary works as far as is practicable. Compensatory measures are designed to offset losses resulting from the works. Measures that will enhance the conservation value of the site will also be considered. Environmental measures will be secured under an environmental strategy for the development, via the implementation of the Construction Environmental Management Plan (Outline CEMP – Appendix 5A). The environmental strategy will include both environmental measures to avoid or reduce significant effects, and to provide compensation and enhancement where appropriate. Many of the mitigation measures relevant to the Proposed Development are applicable to both the construction and the operational phase, and are therefore considered together.

10.6.2 Avoiding negative ecological impacts

329. The following measures have been or will be put into place to avoid negative impacts:

- Works in the vicinity of trees will conform to "*BS 5837:2012, Trees in relation to design, demolition and construction– Recommendations*";
- Proposed tower sites avoid the few fields that support a relatively rich herb flora;
- Any waters high in suspended solids produced as a result of de-watering during the excavation and construction of tower bases will be contained and treated prior to discharge to any watercourse;
- Settlement ponds will be provided to intercept surface water draining from the substation site, and will intercept any suspended solids prior to discharge of water to a watercourse. Discharge may be subject to licensing by Rivers Agency;

- The contractor will provide a method statement for working practices that will be designed to prevent adverse impacts on rivers and other watercourses. Working practices will include standard methods designed to minimise sedimentation and pollution. Mitigation will be formulated and agreed in consultation with Rivers Agency;
- Prinsen *et al* (2011) recommended that countries in the African-Eurasian region should address the problem of bird collisions with overhead lines, in part, by:
- Routeing new above ground power lines away from key areas for birds, taking into account the presence of protected areas (with either a national or international status), abiotic factors that influence the bird/power line conflicts and the susceptibility of relevant bird species. The Proposed Development route in general follows lower ground, for example passing between rather than over drumlins, thus reducing the potential for overflying birds to come into contact with the overhead line. The route also avoids known areas of importance for vulnerable species, for example swan feeding and roosting sites, and the routes between these.
- Tower locations will be sufficiently remote from watercourse channels, as is consistent with NIE standard best practice, to ensure that work practices do not result in bank damage, and care will be taken to prevent ingress of silt into watercourses (managed through production of CEMP). Where crossing of watercourses for construction access is required, an initial draw-line will be taken across major rivers, which will then be used for stringing the operational conductors to the tower position. The initial draw-line will be thrown across narrow watercourses, and a similar procedure followed. There will be no requirement to enter the river, ingress of silt into watercourses will be negligible, and there will be no impediment to fish passage.
- Trampling and the use of machinery on saturated, quaking surfaces will be avoided. The locations of towers have been configured to avoid areas of wet grassland and fen vegetation and the use of brash mats will be used if required.
- Any excavations left unattended overnight will be either covered or ramped in at least one location to allow mammals to avoid becoming trapped.

10.6.3 Reducing negative impacts

330. The substation site and lands within 100m of works associated with tower construction will be re-surveyed for the presence of badger setts immediately prior to the commencement of works. If a sett should be found which could be adversely affected by the works, the advice of NIEA will be sought, on a sett by sett basis, and any actions required to close setts will be carried out under licence.

331. Standard mitigation measures for bats and bat habitats will be followed. Standard procedures include:

- Any sites that have characteristics suggesting that they have a potential for roosting bats, will be surveyed immediately prior to demolition/felling to confirm that they are not being used as roosts. A dusk and dawn survey for each tree of high potential that is to be felled will be carried out immediately prior to felling, or should activity surveys not be possible to the project timescales (i.e. seasonal constraints) appropriately experienced climbers will assess the potential for the tree features to support roosting bats. Where bats are shown to be present or there is significant potential for bat roosting, consultation with NIEA will take place and their advice sought;
- If bats are discovered after demolition/felling has commenced, work is to be stopped and NIEA informed and advice sought;
- Potential tree roosts will be soft felled/pollarded under the supervision of a suitably qualified and experienced bat worker generally in autumn when bats have completed breeding and hibernation has not commenced. Tree felling will include wedging to prevent cracks closing and trapping bats, and leaving felled limbs in situ for at least 24 hours to enable bats to escape.
- Where hedgerows in the vicinity of towers are to be lowered, they will be cut to a height of 2m and be retained in order to maintain bat flightlines;

- Minimal lengths of hedgerow will be removed, and gaps will be replanted with native species following the works;
- Hedgerow trees will be pollarded rather than removed, with a height of 2 m maintained if safety considerations permit. The number of mature trees felled prior to the works will be kept to a minimum. An arboriculturalist will be engaged to prepare an Arboricultural Implications Assessment and subsequently work alongside the engineers during construction to facilitate the retention of trees and avoidance of damage. Where mature trees are present these will be pollarded rather than removed;
- It is acknowledged that the Proposed Development will result in the loss of linear features across the site. It is proposed to maintain connectivity across the proposed tower bases by replacement planting;
- Any removal/reduction of hedgerow trees, cutting of hedgerows and clearing of scrub will take place outside the bird-nesting period, which in Northern Ireland is generally taken as March to August inclusive. This will apply to both the construction and operational (line maintenance) phases;
- Potential bird nesting habitat in close proximity to works that take place between March and August will be checked by a competent ecologist to ensure that there will be no adverse impact on protected bird species.

332. Although surveys indicated that the Blackwater River valley at the crossing point of the proposed overhead line is little used as a commuting route by swans and other vulnerable bird species, it is likely that it is occasionally used. Haas et al (2005) described general principles for protecting birds from collision with overhead lines, including:

- Routeing of overhead lines as low as possible, for example behind buildings or rows of trees, and at the foot of hills or mountains;
- Attachment of clearly visible markers on overhead lines posing a high collision risk Prinsen *et al* (2011) expanded on this by recommending that countries in the African-Eurasian region should address the problem of collisions with overhead lines;
- Develop priority lists of key conservation areas and species in order to identify priorities for mitigating sections of new power lines and retrofitting existing power lines;
- Mitigate problematic sections of power lines, both existing and planned to minimise the effects of electrocution and collisions on birds by using state-of-the-art techniques; and,
- Develop and support evaluation programs that use standardised protocols to monitor the effectiveness of mitigation measures as well as to improve mitigation techniques, including monitoring of incidents (electrocution and collision) and the presence and movements of birds in order to assess the (species-specific) scale of impact.

333. A review of the effectiveness of line marking as a means of reducing bird impacts and mortality from overhead line collisions, indicated that line marking results in significant reductions in bird collisions (MacKenzie Bradshaw 2006). Spiral deflectors on conductors have been shown to reduce annual losses of mute swans at Abberton Reservoir Special Protection Area to near zero (Frost 2008). The efficacy of particular types of deflectors is likely to vary between species, and may depend on the activity being undertaken by individual birds. For example, deflectors that are adequate in full daylight may not be effective in low light or nocturnal conditions. However, Jenkins *et al.* (2010) concluded that, barring some notable exceptions, *"any sufficiently large form of marker (which thickens the appearance of the line at that point by at least 20 cm, over a length of at least 10-20 cm), placed with sufficient regularity (at least every 5-10 m) on either the ground wires (preferably) or the conductors, is likely to lower general collision rates by 50-80%."* Barrientos *et al.* (2011), found collision rates reduced by 55-94%. Prinsen *et al* 2011 suggest that:

- line markers should be as large as possible, and increase the visible thickness of the line by at least 20 cm, for a length of at least 10-20cm;

- spacing of devices should be not more than 5-10 m apart;
- line markers should incorporate as much contrast with relevant backgrounds as possible;
- colour is probably less important than contrast;
- movement of the device is likely to be important;
- markers that protrude vertically both above and below the cable (sic) are likely important; and,
- since many collisions may occur at night, devices that are nocturnally visible (through illumination, phosphorescence, ultraviolet radiation and other means) would be advantageous, although the potential for birds to be attracted to sources of light should also be borne in mind.

334. Bird deflectors will be fitted to the earth line (highest line) between T30 and T43 at appropriate spacings to be agreed in advance of the development with NIEA to ensure that they are of the most effective type.

335. Tower access tracks have been designed to follow existing tracks and lanes as far as possible, to reduce the potential impact of track construction on soils and vegetation (see Figure 5.8 for details). Access tracks have been designed to avoid habitats of conservation interest, and will in the main be constructed across improved grassland fields of low conservation value.

10.6.4 Compensation and Enhancement

336. New habitats will be provided and maintained around the proposed substation, which will provide replacement, improved habitat for breeding birds. Steep banks incised into the local hillside will be ideally suited to dense native shrub species. With the former known presence of stonechats breeding in the immediate area of the substation, dense gorse scrub might encourage nesting of this locally scarce species. The species to be utilised in any habitat creation scheme will be approved by an ecologist with knowledge of local habitats, to ensure integration of new habitats into the local habitat mosaic. All seed and plants used in habitat creation will be sourced locally, and will be of local provenance, to ensure that the genetic integrity of local plant communities is maintained.

337. Where hedgerows are to be lost through the construction of the tower bases, agreement will be sought with the landowner to establish a new hedge of similar length to that which will be lost. If the landowner does not wish to avail of this, NIE will donate an amount to a conservation charity to be used for planting native trees of local provenance in County Armagh. This amount to be donated will be calculated using the prevailing rate at the time (the figure to be used will be that which is used by DARD (Dept of Agriculture and Rural Development) in its agri-environment schemes (currently £12 per metre, per year for 5 years) for a new hedge which is fenced either side). This compensation measure will also resolve a consultation response dated 09.03.11 from DARD Countryside Management Branch (see Appendix 6A). The consultation response had raised the issue of hedgerow reinstatement and these compensation measures will provide the resources for that reinstatement.

338. In addition to the measures to maintain the length of hedgerows, NIE will erect 100 bat boxes as mitigation measures for the loss of mature trees which have to be pollarded as a result of the project. Compensation in the form of hedgerow replacement (where possible) will be provided.

339. Table 10.32 summarises the residual effects of the overhead line after mitigation.

Table 10.32: Residual Effects of the Overhead Line and Towers (with mitigation)

Receptor	Value	Description of Potential Effect	Ecological Impact Significance without Mitigation	Environmental Measure (M) / Compensation (C) / Enhancement (E)	Residual Magnitude	Ecological Impact Significance with Mitigation
Overhead lines						
Lough Neagh and Lough Beg SPA/Ramsar/ IBA	Very high	Potential and permanent loss of habitat for breeding and migratory birds. Potential collision risk with overhead cables of birds using the site and birds passing over the site. Potential effect on designating features of site as an SPA, Ramsar site and IBA.	Negligible	Interconnector route follows lower ground reducing the potential for overflying birds to come into contact with the overhead line. The route avoids known areas of importance for vulnerable species. A Test of Likely Significance, as required by Article 6 of the Habitats Directive, was carried out to assess the potential impacts of the Proposed Development on the designation features of the European sites.	Negligible	Neutral
Lough Neagh ASSI	High	Potential and permanent loss of habitat for breeding and migratory birds. Potential collision risk with overhead cables of birds using the site and birds passing over the site. Potential effect on freshwater habitat and vascular plants.	Negligible	Interconnector route follows lower ground reducing the potential for overflying birds to come into contact with the overhead line. The route avoids known areas of importance for vulnerable species.	Negligible	Neutral
Lough Beg ASSI	High	Potential and permanent loss of habitat for breeding and migratory birds. Potential collision risk with overhead cables of birds using the site and birds passing over the site.	Negligible	Interconnector route follows lower ground reducing the potential for overflying birds to come into contact with the overhead line. The route avoids known areas of importance for vulnerable species.	Negligible	Neutral

Receptor	Value	Description of Potential Effect	Ecological Impact Significance without Mitigation	Environmental Measure (M) / Compensation (C) / Enhancement (E)	Residual Magnitude	Ecological Impact Significance with Mitigation
Hedgerows and scattered trees	Low	Loss of a limited number of hedgerows all of low conservation value. Cutting back of tall trees within hedgerows. Loss of continual connective habitat for mammals and birds using the hedgerow.	Minor Negative	Works in the vicinity of trees should conform to BS 5837:2012, Trees in relation to design, demolition and construction– Recommendations No species-rich hedgerows will be affected by the works. Hedgerows will be protected by scaffolding when conductors are drawn between towers. Where hedgerows in the vicinity of towers are to be lowered, a height of at least 2m should be retained in order to maintain bat flightlines. Minimal lengths of hedgerow should be removed where this is essential, and gaps should be replanted with native species following the works. Wherever possible, hedgerow trees will be pollarded rather than removed, New hedges of equal length planted where hedgerows removed (or donation made to conservation charity to plant replacement trees)	Negligible	Neutral
Fen	Low	Potential disturbance of habitat	Negligible	Significant wetland areas will be avoided. Trampling and the use of machinery on saturated, quaking surfaces will be avoided.	Negligible	Neutral
Lowland meadow	Low	Potential disturbance of habitat	Negligible	Access tracks have been designed to follow existing tracks where possible, new tracks will avoid areas of conservation interest.	Negligible	Neutral
Oakwood	Low	Potential disturbance of habitat Lopping of tall trees	Minor negative	Access tracks have been designed to follow existing tracks where possible, new tracks will avoid areas of conservation interest.	Negligible	Neutral
Wet woodland	Low	Potential disturbance of habitat Lopping of tall trees	Minor negative	Access tracks have been designed to follow existing tracks where possible, new tracks will avoid areas of conservation interest.	Negligible	Neutral
Mixed ashwood	Low	Potential disturbance of habitat Lopping of tall trees	Minor negative	Access tracks have been designed to follow existing tracks where possible, new tracks will avoid areas of conservation interest.	Negligible	Neutral

Receptor	Value	Description of Potential Effect	Ecological Impact Significance without Mitigation	Environmental Measure (M) / Compensation (C) / Enhancement (E)	Residual Magnitude	Ecological Impact Significance with Mitigation
Breeding birds	Low	Potential loss of nest sites and foraging habitat by removal of hedgerows.	Negligible	Any removal/reduction of hedgerow trees, cutting of hedgerows and clearing of scrub will take place outside the bird-nesting period, which in Northern Ireland is generally taken as March to August inclusive. This will apply to both the construction and operational (line maintenance) phases. Potential bird nesting habitat in close proximity to works that take place between March and August should be checked by a competent ecologist to ensure that there will be no adverse impact on protected bird species.	Negligible	Neutral
Wintering birds	Very High	Potential collision risk with overhead power lines	Minor negative	Attachment of clearly visible markers on overhead lines posing a high collision risk	Negligible	Neutral
Bats	High	Loss of potential roosts, foraging habitat and commuting corridors through felling of mature trees and removal of hedgerows.	Minor Negative	A dusk and dawn bat survey will be carried out at potential roosts immediately prior to demolition/felling. I f bats are found work will be suspended until consultation with NIEA. If bats are found after/during demolition/ felling work must be stopped until consultation with NIEA. Felling of potential roosting trees will be carried out in the presence of a licensed bat worker following best practice guidelines. 100 new bat boxes provided to mitigate for loss of potential tree roosts. Hedgerow replacement to compensate for loss of foraging habitat although all hedgerows will be cut to only 2m keeping commuting integrity intact.	Negligible	Neutral
Badgers	Medium	Potential disturbance of sets	Negligible	Any excavations left unattended overnight should be either covered or ramped in at least one location to allow mammals to avoid becoming trapped. Repeat badger surveys will be carried out within 100m of the development immediately prior to the commencement of work. If setts are found work will be suspended until consultation with NIEA.	Negligible	Neutral

Receptor	Value	Description of Potential Effect	Ecological Impact Significance without Mitigation	Environmental Measure (M) / Compensation (C) / Enhancement (E)	Residual Magnitude	Ecological Impact Significance with Mitigation
Otter	Medium	Potential direct disturbance of activity during construction Disturbance of riverine habitat	Negligible	Any excavations left unattended overnight should be either covered or ramped in at least one location to allow mammals to avoid becoming trapped.	Negligible	Neutral
Irish hare	Medium	Loss of foraging habitat on improved grasslands Potential direct disturbance of activity during construction	Negligible	Any excavations left unattended overnight should be either covered or ramped in at least one location to allow mammals to avoid becoming trapped.	Negligible	Neutral
Fish	Medium	Potential disturbance of habitat and increased sediment run-off	Negligible	Waters high in suspended solids produced as a result of de-watering during the excavation and construction of tower bases should be contained and treated prior to discharge. Settlement ponds will be provided to intercept surface water draining from the substation site, and will intercept any suspended solids prior to discharge of water to a watercourse. The contractor will be required to provide a method statement designed to prevent adverse impacts on rivers and other watercourses. Where crossing of watercourses for construction access is unavoidable, an initial draw-line will be flown across major rivers, which will then be used for winching the operational conductors to the tower position. The initial draw-line will be thrown across narrow watercourses, and a similar procedure followed.	Negligible	Neutral

Receptor	Value	Description of Potential Effect	Ecological Impact Significance without Mitigation	Environmental Measure (M) / Compensation (C) / Enhancement (E)	Residual Magnitude	Ecological Impact Significance with Mitigation
Smooth newt	Medium	Potential impact on suitable habitats	Negligible	Waters high in suspended solids produced as a result of de-watering during the excavation and construction of tower bases should be contained and treated prior to discharge. Mitigation measures will be provided to intercept surface water draining from the substation site, and will intercept any suspended solids prior to discharge of water to a watercourse. The contractor will be required to provide a method statement designed to prevent adverse impacts on rivers and other watercourses, in line with the framework of mitigation measures outlined in this ES. Where crossing of watercourses for construction access is unavoidable, an initial draw-line will be flown across major rivers, which will then be used for winching the operational conductors to the tower position. The initial draw-line will be thrown across narrow watercourses, and a similar procedure followed.	Negligible	Neutral
White clawed crayfish	Medium	Potential impact on habitat and increased sediment load.	Negligible	Waters high in suspended solids produced as a result of de-watering during the excavation and construction of tower bases should be contained and treated prior to discharge. Mitigation measures will be provided to intercept surface water draining from the substation site, and will intercept any suspended solids prior to discharge of water to a watercourse. The contractor will be required to provide a method statement designed to prevent adverse impacts on rivers and other watercourses, in line with the framework of mitigation measures outlined in this ES.	Negligible	Neutral
Insects	Medium	Potential loss of food plants	Negligible	Access tracks have been designed to follow existing tracks where possible, new tracks will avoid areas of conservation interest.	Negligible	Neutral

10.7 Conclusions

340. The assessment indicates that provision of the proposed Turleenan substation and the proposed overhead line between the substation site and the border with the Republic of Ireland will have a minimal impact on the ecology of the line route. The habitats present within the survey area are generally ecologically impoverished and of low value both intrinsically and as supporting habitats for protected fauna.

341. The site is dominated by intensive agriculture and the species and habitats reflect this with semi improved and improved grassland and species poor heavily managed hedgerows regularly occurring. Those areas of greater value to biodiversity have been avoided as far as possible by the development proposals and many years of ecological survey have allowed the route to be refined to avoid those areas of greater value in the local context.

342. The Proposed Development covers a large area of land but has a small footprint and therefore the potential for effects is low. Permanent land take is low and habitats lost are generally of low ecological value. Animals quickly habituate to new infrastructure in the environment and with mitigation the long term effects on biodiversity will be negligible.

343. The legislative requirements with regard to nature conservation are contained in national and European instruments, which must be considered alongside the requirements pertaining to the impacts of the Proposed Development on the study areas outlined in the other Chapters of this ES. The potential for the Proposed Development to have an adverse impact on the designation features of European sites has been considered. No recognised sites of international, national or local conservation value will be adversely affected. The Proposed Development will therefore have a negligible impact on sites of recognised conservation importance.

344. Mitigation measures are in the main designed to avoid impacts on habitats and species of conservation concern through the implementation of good working practices and awareness of the potential impacts of the works on ecological receptors. Where there is the potential for limited impacts on these receptors, the impacts will be reduced through the adoption of appropriate timing of activities, pre-construction survey of such features as badger setts and bat roosts, and through limiting the extent of actions that will adversely affect habitats of conservation concern. Habitat creation at the substation site will increase the extent of habitats of conservation value, potentially increasing the area suitable for nesting birds.

345. The major spatial impact will be the loss of the cumulative area of land required for tower bases and the substation; however, since the great majority of tower sites will be in species-poor fields devoted to agricultural grassland of low conservation value, the ecological significance of this impact will be negligible. Siting of towers in or near hedgerows will result in some localised loss of short lengths of hedgerow, but there will be limited minor adverse impacts on the ecological function of the hedgerows at each location. The loss of mature hedgerow trees, although at a small scale in relation to the length of the line route, and in terms of ecological function at a landscape scale, will reduce habitat diversity locally. Areas of significant conservation interest, such as species-rich grassland, river channels and wetlands will be avoided as tower location sites. Following removal of temporary access tracks and storage areas every care will be taken to ensure there will be no remaining areas of compacted land.

346. The overhead line will have limited adverse impact on the mammal, bird and invertebrate species using the line route. Known main badger setts are remote from tower sites, and impacts on subsidiary setts are likely to be time-limited. The siting of towers away from river banks, and the techniques used for stringing lines across watercourses, mean that otters will not be adversely affected. A number of trees potentially used by bats will be removed, but the impact on bat populations is likely to be imperceptible. There will be a potential for bird species to collide with the proposed overhead line, but for the most vulnerable species, particularly swans, it is unlikely that there will be a significant adverse impact at a population or local level; the provision of deflectors at appropriate sections of the line will reduce the potential for impact further.

347. The construction of the proposed substation will require the removal of existing, mainly grassland, habitats of low conservation value, together with a number of hedgerow trees. The landforming required to accommodate the substation provides opportunities for habitat creation that will increase the biodiversity interest of the site.

348. Habitat losses will be restricted in the main to areas of low conservation value, and there will be limited adverse impact on animal species.

10.8 References

AERC 1998. Surveys of the distribution of freshwater crayfish (*Austropotamobius pallipes*) in Northern Ireland. Report prepared by AERC for Environment and Heritage Service, Belfast. http://www.doeni.gov.uk/niea/crayfishreport.pdf

Barn Owl Trust: http://www.barnowltrust.org.uk/infopage.html?Id=81

Barrientos, R., Alonso, J.C., Ponce C. & Palacín, C., 2011. Meta-analysis of the effectiveness of marked wire in reducing avian collisions with power lines. *Conservation Biology*, published online June 2011.

Bibby, C.J., Burgess, N.D., Hill, D.A. and Mustoe, S.H (2000). Bird Census Techniques. Second

Edition. Academic Press London.

Brady Shipman Martin, Kirk McClure Morton, Minnock Barron 1997. Blackwater Catchment Rural Development Strategy Report of Survey. BorderIreland.info.

Byrne, A., Sleeman, D.P., O'Keefe, J. and Davenport, J. 2012 The ecology of the European badger (*Meles meles*) in Ireland: a review. Biology and Environment: *Proceedings of the Royal Irish Academy* 112B, 69_96.

CBD 2010: Updated Global Strategy for Plant Conservation, 2011.2020. Parties to the Convention on Biological Diversity.

Cooper, A. and McCann, T., 2002. Habitat change in the Northern Ireland Countryside: technical report of the Northern Ireland Countryside Survey 2000. Environment and Heritage Service, Department of the Environment for Northern Ireland. Belfast.

Cramp, S. (ed) 1985. The Handbook of the Birds of Europe, the Middle East and North Africa. Volume 4: Terns to Woodpeckers. Oxford University Press, Oxford.

Crowe, O. (2005). Ireland's Wetlands and their Waterbirds: Status and Distribution. BirdWatch Ireland, Rockingham, Co. Wicklow.

Curtis, T.G.F. and McGough, H.N. (1988). The Irish Red Data Book. 1 Vascular Plants. Wildlife Service Ireland.

DCAL 2009. Focus Area Report on Protection, Restoration and Enhancement of Salmon Habitat UK-Northern Ireland. Department of Culture, Arts and Leisure, Belfast

DCAL 2010. Eel Management Plan Neagh / Bann River Basin District. The Scientific Basis for the Viability of Current Management of Eel in the Lough Neagh and Lower Bann River Basin. Department of Culture, Arts and Leisure, Belfast

Early, J. 2010. The Freshwater Pearl Mussel (*Margaritifera margaritifera*). http://www.doeni.gov.uk/niea/freshwater_pearl_mussel_-_owenkillew_-_john_early_niea-4.pdf

Eaton, M.A., Brown, A.F., Noble, D.G., Musgrove, A.J., Hearn, R., Aebischer, N.J., Gibbons,

D.W., Evans, A. and Gregory, R.D. (2009) Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man. British Birds 102, pp296-341.

EHS 2003 Northern Ireland Habitat Action Plan Species-Rich Hedgerows Final Draft – April 2003. Environment and Heritage Service, Belfast.

EHS 2005 Northern Ireland Habitat Action Plan Fens March 2005. Environment and Heritage Service, Belfast.

EHS 2005a Northern Ireland Species Action Plan Marsh Fritillary *Euphydryas aurinia* March 2005. Environment and Heritage Service, Belfast.

EHS 2005a Northern Ireland Habitat Action Plan Lowland Meadow March 2005 Environment and Heritage Service, Belfast.

Frost, D. 2008. The use of 'flight diverters' reduces mute swan Cygnus olor collision with power lines at Abberton Reservoir, Essex, England. Conservation Evidence 5: 83-91

Griffin, L., Rees, E. and Hughes, B. 2010. The Migration of Whooper Swans in Relation to Offshore Wind Farms. Report to COWRIE Ltd. (COWRIE Project Code: SWAN-06-08). Wildfowl and Wetlands Trust, Slimbridge.Haas D, Nipkow M, Fiedler G, Schneider R, Haas W, Schürenberg B. (2005). Protecting birds from powerlines. Convention on the Conservation of European Wildlife and Habitats (Bern Convention). Nature and environment, No 140. Council of Europe Publishing

Hardey, J. 2007. Peregrine Falcon. In *The Birds of Scotland,* The Scottish Ornithologists' Club, Aberlady, pp511.514.

Holt, C.A., Austin, G.E., Calbrade, N.A., Mellan, H.J., Hearn, R.D., Stroud, D.A., Wotton, S.R. and Musgrove, A.J. 2012. Waterbirds in the UK 2010/11: The Wetland Bird Survey. BTO/RSPB/JNCC, Thetford.

IEEM (2006) Guidelines for Ecological Impact Assessment in the United Kingdom. Institute of Ecology and Environmental Management, Winchester.

Jenkins, A.R., Smallie, J. & Diamond, M., 2010. Avian collisions with power lines: a global review

of causes and mitigation, with a South African perspective. Bird Conservation International (2010) 20:

263-278

Joint Nature Conservation Committee 1990 Handbook for Phase 1 habitat survey. A technique for environmental audit. JNCC Peterborough

King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D., 2011. *Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Lynas, P., Newton, S.F. & Robinson, J.A., 2009 The status of birds in Ireland: an analysis of conservation concern 2008-2013. *Irish Birds*, 8(2): 149-166

MacKenzie Bradshaw MBEC 2006. Beauly Denny EIS – Tech Annex 22.22 Review of Bird Collisions and Powerlines.NBN Gateway http://www.habitas.org.uk/priority/nbn_imt.asp?item=33009

NIEA 2012. Badger Survey – Specific Requirements. Northern Ireland Environment Agency, Belfast.

Patterson, I.J., Ollason, J.G. and Doyle, P., 1995 Bird populations in upland spruce plantations in northern Britain. *Forest Ecology and Management*. 79, 107:131

Preston, S.J. and Reid, N. 2011 Northern Ireland Otter Survey 2010. Report prepared by the Natural Heritage Research Partnership, Quercus, Queen's University Belfast for the Northern Ireland Environment Agency. Northern Ireland Environment Agency Research and Development Series No. 11/06

Preston, J., Prodöhl, P. Portig, A. & Montgomery I., 2004 Reassessing Otter *Lutra lutra* distribution in Northern Ireland. Environment and Heritage Service, Belfast.

Prinsen, H.A.M., Smallie, J.J., Boere, G.C. and Píres,N.(Compilers), 2011. Guidelines on how to avoid or mitigate impact of electricity power grids on migratory birds in the African-Eurasian region. CMS Technical Series No. XX, AEWA Technical Series No. XX, Bonn, Germany.

Ratcliffe, D.A. ed.1977. A Nature Conservation Review. Cambridge University Press, Cambridge

Reid, N., Harrison, A.T. and Robb, G.N. 2011 Northern Ireland Irish hare survey 2010. Report prepared by the Natural Heritage Research Partnership, Quercus, Queen's University Belfast for the Northern Ireland Environment Agency. Northern Ireland Environment Agency Research and Development Series No. 11/10.

Robinson, JA, K Colhoun, JG McElwaine & EC Rees. 2004. Whooper Swan *Cygnus cygnus* (Iceland population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.

Shawyer, C. R. 2011. Barn Owl *Tyto alba* Survey Methodology and Techniques for use in Ecological Assessment: Developing Best Practice in Survey and Reporting. IEEM, Winchester.

Stroud, D.A., Fox, A.D., Urquhart, C. & Francis, I.S. (compilers). 2012. International Single Species Action Plan for the conservation of the Greenland White-fronted Goose *Anser albifrons flavirostris*, 2010-2020. AEWA Technical Series No. XX. Bonn, Germany.

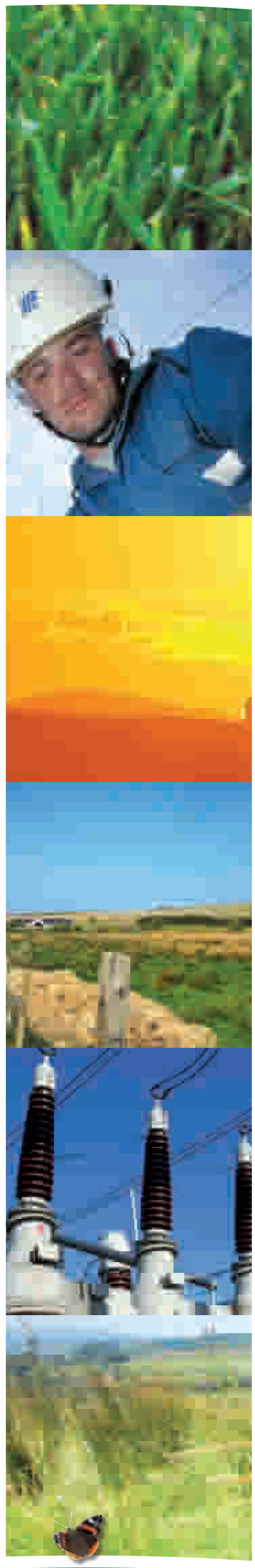
Taylor, I.R. 1994. Barn Owls: Predator-Prey Relationships and Conservation. Cambridge University Press, Cambridge.

Trinder, M. 2012. The potential consequences of elevated mortality on the population viability of whooper swans in relation to wind farm developments in Northern Scotland*. Scottish Natural Heritage Commissioned Report No.459.*

Tyrone - Cavan Interconnector

Chapter 11

Noise



Consolidated Environmental Statement

Volume 2

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11 Noise

Chapter Executive Summary

An extensive noise survey has been conducted around the proposed overhead line route and substation site to establish the existing noise levels. The receiving environment is predominantly rural and the background and ambient noise levels reflect this.

Potential noise levels from the construction and operation of the Proposed Development have been predicted in this assessment.

It is predicted that the highest noise emissions levels from the Proposed Development will be that of construction noise of the substation and the overhead line. However, this impact will be short term and of a limited nature. Mitigation measures have been provided to reduce the potential 'worst case' impact from construction noise. The residual impact of construction noise and vibration following the implementation of mitigation measures are not predicted to be significant.

Once complete the operational noise impact of the proposed overhead line route, towers, and substation will be limited to intermittent corona noise and continuous transformer/plant noise at the substation. The line and substation noise emissions have been predicted and assessed and no mitigation is proposed for noise emissions arising from the operational stage of the Proposed Development. The predicted levels are below the recommended levels and targets set by the WHO and the British Standards BS8233:1999 and BS4142:1997 and are thus within acceptable limits in both Northern Ireland.

11.1 Introduction

1. This chapter presents an assessment of the Proposed Development, as set out in Chapter 5, in relation to noise assessment. This noise assessment deals with 'audible' noise and vibration.

11.2 Methodology

11.2.1 Scope of Assessment

2. Disturbance due to noise is subjective and depends on a number of factors such as the duration of the works, noise characteristics and public perception. In order to minimise the disruption to receptors located near to the site, a noise investigation has been conducted to accurately assess the noise impact and to specify a range of mitigating measures which will ensure that acceptable noise limits are maintained. A noise survey of an existing 400kV overhead line in Ireland (Oldstreet – Woodland route) has been conducted to obtain potential noise emissions levels. This is used in combination with a noise prediction calculation to predict the noise levels at the most proximate noise sensitive properties.

3. Definitions of the noise terms used within this section of the ES are presented in Appendix 11A.

11.2.2 Legislative and Policy Context

4. A number of standards and guideline documents covering the impact of external noise sources and the introduction of industrial and construction noise have been used in this assessment. The standards and guidelines appropriate for this assessment are the WHO Guidelines for Community Noise document (1999), BS5228 Code of practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise (2009), BS4142 Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas (1997) and BS8233 Sound Insulation and Noise Reduction for Buildings (1999). For the assessment of ground borne vibration BS7385:1993 "Evaluation and Measurement for Vibration in Buildings Part 1 and Part 2 Guide to damage levels for ground borne vibration" was used.

11.2.3 Indication of Any Difficulties Encountered

5. Background noise levels have been recorded at locations along the overhead line route and location for the substation representing individual residential properties or clusters of properties in 2005, 2007 and 2013. It is not always possible to record daytime and night-time background noise levels at the properties due to the difficulty of obtaining access. However it is normal practice to record noise levels near to these receptors at a similar distance from a road or other significant noise source in the area. There will be a variation in daytime and night-time background noise levels depending on the season and weather conditions. All measurements were taken in dry conditions at low wind speeds (<5m/s) and the sound level metres were mounted on tripods and fitted with windshields to minimise the influence of wind noise. The background noise levels recorded in 2005, 2007 and 2013 are consistent with what would be expected for a relatively quiet rural area along the proposed route for the interconnector. To provide a margin of safety the lowest background noise levels recorded along the route at these locations were used when assessing the noise impact from the construction phase or operational phase of the Proposed Development.

11.3 Baseline Conditions

11.3.1 Overview

6. The proposed substation is located at Turleenan, Moy, Co. Tyrone. The site is currently used for agricultural purposes. All nearby residential properties are more than 200m from the proposed substation site.

7. The route will travel through a rural environment to the west of Moy, Armagh and Keady.

8. The majority of the residential properties along the route are at a distance of at least 100m from the proposed overhead line. However, there are properties that are located closer to the line, - the nearest property to a tower location is approximately 85m away and the nearest property to the centreline of the overhead line is approximately 54m away.

9. A noise survey has been conducted in order to establish the existing noise environment.

11.3.2 Existing Noise Environment

11.3.2.1 Overview

10. A noise survey has been conducted at the substation and along the proposed overhead line route, in order to establish the existing noise environment. The results of this survey are presented in Tables 11.2, 11.3, 11.4 and 11.5.

11.3.2.2 Substation

11. The measurement results are presented in terms of 'dB L_{Aeq}' which is representative of a logarithmic average of the energy associated with the noise at a location over a given time interval. The levels in terms of 'dB L_{A90}' are also presented and represent the level exceeded for 90% of the given measurement time interval.

Table 11.2: Substation Daytime Measurement Results - 2007

(Locations 1, 2 and 3 are the nearest residential properties to the site for the proposed substation)

Position	Date	Start	Run Time	dB LAeq	dB LA90
1	24/1/2007	11:05	1hr	52.6	40.1
2	24/1/2007	12:10	30mins	43	39.2
3	24/1/2007	12:48	30mins	56	38.9

Table 11.3: Substation Night-time Measurement Results - 2007

Position	Date	Start	Run Time	dB L_{Aeq}	dB L_{A90}
1	25/1/2007	00:31	20mins	35.5	30.1
2	25/1/2007	00:53	20mins	36.5	30.9

12. These background noise levels recorded using an 0800 Series type 1 Cirrus Sound level meter are similar but slightly lower than the most recent background noise levels recorded in 2013 in the Turleenan location (See 174 Trew Mount Road, Moy, in Table 11.5). The lower 2007 levels have been used rather than the 2013 results to provide a margin of safety in any assessment.

11.3.2.3 Overhead Line

13. The measurement locations along the line route represent individual properties or clusters of residential properties along the route. The dB L_{A90} noise levels presented in the table represent the existing 'background' noise levels within the area. The levels presented in terms of 'dB L_{A90}' are defined as the background noise level at a location according to BS4142 (*Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas 1997, British Standards Institute*).

14. The existing environment in to which it is proposed to introduce the overhead line is rural. Ambient noise levels at the properties located close to the majority of the route are shaped by rural environmental noise (i.e. wind in trees, agricultural activities and livestock) and transportation noise on the local supply roads. However, there are sections of the proposed route, near to busier roads, where transportation noise becomes the predominant noise source.

15. All measurements were recorded in suitably calm conditions using appropriately calibrated Type 1 instrumentation which is in-line with current appropriate standards and methodology (i.e. BS4142:1997). The sound level meter and the acoustic calibrator were at the time of measurement calibrated to the appropriate national standards. No significant drift was noted during the field calibration process.

16. A Cirrus Research plc 811B Type 1 sound level meter Serial No. C19087FD Calibration date 30th January 2013 was used for the 2013 daytime and night-time background noise survey at properties along the proposed route. A Cirrus Research plc CR:511E Acoustic Calibrator Serial No. 037718 Calibration date 30th January 2013 was used to calibrate the sound level meter before and after the series of measurements.

17. The Cirrus Sound level meter was calibrated before and after a series of measurements. There was no change in the calibration signal. For the environmental noise survey the meter was mounted on a tripod at 1.5m above ground level and fitted with a 90mm diameter windshield.

18. Extensive daytime and night-time background noise measurements were recorded in 2005 at 13 locations along the proposed line route. The locations chosen are dwellings near to the towers and overhead lines along the route to represent the quiet rural area. Details as to the results from the 2005 survey are given in Tables 1 and 2 of Appendix 11C along with their locations. The results from the 2007 background noise survey are given in Table 11.3 above.

19. Further surveys were undertaken in 2013 and the background noise levels recorded most recently in 2013 are considered to be similar to but marginally higher than those measured previously, but show no significant changes in the existing noise environment. Background noise measurements were recorded during the daytime on 15th February 2013. Night-time background noise measurements were recorded on 18th and 19th of February 2013. Weather conditions were good on both days. Dry calm and still with little wind. There were low temperatures at night with ground frost and a temperature inversion on 18th and 19th February 2013 but very little wind. The results from the 2013 daytime and night-time background noise survey are given in Tables 11.4 and 11.5.

Table 11.4: Overhead Line Daytime Measurement Results - 2013

Measurement Details						
Location	**Date**	**Start**	**Run Time**	**dB LAeq**	**dB LAmax**	**dB LA90**
174 Trew Mount Road Moy	15/2/2013	10:01	20min	45.4	63.6	42.5
65 Artasooly Rd Blackwatertown	15/2/2013	12:23	20min	46.3	61.1	41.1
120 Benburb Rd Moy	15/2/2013	11:17	20min	43.9	58.2	41.8
3 Athboy Lane Blackwatertown	15/2/2013	12:50	20min	44.2	61.7	41.4
190 Monaghan Rd SW of Armagh	15/2/2013	13:39	20min	55.5	73.1	45.9
53 Dernalea Rd Milford	15/2/2013	14:40	20min	38.9	58.3	34.2
27 Curragh Lane Derrynoose	15/2/2013	15:27	20min	39.9	58.9	34.5

Table 11.5: Overhead Line Night-time Measurement Results - 2013

Location	Date	Start	Run Time	dB L_{Aeq}	dB L_{Amax}	dB L_{A90}
174 Trew Mount Road Moy	17/2/2013	23:00	20min	41.0	58.9	35.6
65 Artasooly Rd Blackwatertown	18/2/2013	00:37	20min	41.9	60.8	31.6
120 Benburb Rd Moy	17/2/2013	23:51	20min	39.4	60.1	34.1
3 Athboy Lane Blackwatertown	18/2/2013	01:49	20min	33.5	47.9	31.6
190 Monaghan Rd SW of Armagh	18/2/2013	02:21	20min	45.4	60.7	38.0
53 Dernalea Rd Milford	18/2/2013	02:57	20min	36.4	49.7	28.0
27 Curragh Lane Derrynoose	18/2/2013	03:55	20min	33.4	38.0	31.5

20. These locations are considered to be representative for all residential properties along the proposed route for the interconnector.

21. There is some minor variation in background noise levels as 2005 levels (shown in Appendix 11C) were recorded in August and the most recent in February 2013. The background noise levels recorded most recently in 2013 are considered to be similar to but marginally higher than those measured previously, but show no significant changes in the existing noise environment. Background noise levels are influenced by traffic flows, agricultural activity, other significant noise sources in the area, and weather conditions.

11.4 Potential Impacts

11.4.1 Overview

22. Disturbance due to noise is subjective and depends on a number of factors such as the duration of the construction and maintenance works, operational noise characteristics and public perception of the project. In order to minimise the disruption to near sited receptors, a noise investigation has been conducted to accurately assess the impact and to specify a range of specific mitigating measures which will ensure that acceptable noise limits are maintained.

23. There are a number of aspects of the construction and operation of overhead power lines and substation that have the potential to generate noise.

11.4.2 Construction Phase

11.4.2.1 Approach

24. During construction the majority of the noise emissions from the substation and overhead line will emanate from temporary construction noise within the proposed site (limited duration). The potential noise impact will be dependent on numerous factors such as construction activities, duration of works, distance between works and properties, extent of works, intervening structures and topography, etc.

11.4.2.2 Substation

25. The details of the construction method of the proposed substation are outlined in Chapter 5 (Proposed Development) of this ES.

26. Worst case noise levels for daytime working appropriate to the above works are presented in Table 11.9 at a range of distances from the noise source.

27. Construction noise has been assessed with regard to the current guidelines and practice within Northern Ireland. It would be expected that, in common with other construction sites and the local Environmental Health Departments advice, maximum allowable noise levels at the site during construction would be based on BS5228:2009 Noise and vibration control on construction and open sites Part 1. Noise Code of practice.

Table 11.9: Worst Case substation construction noise levels in dB L_{Aeq}, for each construction phase, at varying distances from works, calculated from BS5228 Code of practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise (2009), and Defra Update of Noise Database for Prediction of Noise on Construction and Open Sites

Construction Activity	dB L_{Aeq} at Distance					
	10m	20m	50m	100m	200m	400m
Excavation & HGV	79	73	65	59	53	47
Fencing	93	87	79	73	67	61
Vehicle activities / road preparation	90	84	76	70	64	58
Trench backfilling	92	86	78	72	66	60
HGV movements	70	64	56	50	44	38
Piling	91	85	77	71	65	59
Crane Operation (Large)	86	80	72	66	60	54

28. It would be expected that, in common with other construction sites and EHO practice, maximum allowable noise levels at the site during construction would be based on Category 'A' of BS5228:2009 Noise and vibration control on construction and open sites Part 1. Noise Code of practice.

Table 11.10: Example Threshold of significant effect at dwelling

Assessment Category and Threshold Value Period LAeq	Threshold Value, in Decibels (dB)		
	Category A	Category B	Category C
Night-time (23:00-07:00)	45	50	55
Evenings and weekends	55	60	65
Daytime (07:00-19:00) and Saturdays(07:00-13:00)	65	70	75

29. It is noted that no residential properties are located within 200m of the proposed substation site and therefore will not be subject to noise exposure from construction works which will be higher than the current guideline level of 65 dB L_{Aeq} per 12 hour day. It should also be noted that this 'worst case' impact will be limited in duration.

30. It is noted that the predicted values in Table 11.9 omit any screening due to the topography of the land and soft ground absorption. It is therefore submitted that the actual impact levels will be lower than calculated.

31. Night-time working should not normally occur, but there may be a need to continue to operate pumps at the proposed site, albeit, for a limited duration.

32. On these occasions, enclosures will be utilised around the pumps to limit noise impact to 45 dB L_{Aeq} (BS 5228 acceptable night time level) at any noise sensitive premises.

33. Appropriate mitigation measures are included in Section 11.5 of this chapter to outline how noise impacts will be controlled.

Ground Vibration Construction Noise

34. A number of site activities will cause increased levels of ground-born vibration around the periphery of the proposed works. Piling activity will occur during the preparation of the site.

35. The requirement for ground piling is outlined in Chapter 5 (Proposed Development) of this ES and it will not occur within 100m of the nearest residential property. Beyond this distance, there will be no significant impacts and the vibration levels will be similar to those expected from passing traffic.

36. BS7385, "Evaluation and Measurement for Vibration in Buildings", was intended to represent the current opinions on the probabilities of damage to structures when exposed to vibration levels with given peak particle velocities. However, the standard is non-specific in many areas due to the limited amount of core data available in the compilation of the document, particularly with regard to vibration damage records.

37. The guidelines in Table 11.11 are based on BS7385:1993, previous literature and the experience of this consultancy. "Cosmetic damage" refers to hairline cracking, with possible loosening of some poorly fixed components.

Table 11.11: Guidelines for Likelihood of Damage from Vibration

Peak Particle Velocity (ppv)	Likelihood of Damage
< 2.5 mm/s	Damage unlikely but continuous vibrations should be avoided.
2.5 - 5.0 mm/s	Poor quality or historic structures susceptible to cosmetic damage. Structural damage unlikely.
5.0 - 10.0 mm/s	Slight probability of cosmetic damage to low rise buildings or poorly fixed/secured panelling due to dynamic amplification. Poor quality structures susceptible to minor structural damage.
10.0 - 20.0 mm/s	High probability of cosmetic damage and slight probability of minor structural damage to low rise buildings.
> 20.0 mm/s	Buildings susceptible to structural damage.

38. Due to the distances involved disturbance from ground borne vibration at the nearby properties is unlikely. Mitigation Measures are proposed to reduce these impacts regardless (see Section 11.5).

11.4.2.3 Overhead Line and Towers

39. The details of the construction method of the proposed substation are outlined in Chapter 5 (Proposed Development) of this ES.

40. Worst Case noise levels for daytime working appropriate to the above works are presented in Table 11.12 below at a range of distances from the noise source.

Table 11.12: Power line construction activity noise levels in dB L_{Aeq}, for each construction phase, at varying distances from works, calculated from BS 5228:2009 and Defra Update of Noise Database for Prediction of Noise on Construction and Open Sites

Construction Activity	Noise Level dB L_{Aeq} at Distance					
	10m	20m	50m	100m	200m	400m
Excavation & HGV	79	73	65	59	53	47
Fencing	93	87	79	73	67	61
Vehicle activities / road preparation	90	84	76	70	64	58
Trench backfilling	92	86	78	72	66	60
HGV movements	70	64	56	50	44	38
Driven Piling	91	85	77	71	65	59
Derrick Crane	86	80	72	66	60	54

Maximum Permissible Construction Noise Levels

41. Until recently the local authorities in Northern Ireland as the enforcing authority for noise and vibration control on construction sites had relied on an advice note prepared by the Pollution Control Division of Belfast City Council for guidance when assessing or controlling noise on sites. This document has now been superseded by *BS5228:2009 Noise and vibration control on construction and open sites, Part 1 Code of Practice.* Using the latest guidance sets revised external noise targets at the nearest residential properties along the proposed route in relation to construction noise.

42. BS 5228 provides recommendations for temporary construction noise limits, based on an assessment of the existing ambient noise levels within the vicinity of the works. The 'ABC' method, as found in BS 5228 Section E.3.2, provides an appropriate assessment method for determining temporary construction noise level targets. The level is determined by rounding the ambient noise level within the vicinity of the construction works to the nearest 5 dB. This resultant level is then compared with Category A, B and C values. When this resultant level is 5 dB less than Category A values, then noise limits should be set in line with Category A values. When the resultant level is similar to Category A values then noise limits should be set in line with Category B values.

43. When the resultant level is similar to Category B values or higher then noise limits should be set in line with Category C values. Table 11.13 below outlines Values for Categories A, B and C.

Table 11.13: Example Threshold of Significant Effect at Dwelling

Assessment Category and Threshold Value Period LAeq	Threshold Value, in Decibels (dB)		
	Category A	Category B	Category C
Night-time (23:00-07:00)	45	50	55
Evenings and weekends	55	60	65
Daytime (07:00-19:00) and Saturdays(07:00-13:00)	65	70	75

44. Therefore, as it is expected that ambient levels at the most proximate residential properties to the substation and overhead line will be relatively low due to the rural setting, it would be deemed appropriate to set noise target levels similar to Category A for construction of the substation and towers.

45. Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction noise ambient plus construction noise) exceeds the pre-construction ambient noise by 5dB or more subject to lower cut off values of 65dB, 55dB and 45dBL_{Aeq} period, from construction noise alone for the daytime, evening and night-time periods respectively and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact. The evaluation criteria

are generally applicable to residential housing, hotels, buildings in religious use, buildings in educational use and buildings in health or community use.

46. The nearest residential property to a tower (allowing for maximum foundation size) is 85m from tower No. 25. The assessment of construction noise using BS5228:2009 would suggest that the maximum permitted daytime noise levels for piling works or similar may potentially be exceeded for properties within 100m of the work.

47. However this is based on a 'worst case scenario' with minimum distance from piling to the properties and no allowance for screening by buildings or attenuation of sound over soft ground. In practice piling is unlikely to be continuous over the course of a day and no allowance has been made for the quieter periods when there is less activity. The standard allows for noisier periods in the course of the day as it is based on the logarithmic average of the sound level between 07:00 hours and 19:00 hours. In the evenings the permitted threshold construction noise levels are reduced and are based on the logarithmic average of the sound level between 19:00 hours and 23:00 hours. Night-time threshold noise limits at nearby noise sensitive receptors are Category A or 45dBL_{Aeq} for a quiet rural area. For a significant effect the total noise level including ambient noise levels and construction noise must exceed the threshold values by at least 3dB.

48. It should also be noted that, given the progress of crews laying foundations, tower construction and stringing, the 'worst case' impact will be of limited duration. The contractor will liaise with the neighbouring residents to keep them informed of progress to minimise their disturbance. It is noted that the predicted values in Table 11.9 omit any screening by topography, intervening buildings and soft ground absorption. It is therefore submitted that the actual noise levels will most likely be lower than predicted in the worst case.

49. Night-time working will not occur, but there may be a need to continue to operate pumps and generators at the proposed site, albeit, for a limited duration. On these occasions, enclosures will be utilised around the pumps and generators to limit noise impact to 45 dB L_{Aeq} (BS 5228 acceptable night time level) at any noise sensitive premises.

11.4.3 Operational Phase

11.4.3.1 Substation

50. The majority of the noise emissions from the substation during operation will emanate from continuous operational noise emissions from the substation components. This facility will operate throughout the operational lifespan of the overhead line. It will therefore be necessary to ensure that the potential noise impact from this installation will not create a significant noise impact at the near sited residential properties.

51. The operational substation noise is assessed with regard to BS4142 (1997), "Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas" and the World Health Organisation "Guidelines for Community Noise" (1999) document.

52. With reference to BS4142:1997, activity noise levels within 5dB above the background level (L_{A90}) have less than marginal significance with regard to whether complaints are likely. Therefore an appropriate target is chosen which is equivalent to the lowest background measurement recorded. This target is such that if any noise is tonal or possessing some other recognisable character, the corrected level is still of marginal significance with regard to BS1412.

53. Continuous operational noise will occur once the substation is operational. Corona noise and transformer hum and tones may be audible. These aspects are assessed below.

<u>Substation Corona Noise</u>

54. Corona noise is occasionally found on transmission lines and in substations where higher voltages exist. Most modern transmission lines and substations are designed to reduce the magnitude of the electric field surrounding the line conductors below the air breakdown value. Occasionally a small sharp

point can be found on a line or on nearby hardware that will result in a corona discharge. Such discharges are often more active during the increased humidity conditions provided by fog or light rain.

55. Corona noise comprises two sound components: one is irregular (random crackling noise) sound, and the other is the pure sound (corona hum noise) of buzzing. The random sound has a wide frequency range because the impulsive sounds caused by corona discharge overlap randomly. The corona hum noise results from the excitation of ion groups, which was generated from corona discharge, caused by the electric field surrounding the conductors. The predominant frequency of corona hum noise is double (100 Hz) the commercial frequency.

56. The level of corona discharge noise from lines and substation plant will vary depending upon the environmental conditions, the locality and a number of other factors including the distance to ground and voltage. The noise experienced from this discharge is typically a short burst of random ‘crackling’.

57. Due to these factors an exact level of impact cannot be predicted. It may be the case, that under certain circumstances (very humid and wet conditions), the background level may be exceeded by more than +10 dB. However due to the elevated background noise levels during conditions likely to generate corona effects, the unpredictability of corona noise derived from overhead lines, and the very short limited duration of such discharges (typically peak levels of a duration of less than 1 second), the overall impact when considered over an hour (the BS4142:1997 daytime reference time period) will be minimal.

<u>Substation Plant/Transformer Noise</u>

58. The substation, will, due to the nature of the plant, be a source of noise.

59. Substations typically comprise line termination structures, high voltage switchgear, one or more power transformers, surge protection, low voltage switchgear, controls and metering. Other devices such as capacitors and voltage regulators may also be utilised. Transformer ‘hum’ is typically regarded as the dominant noise source at substation sites and is caused by magnetostrictive forces within the core causing tones within the harmonic multiples of the AC frequency. The ‘hum’ typically occurs for example at 50Hz and 100Hz.

60. Plant noise may be audible from the proposed substation and it is therefore necessary to assess the proposed facility with regard to BS4142.

61. Target exposure levels (L_{Aeq}) at residential/noise sensitive properties are chosen which are equivalent to the lowest recorded background (L_{A90}) value in the vicinity of the proposed substation site. BS4142 indicates in Paragraph 9 that “*it is marginal as to whether complaints are likely*” with these criteria.

62. This target is such that if any noise is tonal or possessing some other recognisable ‘character’, the corrected level is still of marginal significance as a worst case, again with regard to BS 4142. Use of this criterion will typically represent a less than marginal condition with respect to complaint. This criterion would suggest a Daytime and Night-time Target Level = 30 dB $L_{Aeq.}$ This value has been determined based on the measured night time noise levels (see Tables 11.3 – 11.5 above) and with reference to BS4142 which defines a background level of 30dB as “very low”.

63. With reference to the WHO “Guidelines for Community Noise” (1999) document, this target is within the recommended noise limit for undisturbed sleep, as detailed in Section 4.3.1 of the document.

<u>Noise Prediction Model</u>

64. To predict the noise levels at the nearest residential properties it was necessary to have source noise levels that are representative of the Proposed Development. It was decided to measure the noise levels at an existing 400kV substation. A noise survey at the Oldstreet 500MVA air insulated substation in County Galway was carried out on 26th May 2008. The Oldstreet substation is a modern installation and is similar in scale to the proposed substation.

65. It should be noted that the proposed substation will make use of GIS (Gas Insulated Substation). GIS facilities are designed to be smaller and typically quieter than air insulated substations.

66. Noise levels were measured at the various items of plant using an appropriately calibrated Norsonic 140 Type 1 Sound Level Meter.

67. A Cadna computer based noise prediction model has been generated using the measured noise levels. The calculation details are as follows.

- The transformer sound power level was predicted by varying the source level until the results correlated with the sound pressure levels measured at the Oldstreet Site. A source level of 93 dB was selected as appropriate for the transformers.
- The source height has been set based on the latest available design and the receptor heights have been set at 3.5m.
- Ground topography has been incorporated based on OSNI 1m contours.
- The noise sources within the model have been calibrated to match the noise levels measured at the existing Oldstreet Site.
- Each transformer was incorporated as a point noise source. This is appropriate considering the distances to the nearest properties.
- The noise from the additional conductors has been incorporated as an area source. The noise level has been set based on the measured noise levels.
- As noise information on the proposed noise output of the GIS building is unavailable, the noise levels produced by the air insulated transformers will be used to provide a margin of safety.
- Minimum attenuation from the GIS building façade has been incorporated within the model.

68. A screenshot of the noise prediction model is presented as Illustration 11.1. The noise levels at the receptor locations are presented in Table 11.14.

Illustration 11.1: Substation Noise prediction model screenshot (not to scale)

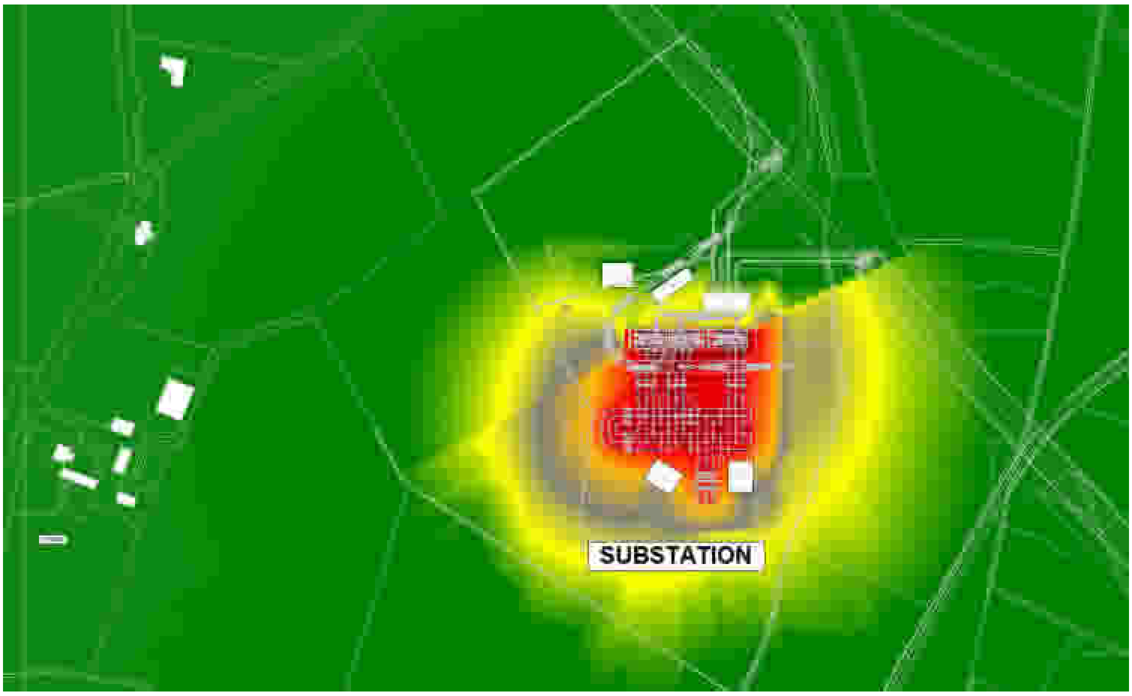


Table 11.14: Predicted substation noise levels (Cadna Noise Model)

Location	Predicted Noise Level dB
174 Trew Mount Road	26.7
164, 166 Trew Mount Road	27.7
70 Grange Road	27.9
151 Trew Mount Road	27.7
152 Trew Mount Road	27.9

69. A comparison of the predicted noise levels presented in table 11.12 above and the noise target set with regard to BS4142:1997 "Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas" would indicate that it is marginal as to whether complaints are likely. The predicted noise levels are lower than the 30 dB L_{Aeq} noise target.

70. The ambient daytime and night-time noise levels are higher than the measured night time background and will mask the substation noise. Considering the predicted noise levels, and the higher ambient noise levels present within the area, it is unlikely that the substation will be audible at the nearby properties.

Substation Road Traffic Noise

71. Access to the substation is via main roads, with existing traffic. Vehicular activity associated with the works will be limited to occasional deliveries and contractors/employees performing maintenance.

72. The likely HGV noise impact due to the expected traffic flows has been calculated using the Haul Road Method detailed in BS5228 Part 1, Annex F section 2.5.2. Considering a maximum frequency of 10 vehicle trips per hour (Q) and a minimum distance of at least 5m (d) from the haul road to any nearby property, and a speed of 30km/h (V) the calculated noise impact is as follows:

Level =	Average SWL (98)	- 33	+10 log Q	-10 log V	-10 log d
Level =	98	- 33	+10 log 20	-10 log 30	-10 log 5
Level =	98	- 33	+13	-15	-7
Level =	56 dB $L_{Aeq,1h}$				

73. The assessment has allowed for up to 60 HGVs per day at peak periods delivering concrete to the Substation site. HGV movements would normally be less and for example the impact from 2 HGV movements per hour is 49dB$L_{Aeq\ 1hour}$ at nearby residential properties based on a separation distance of 5m from the haul road to the dwelling. These level are similar to the existing measured ambient levels in the vicinity of the substation (43 – 56 dB L_{Aeq} – see Table 11.3)

74. Vehicle noise is common in the area surrounding the substation. The Trew Mount Road is the main link road between Moy and the Tamnamore Roundabout. It is expected that HGV movements along the site haul road will be very infrequent and typically limited to the construction phase and during scheduled maintenance. In the worst case applying the same methodology as above, if 2 HGVs were to pass every hour within 5m of any residential property along a haul route then the predicted impact in the worst case would be 56 dB $L_{Aeq,1h}$. This would meet WHO Guidelines for Community Noise during the daytime and would be similar to ambient noise levels recorded at locations along the proposed route. (There will be no construction traffic at night).

11.4.3.2 Overhead Line

75. During the operational phase, noise emissions from the overhead line will emanate from continuous operational noise emissions from the overhead line (from the towers and the lines). This may include temporary noise discharges, such as Corona noise (continuous noise or humming from the conductors). Aeolian noise is distinct from Corona noise and is due to wind passing through and around the towers. It is normally generated by wind passing buildings and stretched wires.

Overhead Line Corona Noise and Corona Discharge

76. Corona noise is occasionally found on transmission lines where higher voltages exist. Most modern transmission lines and substations are designed to reduce the magnitude of the electric field surrounding the line conductors below the air breakdown value. Occasionally a small sharp point can be found on a line or on nearby hardware that will result in a corona discharge. Such discharges are often more active during the increased humidity conditions provided by fog or light rain. Water drops impinging or collecting on the conductors produce a large number of corona discharges, each of them creating a burst of noise. In dry conditions, the conductors usually operate below the corona inception level, and less corona sources are present.

77. Corona noise comprises two sound components: one is irregular (random crackling noise) sound, and the other is the pure sound (hum noise) of buzzing. The random sound has a wide frequency band because the impulsive sounds caused by corona discharge overlap randomly. The corona hum noise results from the excitation of ion groups, which was generated from corona discharge, caused by the electric field surrounding the conductors. The predominant frequency of the corona hum noise is double the commercial frequency (100 Hz in this instance).

78. The level of operational noise from overhead lines will vary depending upon the environmental conditions, the locality and a number of other factors including the distance to ground and voltage. The noise experienced from this discharge is typically a short burst of random ‘crackling’. Corona discharge typically occurs where a sharp point or edge is present, either on the conductor or the tower coupling. This is minimised by careful handling of the overhead line conductor during the stringing process so that sharp points are not created along the conductor.

79. The EPRI AC “Transmission Line Reference Book – 200kV and Above”, Third Edition, , provides a method for predicting the noise level at varying distances from the line under varying climatic conditions. The document provides the noise level during rainfall in terms of dB L_{A50} which represents the A-weighted sound pressure level (in decibels, dB) obtained using “Fast” time-weighting that is exceeded for 50% of the given time interval.

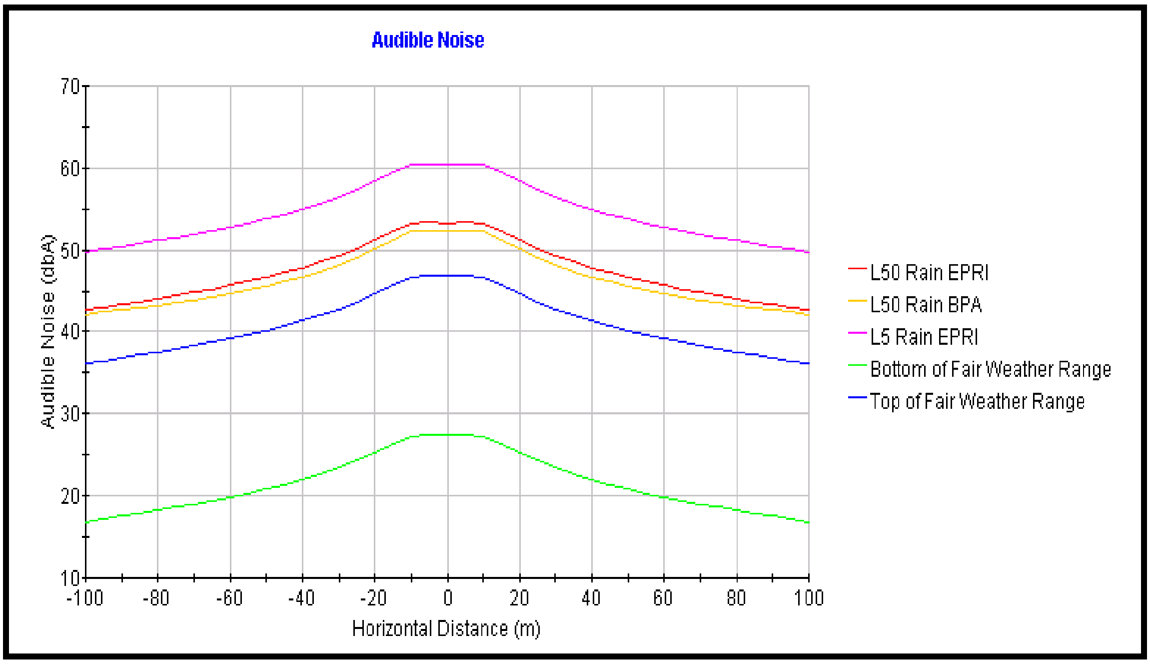
80. The noise levels presented as dB (A) L_{50} (BPA) have been calculated using the Bonneville Power Administration Method (BPA) and represents the noise level during normal rainfall.

81. The noise levels presented as dB (A) L_5 (EPRI) are representative of the maximum or highest noise levels produced during rainfall.

82. The noise levels presented in Table 11.14 fall within the fair weather range shown in Illustration 11.2.

83. ESBI Engineering & Facility Management Ltd has carried out a noise prediction calculation with reference to the proposed line for inclusion within this assessment. The results of this calculation are presented in Illustration 11.2 which illustrates the noise level at varying distances from the line.

Illustration 11.2: Lateral Profile, 100m on both sides of the centre line (not to scale).



84. Notes on the methodology of the calculation have been provided by ESBI Engineering & Facility Management Ltd and are presented in Appendix 11B. It is noted that the L_{50} noise levels presented in illustration 11.B are not equivalent to the L_{Aeq} 'average' noise levels typically used for the assessment of noise. The L_{50} results are provided as another indication of the potential impacts of the Proposed Development. While not directly equivalent to the L_{Aeq} 'average', the L_{50} data presents predicted noise levels for 50% of the stated duration. As demonstrated in Illustration 11B, the impacts resulting from weather conditions will be attenuated by distance.

85. It may be the case, that under humid conditions, the background level may be exceeded by more than +10 dB for a very short duration. However due to the unpredictability of corona noise derived from overhead lines and very short limited duration of such discharges (typically peak levels of a duration of less than 1 second) the overall impact when considered over an hour (ref BS4142 :1997 "Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas" daytime reference time period) will be minimal.

86. 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. The installation process will comply with the NIE standards for Quality Assurance (QA). Based on the conductor type proposed for this project and the high level of QA carried out on transmission materials it is expected that the potential for corona discharge will be minimised.

<u>Overhead Line Continuous Noise</u>

87. Due to the high voltages associated with 400kV line routes continuous operational noise (a hum) can be present. As stated previously a noise survey at an existing 400kV overhead line route was conducted. The line route that was surveyed is the Oldstreet – Woodland route operated by EirGrid. This line runs to the west of the Woodland Substation on a route south of the town of Summerhill, Co. Meath. The measurements were conducted at a range of distances from the tower. In each case the tower noise was audible but at a lower level than the ambient noise levels.

88. The measurement results are presented in terms of 'dB LAeq' which is representative of an average of the energy associated with the noise at a location over a given time interval. The levels in terms of 'dB LA90' are also presented and represent the level exceeded for 90% of the given time interval. This is often considered as representative of the 'background' noise level at a location. The results are presented in Table 11.15 below.

Table 11.15 Measured Power Line Noise Levels

Measurement Position	Measured Noise Level	
	dB L_{Aeq}	dB L_{A90}
At base of tower, Bogganstown. 5mins	45.3	45.1
At base of tower, Newtownrathganley, 5mins	44.4	44.0
Underneath Power lines, Newtownrathganley, Lowest Point, 5mins,	39.8	39.5

89. These measurements can be used to estimate the possible noise levels at varying distances from the proposed line and towers.

90. Based on a noise level of 45 dB LAeq at the base of a tower, the noise levels at varying distances, using standard formulae and a source height of 20m have been calculated and are presented in Table 11.16 below.

91. The 45 dB L_{Aeq} noise level at the base of a tower is used here to illustrate a worst-case scenario. The towers will be spread along the route at a distance ranging from 150m to 476m. Many receptors will be closer to the line route itself than a tower. Thus the noise emission levels from the towers, which are higher than the line route, have been employed along the entire route to present a worst case scenario. For comparison, the nearest dwelling to the overhead Line is 54 m from the outer conductor. The nearest dwelling to a tower (allowing for maximum foundation size) is 85m from tower No. 25.

Table 11.16: Predicted noise levels at varying distances from tower base

Distance	At base of tower	20m	40m	60m	80m	100m	150m
Level dB	45	42	38	35	33	31	29

92. BS8233 (1999) Sound Insulation and Noise Reduction for Buildings contains guidelines for appropriate internal and external environments based on WHO Guidelines on Community Noise (1999).

Guidelines on Internal Environments

93. BS8233:1999 Section 7.6.1 contains guidelines for residential properties within a noise level range such that the lower value is 'good' and the upper value is 'reasonable'. The target criteria for living rooms recognises that these rooms may be used for resting or sleeping, and there is no distinction between day and night-time use. The criteria presented are:

Living Rooms = 30-40 dB L_{Aeq}

Bedrooms = 30-35 dB L_{Aeq}

94. Considering fair weather and an external level of approximately 40 dB at any close noise sensitive property as a worst-case scenario (this is the predicted value for the closest dwelling being, 54 metres distance from the centreline of overhead line and within the 'fair weather range' as shown in Illustration 11B), and 15 dB attenuation due to an open window (as per the WHO Guidelines), the predicted internal noise level would be circa 25 dB. This is below the BS 8233 guidelines levels of between 30-35 dB for bedrooms and below 30-40 dB for Living Rooms.

95. It is useful to consider the EPRI predicted rain noise levels (Illustration 11B) with regard to BS8233. Considering a second scenario with the same distance (54m) and a EPRI rainfall L_{50} level of circa 47 dB (A) the internal noise level will be 32 dB (considering 15 dB through an open window), within the BS 8233 guidelines levels of between 30-35 dB for bedrooms and within 30-40 dB for Living Rooms.

96. Thus it can be seen that the internal noise levels within a property, considering the presence of fair and wet weather will be within the BS8233 recommendations. During periods of rainfall windows will generally remain closed which will provide further attenuation of noise levels and prevent noise break-in. Rain fall noise would also help to mask any occasional line noise at nearby dwellings.

Guidelines on External Environments

97. The WHO Guidelines for Community Noise document provides guideline acceptable noise levels for external spaces. Section 4.2.7 of the WHO Guidelines states that "*During the daytime, few people are seriously annoyed by activities with LAeq levels below 55 dB; or moderately annoyed with LAeq levels below 50 dB*" The WHO Guidelines go on to state that *"Sound pressure levels during the evening and night should be 5–10 dB lower than during the day."*" Section 4.3.1 of the WHO Guidelines states that *'To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB LAeq.'*

98. It is the consensus view among experts on annoyance studies that 50-55dBL_{Aeq} daytime is the onset at which these health effects such as annoyance may be observed. In practice many residential properties are subject to much higher outdoor daytime noise levels than 50-55dB$_{LAeqT}$ due to road traffic, railways or industry.

99. The predicted noise levels for the continuous noise emissions from the overhead power lines are 35 dB at a distance of 60m. Thus the predicted external noise levels meet the requirements in the WHO Guidelines for Community Noise document.

Construction Traffic Noise

100. The expected construction vehicle numbers are too few to cause any noticeable increase in traffic flows on the local road network. It is generally accepted that an increase of 3 dB (A) on existing traffic noise is required before it may be noticed by the public (example ref: UK DOETR "Guidance on the Methodology for Multi-Modal Studies", Paragraph 4.3.5). With reference to the "Calculation of Road Traffic Noise" document (CRTN), and if all other factors remain equal, this would represent an increase in traffic flow of 100%.

101. The "Design Manual for Roads and Bridges" document (DMRB) suggests that a 1dB increase in traffic might be perceptible, although it acknowledges that other factors in visual perception and magnitude of traffic levels before increase are relevant. Again with reference to CRTN, a 1dB increase in noise level is approximately equivalent to a traffic number increase of 25%. It is unlikely that the introduction of a small number of additional vehicles on the public road network will be sufficient to present a 25% increase in traffic flows.

102. Where the construction traffic will use private access tracks (see Chapter 5 for details), there will be a large change in the numbers of daily vehicles. The likely HGV noise impact due to the expected traffic flows has been calculated using the Haul Road Method detailed in BS5228 Part 1, Annex F section 2.5.2. Considering a maximum frequency of 10 vehicle trips per hour (Q) and a minimum distance of at least 5m (d) from the access track to any nearby property, and a speed of 30km/h (V) the calculated noise impact is as follows:

Level =	Average SWL (98)	- 33	+10 log Q	-10 log V	-10 log d
Level =	98	- 33	+10 log 20	-10 log 30	-10 log 5
Level =	98	- 33	+13	-15	-7
Level =	56 dB $L_{Aeq,1h}$				

103. The assessment has allowed for up to 60 HGVs per day at peak periods at a tower location. The assessment has been based on a maximum of 10 vehicle trips per hour as shown above. HGV movements would normally be a lot less and for example the impact from 2 HGV movements per hour is 49dB$L_{Aeq\ 1hour}$ at nearby residential properties based on a separation distance of 5m from the access

track to the dwelling. These levels are similar to the existing measured ambient levels in the vicinity of the substation (39 – 56 dB L_{Aeq} – see Table 11.4).

104. This would meet WHO Guidelines for Community Noise during the daytime and would be similar to ambient noise levels recorded at locations along the proposed route. (There will be no construction traffic at night).

11.5 Mitigation Measures

11.5.1 Construction Phase

105. Appropriate mitigation measures are included to provide instruction to the contractor to control noise impact of construction activity close to existing residential properties.

106. BS5228 Code of practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise (2009) includes a number of guidelines and recommendations which are considered appropriate and of good working practice for all construction contracts. These are summarised below.

11.5.1.2 Substation

107. The contractor will be required to comply with BS5228, which includes a number of guidelines and recommendations. These are considered appropriate and of good working practice for all construction contracts. These are summarised below and see the Outline CEMP (Appendix 5A).

General Measures

108. During the construction phase, control measures for relevant plant as listed in BS5228 will be applied, including temporary screening or enclosure of noisy plant, control of "on times" for noisy plant, and positioning of plant as far as possible from noise sensitive locations and properties. Also:

- Use of good well maintained plant and where possible new plant manufactured under recent EC guidelines for manufacturers;
- Substitution of unsuitable plant; and,
- Maintenance of silencers and moving components.

Vibration

109. On site vibration monitoring will be undertaken when the activities will be occurring in close proximity to any buildings. The use of on-site vibration monitoring will allow the impact of piling to be controlled to within the recommended guideline levels. Low vibration piling methods (such as auger types) are available and may be used to limit any vibration impact. Monitoring will provide assurance that there are no likely significant effects and ensure that measures, as detailed in this Chapter, are taken as required.

Screening/enclosure

110. The contractor will sequence operations such that spoil mounds or storage areas are located in positions to screen nearby residential properties from ongoing works. Temporary screening using sandbags, 20mm plywood sheeting or similar dense boarding may be required to reduce impact of static machinery or extensive works close to noise sensitive locations.

Monitoring

111. Given the limited impact it would not be appropriate to require regular noise monitoring of the site. However occasional measurement of noise levels generated using a Type 2 or better sound level meter will be conducted to check on the continuing impact of the works.

Off-time

112. In the unlikely event that earthworks will result in an exceedance of EHO limits, the duration of daily operations in that area will be limited so as to control impact.

Responsible Person

113. NIE will appoint or delegate a responsible person who will be present on site and who will be willing to answer and act upon queries from the local public.

Night Works

114. Where pumps and generators are in use during night-time hours they will be chosen, sited and enclosed such that levels at the nearest residential properties do not exceed the background level. Sound reduction of up to 15 dB (A) is possible by enclosure.

11.5.1.3 Overhead Line

General Measures

The contractor will be required to take note of the control measures for relevant plant listed in BS5228:2009 and will apply the measures stated above for construction of the Substation (see Outline CEMP – Appendix 5A).

11.6 Residual Impacts

11.6.1 Construction Phase

11.6.1.1 Substation and Overhead Line

115. It is predicted that the highest level of noise emissions will be from construction noise. However, this impact will be short term and of a limited nature at any one location. Mitigation measures are provided to reduce the potential 'worst case' impact from construction noise. Following the implementation of the mitigation measures proposed construction noise impacts are not deemed to be significant, given that the construction noise at the nearest properties would not be greater than 3dB above the threshold values set out in Table 11.10.

11.6.2 Operational Phase

11.6.2.1 Substation

116. The operation noise impact of the proposed substation will be limited to intermittent corona noise and operational transformer/plant noise. The impact of this is not deemed to be significant as the noise levels predicted are less than those likely to be a nuisance according to the established WHO and British Standard Guidance. The proposed target level, set with regard to BS4142, will not be exceeded at the nearest noise sensitive properties.

11.6.2.2 Overhead Line and Towers

117. The noise from the line has been predicted at varying distances using the measured noise levels and the noise prediction applet. The predicted noise levels have been found to be within the guidelines presented within BS8233:1999 for internal noise levels and within the WHO guidelines for external amenity spaces. Therefore the potential noise impact from both corona discharge and the continuous tone, whilst it may be perceptible under certain climactic conditions, will fall within the criterion.

118. ‘Aeolian noise’ also known as turbulent wind noise may be created due to high wind speeds affecting the towers and conductors. The amount of Aeolian noise is directly linked to wind speed and direction. This type of noise impact is normally not considered as significant as the ambient noise levels are also higher (affected by occurrences such as wind in trees) therefore minimising and masking any possible impact.

11.6.2.3 Maintenance

119. The maintenance requirements for the Proposed Development are outlined in Chapter 5 of this ES. The proposed helicopter inspection flights will be of limited duration and there will be public notification in advance of the flights. All other maintenance activities will not have likely significant noise impact given the limited duration and infrequency of the works.

11.7 Conclusions

120. An extensive noise survey has been conducted around the proposed overhead line route and substation site to establish the existing noise levels. The receiving environment is predominantly rural and the background and ambient noise levels reflect this.

121. Potential noise levels from the construction and operation of the Proposed Development have been predicted in this assessment.

122. It is predicted that the highest noise emissions levels from the Proposed Development will be that of construction noise of the substation and the overhead line. However, this impact will be short term and of a limited nature. Mitigation measures have been provided to reduce the potential ‘worst case’ impact from construction noise and the contractor will be required to liaise with the local Environmental Health Officers and residents throughout the contract. The residual impact of construction noise and vibration following the implementation of mitigation measures is not predicted to be significant.

123. Once complete the operational noise impact of the proposed overhead line route, towers, and substation will be limited to intermittent corona noise and continuous transformer/plant noise at the substation. The line and substation noise emissions have been predicted and assessed and no mitigation is proposed for noise emissions arising from the operational stage of the Proposed Development. The predicted levels are below the recommended levels and targets set by the WHO and the British Standards BS8233:1999 and BS4142:1997 and are thus within acceptable limits in Northern Ireland.

11.8 References

BS4142 Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas 1997, British Standards Institute

BS5228 Code of practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise, 2009, British Standards Institute Haul Road Method Part 1 Section D.3.5.2 Ground Absorption (5 log d/d0 - 2) Part 1 Section D.3.2.2.2

Guidelines for Community Noise World Health Organisation, 1999 Attenuation of Partially Open Window (15dB) ITS Guidelines for Community Noise Section 4.3.1

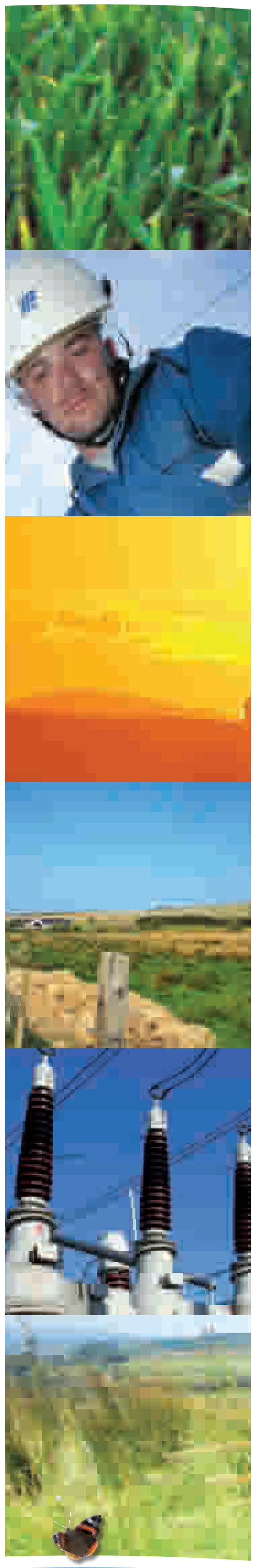
Update of Noise Database for Prediction of Noise on Construction and Open Sites. DEFRA

Planning Policy Guidance (PPG) 24 Planning and Noise 1994, DOE

BS8233 Sound Insulation and Noise Reduction for Buildings (1999), British Standards Institute

AC “Transmission Line Reference Book – 200kV and Above”, Third Edition

Tyrone - Cavan Interconnector



Chapter 12

Cultural Heritage

Consolidated Environmental Statement

Volume 2

Part funded by
EU TEN-E Initiative

Northern Ireland Electricity

12 Cultural Heritage

Chapter Executive Summary

The Proposed Development has been assessed for the significance of impact on cultural heritage during both the construction and operation stages.

There are no direct physical impacts on recorded archaeological sites and therefore the impact is considered to be neutral. In terms of heritage assets there will be some short term impacts during the construction of the substation, but these are considered to be of low significance. Construction works impacts on the setting of heritage assets in the construction phase will be short term.

Throughout the construction period, an archaeological watching brief will be maintained during removal of topsoil and subsoil in all areas of disturbance. Fencing will be provided during construction to avoid accidental damage to Site 71.

The Proposed Development will impact the setting of several archaeological sites and built heritage features. Mitigation measures have not been recommended and therefore there will be no reduction in the significance of impact upon individual sites. The overall significance of impact is considered to be moderate adverse due to limited impacts upon the setting of designated sites within the wider area.

12.1 Introduction

1. This Chapter presents an assessment of the Proposed Development, as set out in Chapter 5, in relation to cultural heritage.

2. Cultural heritage within this context means the archaeology, built heritage, historic landscape and any other factors that significantly contribute to the historic and archaeological resource of the area.

3. The baseline cultural heritage conditions are described, together with an assessment of the potential effects and impacts of the Proposed Development. Mitigation measures to be included within the design and construction proposals are described and mitigation is taken into account in the assessment of the overall residual impact.

4. The following sections provide:

- Information on the scope of the assessment;
- The legislative and policy context for cultural heritage;
- Details of consultations;
- A description of the methods of cultural heritage assessment;
- A description of the baseline conditions for cultural heritage;
- An assessment of the predicted impacts of the proposed Interconnector, both constructional and operational;
- A description of the proposed mitigation strategy; and,
- An assessment of the residual impacts of the proposed Interconnector with mitigation in place.

12.2 Methodology

12.2.1 Scope of Assessment

5. The scope of the assessment was to:

- Determine the presence of known archaeological and built heritage sites that may be affected by the Proposed Development;
- Assess the likelihood of finding previously unrecorded archaeological remains during the construction programme;
- Determine the impact upon the known cultural heritage sites in the surrounding area, caused by both physical impacts and impacts on the setting of heritage assets;
- Consider what mitigation measures could be offered based upon the results of the above research; and,
- Assess residual impacts of the Proposed Development with any such mitigation in place.

6. Two study areas were utilised for the assessment of impacts on archaeology and cultural heritage. These comprised the immediate study area and the wider study area. The immediate study area was made up of an area of 500m either side of the centre line of the Proposed Development (approximate National Grid Reference - north H 85 58 and south H 78 29). This was undertaken to gain an understanding of the nature of the surrounding archaeological landscape to enable direct physical impacts to be assessed. The immediate study area and the heritage assets that fall within it can be seen on Figures 12.1-12.4.

7. The wider study area comprised an area of 5km from the Proposed Development. This was examined for Scheduled Monuments, State Care Monuments, entries on the Register of Historic Parks, Gardens and Demesnes and Conservation Areas to enable impacts upon the setting of these heritage assets to be assessed. Due to the large number of heritage assets within this wider study area only those considered to be impacted are depicted on Figures 12.5 and 12.6 and detailed in Appendix 12A.

8. All elements of the Proposed Development have been considered within the chapter. However, some elements will not have a significant effect on any heritage asset and are not considered further. These include waste management, construction traffic, construction duration, construction sequencing, and maintenance. Due to the short duration of construction works, impacts on the setting of heritage assets in the construction phase are not assessed.

12.2.2 Legislative and Policy Context

9. Key pieces of legislation and guidance relating to archaeology and cultural heritage include:

- Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995;
- The Planning (Northern Ireland) Order, 1991; and,
- Planning Policy Statement 6: Planning, Archaeology and the Built Heritage, 1999.

10. PPS 6 sets out the Department of the Environment's planning policies for the protection and conservation of archaeological remains and features of the built heritage. Within PPS 6 are a number of specific polices detailing the importance of archaeological remains and criteria for the protection of the historic environment, both directly from construction and indirectly though developments impacting on their setting.

11. In addition to the Northern Ireland legislation and guidance, other guidance has been taken into account in the preparation of this chapter as no specific guidance exists detailing the process for assessing the effects of a development on heritage assets. This has included:

- English Heritage “The Setting of Heritage Assets”;
- Historic Scotland “Managing Change in the Historic Environment: Setting”;
- Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 2 Cultural Heritage, HA208/07; and,
- National Planning Policy Framework (NPPF).

12. The NPFF includes a definition of significance of heritage assets. This is defined as *“the value of a heritage asset to this and future generations because of its historic interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset’s physical presence, but also from its setting.”* The Institute for Archaeologists’ guidance requires that the significance of assets is assessed in line with these categories. It is not used for any policy test as it is not applicable to Northern Ireland and has been used to supplement regional Northern Ireland guidance in terms of significance of heritage assets.

13. The Dungannon & South Tyrone Area Plan 2010 (Adopted March 2005) contains the following relevant policies:

- Policy CON 3 – Areas of Archaeological Potential: Within the defined areas, developers will normally be required to submit an archaeological assessment or an archaeological evaluation in association with planning applications;
- Policy CON 4 – Historic Parks, Gardens and Demesnes: Development with the designated parks, gardens and demesnes will be assessed in accordance with the prevailing regional planning policy; and,
- Policy CON 6 – Historic Waterways: Development prejudicing future restoration and re-use of the Coalisland Canal will not be permitted. Development proposals must maintain pedestrian access along the canal. In addition the Blackwater River is the necessary link between any future route of the Ulster Canal and Lough Neagh and developments that would prejudice the use as a navigable link would not be permitted.

14. The Armagh Area Plan 2004: Alteration No 1- Armagh Countryside contains the following relevant policy:

- Policy HP1 Historic Parks, Gardens and Demesnes: Development within the designated parks, gardens and demesnes will be assessed in accordance with the provisions of regional planning policy.

15. The Armagh Area Plan also contains information on archaeological sites and historic monuments, Conservation Areas and listed buildings. There is also specific information on Navan.

12.2.3 Consultation

16. The public and statutory consultation process undertaken by NIE and its consultants from 2006 to the beginning of 2013 is outlined in Chapter 6 of this ES and covers a broad range of consultees. Specific consultation was undertaken with NIEA as part of the routine process in 2009 with regard to cultural heritage issues as part of the EIA consultations.

17. Additional written consultation was undertaken with NIEA and a meeting was held to discuss possible route options around Tamlaght and it was decided to avoid a line route option which would have been

in close proximity to a Scheduled Monument (see Figures 4.4 and 4.5). Further consultation was undertaken to agree the methodology for assessing impacts on the setting of cultural heritage features within the wider study area. Further consultation was undertaken to agree the methodology for assessing impacts on the setting of cultural heritage features within the wider study area. This was agreed by NIEA: Historic Monuments Unit in October 2009.

Sources Consulted

18. This archaeological and cultural heritage assessment has been undertaken following guidelines from the Institute for Archaeologists (IfA) (2012).

19. The sources consulted were:

- The Monuments and Building Record (MBR) held at NIEA, including the Sites and Monuments Record, the Industrial Heritage Record and details of listed buildings;
- Ulster Museum, Department of Archaeology and Ethnography;
- Documentary and cartographic records relating to the study area; and,
- Available aerial photographs.

20. A walkover survey of the Proposed Development was undertaken between 25-29 September 2006, 21-22 February 2007 and 1-2 October 2007. Further site visits were undertaken on 23 February 2011, 16-17 January 2012 and 13 November 2012 to undertake assessment of effects on the setting of heritage assets.

12.2.4 Assessment Methodology

21. No standard method of evaluation and assessment is provided for the assessment of impact significance upon cultural heritage. Therefore a set of evaluation and assessment criteria was developed using the DMRB guidance on cultural heritage, Volume 11, Section 3, Part 2, HA208/07.

22. The IfA (2012) guidance also requires the significance of heritage assets to be assessed. These criteria refer to the English planning guidance (NPPF) and have been used in the absence of similar regional guidance. Heritage significance should be assessed for the archaeological, historic, architectural and artistic interests of the affected heritage assets.

23. In addition, guidance on the assessment of impacts to setting produced by Historic Scotland (2010) and English Heritage (2011) has been considered in the absence of similar regional guidance.

24. The criteria for assessing the value of heritage assets are presented in Table 12.1.

Table 12.1 Cultural Heritage Value

Value	Examples
Very High	World Heritage Sites; Assets of acknowledged international importance; Other buildings of recognised international importance; and Historic landscapes of international sensitivity, whether designated or not.
High	Scheduled Monuments; Undesignated sites/features of schedulable quality and importance; Listed Buildings; Undesignated structures of clear national importance; and Designated & undesignated historic landscapes of outstanding interest.
Medium	Sites/features that contribute to regional research objectives; Unlisted buildings that can be shown to have exceptional qualities in their fabric or historical association; Conservation Areas; Historic townscape or built-up areas with historic integrity in their buildings, or built settings; and Designated special historic landscapes and undesignated historic landscapes of regional sensitivity.
Low	Undesignated sites/features of local importance; 'Locally Listed' buildings and unlisted buildings of modest quality in their fabric or historical association; and Historic landscapes whose sensitivity is limited by poor preservation and/or poor survival of contextual associations or with specific and substantial importance to local interest groups.
Negligible	Assets with very little or no surviving archaeological interest; Buildings of no architectural or historical note; buildings of an intrusive character; and Landscapes with little or no significant historical interest.
Unknown	Archaeological sites/features where the importance of the resource cannot be ascertained; and Buildings with some hidden (i.e. inaccessible) potential for historic significance.

25. When professional judgement is considered, some sites may not fit into the specified category in this table. For example, some Grade C listed buildings may only be of medium value or the rarity value of a certain asset regionally may raise its value. Each heritage asset is assessed on an individual basis and takes into account regional variations and individual qualities of sites.

26. The magnitude of change resulting from the Proposed Development is assessed for each heritage asset independently of its archaeological or heritage value. The magnitude of change categories are adapted from DMRB guidance and are presented in Table 12.2.

Table 12.2 Determining Magnitude of Change

Magnitude	Example Criteria
Major	Change to most or all key archaeological/historic building/historic landscape elements or their setting, such that the resource is totally altered.
Moderate	Changes to many key archaeological/historic building/historic landscape elements or their setting, such that the resource is clearly modified.
Minor	Changes to key archaeological/historic building/historic landscape elements, such that the asset or its setting is slightly altered.
Negligible	Very minor changes to elements.
No Change	No change

27. By combining the sensitivity of the cultural heritage resource with the predicted magnitude of impact, the significance of the effect can be determined. This is shown in Table 12.3.

Table 12.3 Determining Impact Significance for Cultural Heritage

Significance of Impact		Magnitude of Change				
		Major	**Moderate**	**Minor**	**Negligible**	**No change**
Cultural Heritage Value	**Very high**	Very Large	Large/Very Large	Moderate/Large	Slight	Neutral
	High	Large/Very Large	Moderate/Large	Slight/Moderate	Slight	Neutral
	Medium	Moderate/Large	Moderate	Slight	Neutral/Slight	Neutral
	Low	Slight/Moderate	Slight	Neutral/Slight	Neutral/Slight	Neutral
	Negligible	Slight	Neutral/Slight	Neutral/Slight	Neutral	Neutral

28. Where a choice of two effect significance descriptors (e.g. Slight/Moderate) is available, only one should be chosen. This choice allows for professional judgement and discrimination in assessing effects on cultural heritage assets on a case by case basis. To aid in the assignment of significance, significance criteria have been developed to enable effective and transparent discrimination between categories. These are listed in Appendix 12B.

29. An assessment of the predicted significance of effect is made both prior to the implementation of mitigation and after the implementation of mitigation to identify residual impacts. This first highlights where mitigation may be appropriate and then demonstrates the effectiveness of mitigation and provides the framework for the assessment of significance which takes mitigation measures into consideration.

30. Impacts are assessed in the same way whether the impact is a physical impact upon an archaeological site or an impact to the setting of a heritage asset.

12.2.5 Indication of Any Difficulties Encountered

31. Public access was not available from some parts of the wider study area to allow for assessment of impacts on the setting of heritage assets. This included some of the scheduled raths. However, assessments were undertaken from the nearest publically accessible point to enable the impacts to be assessed. Walkover surveys of the access tracks were not undertaken as there were no predicted effects by the access tracks due to their construction technique. As the access tracks will not involve topsoil removal this does not affect the assessment and there are no likely significant effects.

12.3 Baseline Conditions

12.3.1 Immediate Study Area

12.3.1.1 Overview

32. The Sites and Monuments Record holds information for 22 sites within the immediate 500m study area. Eleven sites were recorded from the Industrial Heritage Record and seven from the Buildings Database. Twenty-eight additional sites were identified from documentary and cartographic sources

and eight additional sites were identified from aerial photographs (see Appendix 12A and Figure 12.1-12.4).

33. Ulster Museum holds details of 17 archaeological objects accessioned to their collections from townlands within the study area. There were three further records of objects recorded under the Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995 and not added to the museum collection. There are no records of archaeological objects from the immediate study area in published gazetteers held by Ulster Museum. Details of these objects are contained in Appendix 12C.

34. The bracketed numbers after site descriptions within the text relate to those allocated to individual sites on Figures 12.1 to 12.6 and in Appendix 12A.

35. There are three Scheduled Monuments within the study area. These are a steep sided domed mound of uncertain function **(Site Number 54)**, Rawes Fort, a rath and souterrain **(65)**, and another rath known as McNally's Fort **(68).**

36. There are six listed buildings within the study area. These are Mullyloughan House **(35),** listed Grade B and set in formal gardens, and two private residential houses also of Grade B designation **(3 & 4).** Tullydowey House **(21),** set in formal gardens, its associated gate lodge **(21),** and a private residential house **(8)** are all Grade B1 listed.

37. The gardens of The Argory (84) represent both formal and more informal grounds, and survive as part of the National Trust property and parkland. The garden is on the Register of Historic Parks, Gardens and Demesnes.

38. There are no State Care Monuments within the immediate study area.

39. The archaeology of the study area conforms to the settlement pattern of the Irish landscape, with a number of different monument types present. However, there is little evidence for settlement evidence from the prehistoric periods within the immediate study area, although Iron Age settlement is present within the wider area, such as at Navan. Ritual evidence is present within the wider area with evidence of Bronze Age and Iron Age date, which suggests that associated settlement must have been present. There is significant evidence of the Early Christian period, represented by the large number of raths (earthwork enclosures) surviving within the study area. It is possible, however, that some of these began to be constructed and used in the earlier Iron Age period. Other site types of Early Christian date are also recorded, including crannogs and souterrains. A monastery was established in Armagh to the east.

40. There is little evidence for the medieval period within the immediate study area, although towns such as Armagh were established by this date. The surrounding landscape was probably under agricultural use, as it is today, and settlement within the area would likely have been limited to small farmsteads or hamlets, with small field systems associated with them. During the post-medieval period, as the linen trade and other industries grew, the population, and consequently settlement increased. This is reflected in the larger amount of recorded evidence and the types of sites recorded within the study area.

12.3.1.2 Prehistoric

41. The earliest period for which there is archaeological evidence in the study area is the Neolithic (c. 4000 – 2500 BC), represented by find spots of a Neolithic axe and flint knife from the townlands of Ballybrocky and Lisbane. The recorded sites of Bronze Age date (c. 2500 BC - c. 500 BC) are clustered in the townlands of Moy and Culverog and consist of find spots of artefacts from this period found in dredgings from the River Blackwater. In addition large numbers of artefacts have also been found in the townland of Derrryoghill, also from dredgings of the Blackwater. The dredgings were spread on fields within the townland of Derrryoghill. The dredgings were, however, taken from a substantial length of the river and therefore the finds may not have originated from within the study area. These may represent either ritual deposition, accidental loss or the changing environment as sites that would have been on land in the Bronze Age may since have been flooded by the river. They are most likely to represent ritual deposition. Other ritual deposition sites are recorded in the vicinity (Warner *et al* 2004), including the King's Stables **(82),** an artificial deposition site dating to the Bronze Age.

42. There are no recorded archaeological sites dating specifically from the Iron Age (c. 500 BC – c. AD 500) within the immediate study area. This, together with the absence of sites of Neolithic and Bronze Age date, is likely to be due to the lack of archaeologically monitored development in this largely rural area, rather than a lack of prehistoric occupation. Within the wider study area, to the west of Armagh, is Navan Fort, the Seat of the Kings of Ulster from c.300BC to 330AD, although possibly an early monument established some 4,000 years ago (Lynn 1993). This site, on an area of raised ground, is considered ceremonial rather than defensive, and although its origins might lie in the Bronze Age, activity at the site was at its peak in Iron Age (*ibid* 1993).

43. One recorded site of prehistoric date which has not been assigned a more specific period is present within the study area. This is a standing stone, partially buried and embedded within a field bank **(72).**

44. A number of the recorded archaeological sites on the Sites and Monuments Record and those identified from aerial photography are of unknown date. Several of these sites may date to the prehistoric periods, particularly the mound **(54),** a Scheduled Monument, possible enclosure **(34)** and circular cropmark features **(6, 7, 9, 15, 39, & 73-76)** which may represent ring ditches of prehistoric houses or burial mounds.

12.3.1.3 Early Christian

45. The Early Christian period (c. AD 500 – c. AD 850) is the first period with recorded archaeological evidence for settlement in the immediate study area and is dominated by raths (**42, 48, 65, 66, 67, 68 & 71).** Raths are a type of ring fort made of earth found in Ireland and south-west Wales. In Ireland they are mainly dated to the Early Christian period (Bahn 1992). These defensive settlements are common throughout Northern Ireland in this period. Some raths may date to the Iron Age period but those present within the study area have been ascribed an Early Christian date on the Sites and Monuments Record. Many of the raths are positioned on drumlins. These relatively steep-sided mounds were formed during the last glaciation of Ireland, with the lower lying land becoming peat bogs and wetlands, although much of the lower land has since been improved (Clerkin 2008). There is also a souterrain **(65),** associated with Rawes Fort **(65),** a rath. This site is a Scheduled Monument. Souterrains are long stone-built chambers sunk into the ground, roofed with stone slabs, usually beneath a house and are commonly found in association with settlement and were probably utilised for cold storage.

46. Further recorded sites from the Early Christian period include the site of a possible crannog **(12)** (an artificial island in a lake or marsh forming the foundation for a small settlement (Bahn 1992)). This is no longer extant and a new lake has been constructed in this area. The immediate study area also contains the remains of a former church and graveyard **(70)** and the site of a battle in 745 AD between the Ui thuitri and the Int Airthir **(27)** at the River Blackwater.

12.3.1.4 Medieval

47. The recorded archaeological sites of the medieval period (*c.* AD 850 – *c.* AD 1500) include an iron axe head from dredgings of the River Blackwater. In addition to this, numerous other medieval artefacts have been recovered from the Blackwater dredgings in the townland of Derrryoghill. The dredgings were taken from a substantial length of the river and therefore the finds may not have originated from within the study area.

48. The medieval period in Ireland marks a major change in the governance of the country which shaped its settlement patterns and history, with the Anglo-Norman invasion of Ireland in 1169 (Lynch 2001. The country was also divided into four provinces in the 12th century, with areas then sub-divided into parishes (Ghabhláin 1996). The present study area falls within the counties of Tyrone and Armagh, which in turn lie within the Province of Ulster.

49. Agriculture seems to have been the main activity practiced in the area, and many of the field systems recorded within the study area appear to date to the medieval period, or indeed earlier. The often small and irregular nature of many fields, coupled with the way many fields respect earlier monuments such as raths or enclosures, suggests an early date for the fields systems.

12.3.1.5 Post-Medieval

50. It is clear that many of the settlements within the study area were established by the post-medieval period (c. AD 1500 – AD 1900), and a total of 43 assets dating to this period have been identified. Agriculture was the main activity within the study area, with most land utilised for that purpose, although settlement patterns and the demographics of the population were dramatically altered by the establishment of plantations, or English Colonies, throughout the 16th and 17th centuries.

51. A castle is recorded at Benburb from at least the middle of the 16th century with a document describing the site as being held by Shane O'Neill in 1561 (Davies 1941. This site seems to have been sacked by the English at least once, in 1566, although it was re-occupied by 1567 (*ibid* 1941). By the early 17th century the castle formed the centre of the Manor of Benburb, an estate that was increased in the second half of the 17th century by encompassing at least six adjacent townlands along the River Blackwater to the east (*ibid* 1941).

52. The Ulster Plantation (large scale migration into the area by Scottish and English settlers on the authority of the English Crown) began in 1571 with the Enterprise of Ulster. Although these ventures resulted in little success, with only the construction of a fort on the River Blackwater (Connolly 2002. However, during the early years of the 17th century, the process was again tried. In Ulster this process involved dividing the landscape up into 2,000, 1,500, and 1,000 acre holdings. These new estates also resulted in new buildings with manor houses, such as that at Benburb built at the centre of the newly formed land holdings, while defensive structures were also constructed.

53. The mid-17th century also marked another unsettled period for the area with what started as the Ulster Rebellion turning into an element of the English Civil War. The Benburb and Moy area was involved in the conflict from a relatively early stage with a major Irish victory at the Battle of Benburb under Owen Roe on 5th June 1646 (McDonnell 1979). The importance of the area, especially the crossing points on the River Blackwater, are highlighted by elements such as the artillery fort known was Mullan Fort which appear to date to this period **(79).**

54. The mid-19th century marked a major change in the population of the study area due to the Great Famine of 1845-49. The famine that followed resulted in a major population decrease in the counties of southern Ulster, as well as other areas, with the population of Tyrone decreasing by *c.*15%, a figure that was close to the national average (AGH 2011). However, Tyrone and Armagh were more fortunate than other areas due to a large percentage of the population relying on the linen trade. The linen trade was established in Ulster by the late 17th century and continued to develop throughout the 18th and early 19th century (Crawford 2005, 24). Sites linked to linen production include a bleaching mill **(23),** yarn manufactory **(38),** flax mills **(14 & 57),** and associated water management systems **(22 & 59),** while markets were held at a number of settlements including Keady, Moy and Armagh (*ibid* 2005). Indeed the growth of Keady was largely associated with the linen industry in the area.

55. Of the 43 recorded sites from the post-medieval period within the study area, the majority are sites linked to industrial activities. Industrial remains have been identified largely from the historic mapping of the area, and include sites linked to the linen industry mentioned above as well as other trades. These include quarries **(51, 53, 60-64),** gravel pits **(5, 16, 18, 41 & 49-50**) and spoil mounds associated with their operation **(52 & 55).** Other sites include a bleach mill **(23),** yarn manufactory **(38),** flax mills **(14 & 57)** and features associated with the water management for these enterprises **(22 & 59).** A complex of industrial features was also identified including a corn mill, patch mill, flax mill and mill race **(59).** Keady, close to the southern part of the Proposed Development, developed in the 19th century due to the linen industry which grew up in this area.

56. Numerous features associated with new transport links of the 18th and 19th centuries, such as the railway **(43),** canal **(29-31),** bridges over the River Blackwater **(25, 26 & 28)** and road bridges **(11 & 56)** have also been identified within the study area.

57. Several houses **(3, 4, 8, 13, 20, 21, 32, 33, 35 & 44)** of which six are listed buildings, a domestic well **(2)** and a church **(37)** also date from this period. These range from small private dwellings such as the estate workers cottages on Trew Mount Road **(3 & 4)** to larger formal houses such as the Mullyloughan House **(35)** and the Argory **(84).**

12.3.1.6 Modern

58. Modern features (AD 1901 – present) identified in the study area include a smithy **(47),** nursery **(46),** an Orange Hall **(45),** tree ring **(24),** weir **(58),** a residential lodge **(1)** and rectory **(40).**

12.3.1.7 Unknown Date

59. Sites of unknown date, further to the mounds, cropmarks and enclosures discussed in the prehistoric section above, include two holy wells **(10 & 69),** and a graveyard (IGR H 82 45; the exact location is unknown). A mound described as a fort on OS mapping **(19)** has also been recorded. This has since been reinterpreted as a naturally defensible mound, but with no signs of occupation in antiquity.

12.3.1.8 Documentary Evidence

60. The place-names of the area date largely to the post-medieval period (Mills 2003), although archaeological evidence suggests that some of the towns and villages were settled earlier. The exception is Armagh which was first recorded in 444 and either means 'Macha's height' or 'height of the plain'. Other place-names in the area are also derived from information about the topography of the area. Moy is first recorded in 1645 and means 'the plain', Benburb was first recorded in 1621 and means 'the bold peak', and Keady, first recorded in 1854, means 'the flat-topped hill'. Other place-names have also originated from their location. Blackwatertown is, as expected, a village located on the River Blackwater. However, its Irish name (*An Port Mór)* means 'the big landing-place, Milford, in the outskirts of Armagh, means 'ford by a mill' and came from the presence of a linen mill which was located by a ford over the River Callan.

61. Historic mapping was examined at the Public Record Office for Northern Ireland (PRONI). The extensive nature of the mapping means that the maps have not been reproduced in this ES. References, including the PRONI reference number, have been included in the bibliography.

62. The main sources of historic estate mapping information for this region are the private collections of the Ranfurly Estate papers (D/1932 and T/871), 1770-1843, the Charlemont papers (T/1176), 1824, and the Patterson papers (D/266), 1860. The historic maps in these collections are mainly estate maps of townlands detailing the tenants' holdings and the quality and use of the agricultural land.

63. The field layout and landscape has changed little since these maps were produced. The land is described mainly as pasture or arable, which may indicate production of winter fodder, rather than cereals. There are some areas designated as 'bog', particularly around Tamlaght and Farnalay.

64. The Ordnance Survey mapping was first produced in 1833-5 and revised in 1853-60 and 1905-7 for this region. The identified features from the OS mapping have been incorporated into Appendix 12A and can be seen on Figures 12.1 to 12.4. The features are mainly industrial or quarries and have been discussed above.

65. The field boundaries and alignments have changed relatively little since the early edition OS mapping. The main areas of change have been the amalgamation of smaller fields into larger fields from the mid-20th century onwards.

12.3.1.9 Aerial Photographs

66. Available aerial photographs were examined at the Ordnance Survey of Northern Ireland (OSNI). The black and white photographs were examined with a lightbox and magnifying glass to aid the identification of features. A list of aerial photographs examined can be seen in Appendix 12D.

67. Several features were identified from this photography. Three circular features (**6**) were visible in a pasture field. It is unclear from the scale and clarity of the film whether these are archaeological in origin. They may represent ring ditches or burial mounds or they may be the remains of trampled areas around livestock feeding stations that, several years after removal, have weathered to resemble ring ditches. There were no feeding stations visible in the field or surrounding area on the photographs.

68. Two further circular features were identified a few fields to the south of the above features (**7 & 9**). These features are thought more likely to be ring ditches due to their increased size and definition. The ring ditches are most likely to be associated with a prehistoric house, burial mound or rath.

69. The line of the disused Ulster Canal was also noted to the south of the River Blackwater.

70. Two features were identified relatively close together and both may date to the prehistoric or Early Christian periods. A circular feature which may be a ring ditch (**15**) lies to the north of a sub-rectangular feature which has an outer dark edge and a pale centre (**17**), which resembles other features which have been identified as long barrows or souterrains.

71. A small enclosure (**36**) abutting a field boundary on its eastern side was observed. This may be a relic from an earlier smaller field system or may represent a free-standing pound used for keeping livestock.

72. A further sub-circular feature (**39**) was observed in the centre of a field and not abutting any field boundaries. This may be another ring ditch.

73. A mound (**52**) may be the remnants of quarrying activity, as the surrounding landscape appears to have been disturbed.

12.3.1.10 Walkover Survey

74. A walkover survey of the Proposed Development was first undertaken in September 2006 and further visits were made in February and October 2007 to examine areas where the Proposed Development had been amended in the intervening period. Additional site visits were undertaken in February 2011, January 2012 and November 2012 to undertake further assessment of effects on the setting of heritage assets.

75. The study area and the line of the Proposed Development was largely under pasture and used for the grazing of cattle and sheep. Some of the pasture was improved and well maintained, whilst other areas were poorly maintained and contained large quantities of reeds and scrubby vegetation.

76. A number of field boundaries had been removed since the production of the modern OSNI mapping used for the walkover survey. However, these were minor changes relating to the running of agricultural activities in the area and do not have archaeological significance.

77. During the walkover survey the locations of known archaeological sites underlying the Proposed Development or likely to be visually impacted by the Proposed Development were examined. The listed buildings on Trew Mount Road (**4 & 5**) and gate lodge for Tullydowey House (**20**) were still extant, as was the crannog (**12**), Clonfeacle Glebe House (**13**), the line of the disused Ulster Canal (**32**), Tullymore Bridge (**31**), Woulsey's Bridge (**42**) and two raths (**66 & 71**). No evidence was seen for other sites which were noted as close to the proposed line including two possible ring ditches (**16 & 18**), a gravel pit (**49**) and a weir (**57**). These are likely to remain only as buried features or to have been removed completely.

78. No new features of archaeological or historical interest were noted along the Proposed Development.

12.3.1.11 Historic Landscape

79. With the exception of a small area in the north, the majority of the route falls within the Armagh Drumlins landscape area. This landscape is typified by an area of rolling drumlins, hills formed by glacial action. The area predominantly consists of a rural, pastoral landscape, with fields separated by hedgerows which were probably established in the early Christian period (7^{th} or 8^{th} centuries). The study area is interspersed with isolated settlements and small hamlets. The landscape contains areas with long views and may have originally had intervisibility between sites such as raths. However, the deliberate intervisibility of such features is by no means certain. A number of additional elements must be taken into account when assessing this factor. These include the fact that raths as a site type were in use for a period of at least 350 years and it is therefore unlikely that all raths were in use at the same time; some raths may not, therefore, have been designed to be intervisible. It has been suggested that at any one time only a sixth of raths were occupied (Mytum 1992, quoted in Kerr 2007). In addition, the

location of the entrance to each rath should be considered. The size of the earthwork bank would have precluded views from inside the raths apart from the entrances. There have been relatively few changes to the landscape over the last two hundred years, although the number of dwellings in the countryside has increased. However, the historic landscape pattern has been retained. Most of the other changes that have occurred relate to the changing practices of modern agriculture particularly the removal of field boundaries to create larger fields.

80. In the north of the immediate study area, the landscape is quite marshy in nature. Most of the remainder of the route comprises well-maintained pasture fields although there are areas where the land is less well maintained. The southernmost part of the route, for example, contains derelict buildings, and hedgerows are poorly maintained.

12.3.1.12 Archaeological Potential of Immediate Study Area

81. There are 76 archaeological sites recorded within the immediate study area and there is potential for additional archaeological remains to be discovered. The potential for undiscovered archaeology depends on a range of factors included ground type, previous land use, the presence of currently known features and the nature of individual features. For instance the nature of raths as highly visible features mean that the potential for discovery is low, as such features will most likely already be visible. Table 12.4 summarises the predicted likelihood of further discovery in the study area, which is based on these factors. Further details of the justification of these predictions can be found below.

Table 12.4 Archaeological Potential

Period	Visibility	Presence/Absence	Likelihood Of Further Discovery
Early Prehistoric	Poor – no sites recorded	Absent	Low
Bronze Age	Fair – although only unlocated find spots	Limited	Low - Medium
Iron Age	Good – sites within the wider area	Absent	Medium
Early Christian	Good – several recorded earthwork features	Frequent	Medium
Medieval	Poor – only finds spots recorded	Limited	Low
Post-Medieval	Good – several sites and good historic map coverage	Frequent	Low

82. Evidence of Palaeolithic, Mesolithic and Neolithic activity is absent from the immediate study area. No definite evidence yet exists of Palaeolithic occupation of Ireland whilst Mesolithic occupation very rarely survives. Neolithic evidence in Ireland often takes the form of ritual monuments but there is a dearth of these in the area. Given the lack of any archaeological remains from these periods the potential for previously unrecorded sites is considered to be low.

83. Although evidence of Bronze Age occupation has been recorded within the study area, evidence is currently limited to unlocated find spots discovered during dredging of rivers. There is, however, further evidence of Bronze Age date within the wider study area, although no settlement remains are known. The possibility of discovery of additional sites cannot be discounted and the potential is considered to be low to medium.

84. There is little evidence of Iron Age date within the immediate study area, although there are sites of this date within the wider study area. Several sites of unknown date may date to the Iron Age. While it is likely that few Iron Age settlements remain to be discovered in the wider area, there is currently little evidence of settlement. Therefore the possibility of discovery of previously unrecorded sites of Iron Age date is considered to be medium.

85. There are several sites of early Christian date recorded in the area. These encompass raths across the area. Raths probably formed defensive settlement locations. Given the good coverage of these

sites across the area it is unlikely that additional sites of this type will be discovered. Associated remains, such as field systems, could survive. It is considered that the potential for discovery of sites of this date is medium.

86. There is little evidence dating to the medieval period within the immediate study area, although Armagh was established by this date. The surrounding landscape was probably under agricultural use with scattered settlement. The potential for discovery of previously unrecorded sites is therefore considered to be low.

87. Although there are a large number of sites of post-medieval date recorded in the area, the potential of discovery of previously unrecorded sites is considered to be low. This is because analysis of historic maps and aerial photography confirms the sites of this date and therefore few sites are likely to remain to be discovered.

12.3.2 Wider Study Area

88. An area of 5km from each side of the centre line of the Proposed Development and from the boundary of the substation area was examined for Scheduled Monuments, State Care Monuments, entries from the Historic Parks, Gardens and Demesnes, listed buildings and Conservation Areas. Some sites outside of this area were also considered as English and Scottish guidance on setting indicates that setting assessments should not be constrained to a pre-defined zone at the initial stages of assessment.

89. Within this wider study area there are four monuments under State Care, 19 Scheduled Monuments, 32 listed buildings, two entries on the Register of Historic Parks, Gardens and Demesnes of Special Historic Interest, one Conservation Area and one Area of Special Archaeological Interest. The majority of the Scheduled Monuments comprise raths scattered across the landscape, while there are also several forts of Iron Age date. The Area of Special Archaeological Interest is at Navan to the west of Armagh. This area contains a number of the Scheduled Monuments. Full details of the sites can be seen in Appendix 12E. The affected sites are shown on Figures 12.5 and 12.6.

90. Although not a designated site, the setting of the site of the Battle of Yellow Ford (**97**) has also been considered due to public interest in this site. This battle was fought in 1598 between Marshall Bagnall and O'Neill. There are no visible remains surviving.

91. A number of additional assets were considered within the wider area, including the Armagh Cathedrals. Due to distance and intervening topography these sites have been scoped out of the assessment as they are located sufficiently far away so that likely significant impacts on their setting would not occur.

92. These assets were visited during site visits to the area and only sites where impacts are possible have been assessed in the following sections.

12.3.3 Value of Heritage Assets

93. The value and significance of heritage assets that could be affected by the Proposed Development are discussed below. Other sites that have not been assessed are either located sufficiently far away for impacts to be minimal or non-existing or their setting does not contribute to their significance and consequently the construction of the Proposed Development will not affect them.

94. An undesignated lodge (1) is located within the area of the substation. This is shown on historic mapping dating to the early 20th century as being a square building with a projecting bay. There is still a building at this location but it is unclear whether this is a new structure or whether the original building has been extended. The asset is considered to be of no more than low value and only has very limited architectural significance. The building has been altered so that the original structure is no longer apparent.

95. The Grade B listed buildings known as 164 and 166 Trew Mount Road, Moy (3 & 4), represent a pair of two storey estate cottages built c. 1860. Set slightly off Trew Mount Road, the houses are surrounded by garden and parking areas which in turn give way to fields. They have architectural significance linked to their specific form, and they also have historical significance associated with their role in the development of land use and the local estate holdings in the area. As private houses that were not designed to have wide/distant views, or be visible in the landscape, their setting is not considered to contribute to their significance.

96. Number 142 Moy House (8) is a two-storey thatched house dating to c. 1741 which may have formally been a public house. It is designated as a Grade B1 listed building. As well as the main house, the asset consists of outbuildings including stables and barns around a rectangular courtyard. As a result of its form and listed status it is considered to be of high value. The complex is considered to have architectural significance due to the style of the building, and the various structures that make up the asset. It also has historical significance resulting from its role as an inn or public house, and its place within the community and settlement. As an inn it would have been deliberately sited along the road, although it was not designed to have far reaching views, or be visible in the wider landscape. As a result the setting of the asset only contributes to its significance to a minor extent.

97. The two-storey lodge house to Tullydowey House (20) was built in 1843 to serve the larger main house located to the south of the lodge along the main drive. The white rendered lodge, with slate roof and decorative edging around the gables has architectural significance due to the style of architecture which it represents. It also has historical significance associated with its place it history of settlement in the area, and the development of the house and estate which it served. It is considered to be of high value as it is a Grade B1 listed building. As a gate lodge, the building was designed to face the approach to the entrance to the main Tullydowey House. The lodge therefore faces east, away from the proposed line. Although it was not designed to have any long ranging views, it was designed to be seen as people approached the main house. However, this lodge was the secondary lodge along a secondary access to the house. As such, its setting contributes to its significance to only a minor extent.

98. Tullydowey House (21), and its associated gardens and outbuildings, is a two-storey building with elements dating to the 1700s and later additions and alterations. It is located between the settlements of Benburb and Blackwatertown in a rural location, and in a slightly elevated position. As the asset is a Grade B1 listed building it is considered to be of high value. It is considered to have architectural significance as the asset represents an example of a relatively large formal house with associated outbuildings. It also has historical significance linked to its role in the development of settlement in the area. As the house is set within its own grounds, and was designed to have some views across the surrounding landscape, its setting is considered to contribute to its significance.

99. The Ulster Canal (31) was completed in 1841 following many years of uncertainty due to funding and issues with the engineering. The canal failed to attract sufficient usage and within three years of the Ulster Railway reaching Monaghan, in 1858, the canal had fallen into disrepair. In 1865 the government took control and made repairs to the canal which reopened in 1873. By 1929 the canal had fallen out of use and was abandoned. Although the asset is not designated, it is considered to be of medium value due to the role it played in the development of the local infrastructure. The canal has historical significance due to its industrial heritage and is association with the industrial development of the area. Excavation of the asset could also improve the understanding of the asset and therefore it has some limited archaeological significance. The asset was not designed to have any views, but the nature of the canal resulted in it being a major feature in the landscape. The canal as a whole runs through both urban and rural areas. The setting of the asset only contributes to it significance in that a specific route was chosen.

100. Mullyloughan House (35), also known as Glenaul House, is an L-shaped late Georgian two-storey house built in 1830. A formal laid garden was formerly located to the west of the house, although this now appears to have partly been built over. This in turn gave way to parkland which also surrounds the house. As a Grade B listed building it is considered to be of high value. The house has architectural significance as it represents a fine example of a Georgian house, while it has historical significance due to its role in the development of settlement in the area. The positioning of the house suggests that it was designed to have views over its surrounding formal gardens and parkland, as well as the wider area. As such its setting is considered to contribute to its significance.

101. The Scheduled Monument known as Rawes Fort (65) survives as a roughly circular enclosed area of land c.32m by 28m, with a surrounding bank and ditch surviving as reasonably well-preserved earthworks. As the site is located on a ridge of high ground it commands views to the north, south and east, while a large depression may represent a souterrain. Its scheduled status means it is of high value, and the site is considered to have archaeological significance as excavation or fieldwork could add to our understanding of the site. Like other raths in the area, Rawes Fort was constructed to occupy a dominant position in the landscape. As such its setting is considered to contribute to its significance.

102. A rath (68) is located on a ridge with good views to the south. It survives as an earthwork feature with both banks and ditch visible. Although the bank varies in size and has been reduced over time, it seems to have been c. 3m wide, while the ditch is c. 2.8m in width. The site is of high value due to its scheduled status, and it is considered to have archaeological significance as excavation would help with the sites interpretation. The asset was designed to occupy a dominant location in the landscape, and as a result of this it was constructed on high ground with views over the surrounding area. As such its setting is considered to add to its significance.

103. A rath (71), which has been remodelled to form a tree ring, has also had its east side straightened and the west side slightly cut by a trackway. However, the site still retains a roughly circular shape c. 30.5m in diameter with its surrounding bank surviving up to 4m in width. The site is of considered to be of medium value, and has archaeological significance as excavation could improve our understanding of the site. The asset was originally designed to be a significant feature in the landscape, and it is located slightly to the east of the summit of a prominent and commanding hilltop. As a result the setting of the asset contributes to its significance.

104. Sessiamagroll Fort (77) is an impressive earthwork site exploiting a drumlin top. Initially a rath, the site was later remodelled to form a motte and bailey castle, and has good views over the surrounding area. The asset is of high value as it is a Scheduled Monument, and it has archaeological significance. The fort also has historical significance linked to its role on the history and development of the area. The site occupies an elevated position, and its location was chosen as it commands views over the surrounding area. The asset was designed to be both seen from the surrounding landscape and have views over the landscape and as such its setting contributes to its significance.

105. The Scheduled Monument known as Lisgobban Rath (78) is a bivallated rath surviving as an earthwork, although it is heavily overgrown with thorns and other vegetation. Located on the top of a drumlin, the asset has views over the local landscape and is intervisible with Sessiamagroll Rath (77), and Curran Lough Crannog (94). The site is of high value due to its scheduled status, and is considered to have archaeological significance as excavation would improve the understanding of the asset. As the site is located in an elevated position it commands views over the surrounding landscape. Its setting is considered to contribute to its significance.

106. Mullan Fort (79) is a D-shaped artillery fort located on a raised platform of land overlooking the River Blackwater near the junction of Artasooly Road and Blackwatertown Road. Although now relatively overgrown and the full extent of the site is not known, it is a Scheduled Monument and considered to be of high value. The site is also considered to have historical significance linked to the military history of the area, while it is also considered to have archaeological significance as excavation of the site may improve its interpretation and understanding. It is clear that, as an artillery fort located on a raised platform of land, the asset was designed to have views across the surrounding landscape. It is also possible that it would have been designed to have been a prominent feature in the landscape and to act as a deterrent. As a result the setting of the asset contributes to its significance.

107. The enclosure located to the north of the Navan Fort Road (80) is located on an area of high ground largely used for arable agricultural. The site does not survive as a distinctive earthwork, although elements of its original form appear to be visible and incorporated into the field boundary which is irregular in shape in this area. As the asset is designated as a Scheduled Monument it is considered to be of high value. It has archaeological significance due to its survival as an earthwork, and the possibility that further remains survive as sub-surface features. It also has historical significance linked to its place in the development of settlement in the area. Although the purpose of the asset is not fully understood, the fact that it is an enclosure on a raised area of land may suggest it was designed to have been at least partially defended, and therefore have some views of the surrounding landscape. As a result its setting could be considered to contribute to its significance.

108. The large late Bronze Age hillfort known as Haughey's Fort (81) largely survives as a cropmark due to ploughing removing most traces of the surrounding bank. Originally enclosing an area c.150m in diameter, excavations at the site revealed the outer ditch to be up to 4m wide and 2.4m deep, while aerial photographs have picked up two more possible outer ditches. As the asset is a Scheduled Monument it is of high value, and it is considered to have archaeological significance as further excavation could improve its understanding. As the site was originally designed to be a prominent feature in the landscape, and would have been viewed from the surrounding area, its setting is considered to contribute to its significance.

109. The King's Stables (82) is a man-made flat-bottomed basin sunk c.3.5-4m below the surrounding landscape, with a 25m diameter. A low bank surrounds and encloses the pond, and excavations at the site have recovered animal and human bone, along with clay mounds used for manufacturing swords. These items have dated the site to the first half of the fist millennium BC. The site is of high value due to its scheduled status, and it has archaeological significance as further investigations of the site might supply additional information relating to its use. It also has historical significance associated with its role in the development of settlement in the area, and how it was used/perceived by the surrounding population. The location of the asset in a low-lying position suggests that it was not designed to be viewed from the surrounding landscape in the same way as a rath. However, its size would suggest that it was designed to be visible to a certain extent, while its positioning near the Navan complex may also be significant. As a result it is considered that the setting of the asset contributes to its significance.

110. The State Care Monument of Navan Fort (83 & 95) is located to the west of Armagh and is a former royal seat of the Kings of Ulster and the ancient capital of the Province. Exploiting the natural higher ground, the fort is a prominent feature in the landscape and has historical significance linked to its place in the ruling and development of the landscape. It also has archaeological significance as excavation of the site could greatly increase our understanding of the site and add to the data recovered from previous excavations. The site could also be considered to have some artistic significance linked to its place in the history of the Kings of Ulster. Its designated status means it is considered to be of high value. The asset is a distinctive feature in the landscape and was originally designed to be prominent with views over the surrounding area. It was a large monumental structure from where the Province could be ruled, and as such the setting of the asset contributes to its significance.

111. The Argory (84a) is a large Irish gentry house built in the 1820s and now managed by the National Trust. Located in 320 acres of parkland and wooded riverside, the house and associated outbuildings are positioned on an area of raised land offering views over the estate which surrounds it. As a Grade B+ listed building it is considered to be of high value. The house has architectural significance due to its style and form, and historical significance linked to its place in the development of the estate and the management of the landscape. The house is located within extensive grounds, and also commands views over the surrounding area. As such its setting is considered to be its own private parkland as well as the wider area, and as a result its setting is considered to contribute to its significance.

112. The gardens (84) which surround the house known as the Argory represent both formal and more informal grounds, and survive as part of the National Trust property and parkland. The garden is on the Register of Historic Parks, Gardens and Demesnes. The formal gardens are limited to the area immediately in front of the house, and give way to woodland walks that run to the river that borders the estate. Due to its designation and connection with the listed building, the gardens of the Argory are considered to be of high value. They have historic significance as they represent a major feature of the estate and were designed by the architects A & J Williamson. Elements also have architectural significance due to features that they incorporate, such as gate lodges. Although the gardens are linked to the house, they were designed to have some views of the surrounding landscape which falls outside of the managed parkland. As a result the setting of the asset contributes to its significance.

113. This large enclosure (85) is located on top of a low drumlin, and measures some 100 east-west, and 105m north-south. Although sections have been altered to conform to the modern-day field system and the bank has been lost, the original ditch which defines the site can be observed in some areas. The site is of high value due to its scheduled status, and has archaeological significance as fieldwork might improve our knowledge and understanding of the site. The asset, like many other raths and enclosures

in the area, was constructed on high ground and would have been visible within the surrounding landscape. As such the setting of the asset is considered to contribute to its significance.

114. Lisglynn Fort (86) consists of a substantial rectangular earthwork defined by a large bank and ditch, with a single entrance in the north-west side. The bank survives up to 2m in height, while the ditch is up to 3.5m below the bank. It has been suggested that the site was originally a rath that was later remodelled in the 17th century, while a note from 1848 refers to a stone vault within the site. This may be a souterrain although no trace of this feature survives. The site has historic significance linked to its place in the development of settlement in the area, and the phases of activity that have taken place at the site. The asset also has archaeological significance as excavation could improve our understanding of the site. Its scheduled status means it is considered to be of high value. The site of Lisglynn Fort would seem to have been used as a defended site for at least some of its life, and was designed to be prominent in the landscape. As such the setting of the asset is considered to contribute to its significance.

115. This rath (87) survives as a well preserved earthwork feature measuring c. 42m across with a small bank, and an outer ditch. An additional outer bank is also recorded to have originally existed, but this was levelled to fill the ditch. The site is of high value due to its scheduled status, and has archaeological significance as investigations at the site might add to its understanding. The asset would have been visible from the surrounding area as it was constructed on an area of high ground. This would also have provided it with views over the surrounding area, and as such its setting is considered to contribute to its significance.

116. Located in a prominent position on the crest of a drumlin ridge, the rath (88) survives as an earthwork which has been modified to conform to the modern field system in areas. The asset is roughly circular in shape and measures c.32m across, with a substantial bank surrounding the central area, and the ditch visible in most areas. A more recent lime kiln has also been recorded within the enclosure. The designation of the asset means it is of high value. The site has archaeological significance as fieldwork may improve the understanding of the site. The elevated positioning of the asset provides it with views over the landscape which surrounds it, and also makes it visible. As a result the setting of the asset contributes to its significance.

117. The Grade B1 listed “Stone Tower” (92) is located on an area of high ground to the north-east of Moy and to the west of the former home farm for Roxborough Castle. Due to its designation it is considered to be of high value. The area surrounding the tower is grazed and relatively free from extensive tree cover, and as a result the tower is a prominent feature on the landscape. Its structural form means it has architectural significance, while it also has historical significance associated with its place in the development of the landscape. It is clear, from the dominant nature of the structure and it’s positioning on an area of raised ground, that the asset was designed to be seen from, and have views over, the surrounding landscape. As a result it is considered that the setting of the asset contributes to its significance.

118. The Grange (93) is an early 19th century rebuild of a 17th century dwelling located on a raised area of land surrounded by private grounds and some woodland. As a Grade B listed building the asset is considered to have a high value. The structure is considered to have architectural significance due to the style of the building, and it is also considered to have historical significance as it represents an element in the development of settlement in the area. The Grange is located within large private grounds, with trees surrounding both the grounds and the house. As a result the house is relatively secluded. However, the house is located in a prominent position and as such the setting of the asset is considered to contribute to its significance, but only to a minor extent.

119. The Moy Conservation Area (96) is focused on the centre of the settlement of Moy which is located on the River Blackwater. The settlement is linked to its twin town of Charlemont by three arched stone bridge built in 1855, and its importance as a crossing place on the River Blackwater resulted in the construction of Charlemont Fort in 1602 (DOENI 1984). The main centre of Moy, which represents the Conservation Area, was set out in 1764 by the Earl of Charlemont as a result of increased prosperity in the area from the limestone quarries (*ibid.*). The plan was based on Marengo in Lombary, and consists of a number of designated and non-designated buildings around a central square, or diamond, forming the focal point. As a collection of buildings the Conservation Area is considered to have architectural significance, along with historical significance due to its place in the development of the settlement. Its status as a Conservation Areas means it is considered to be of medium value. Although it was not

designed to have major outwards views, the relatively unspoilt nature of the central area is the reason it has been designated a Conservation Area, and as such its setting adds to its significance.

120. The Battle of the Yellow Ford (97) took place on the 14th August 1598 and represents the largest single defeat suffered by the English army during the 16th century in Ireland (Connolly 2007, 632). The Queen's army, lead by Henry Bagenal, were taking supplies to Blackwater Fort when they were ambushed by Hugh O'Neill, and the battle that followed resulted in the death of Bagenal and 800 of his men (*ibid* 2007, 632). As a result of this defeat the Blackwater and Armagh forts were abandoned. Although no visible remains now survive, the battlefield is considered to have historical significance due to its role in the history of the region. It is also considered to have archaeological significance as detailed field survey and excavation might provide additional information regarding the battle. As a number of paintings of the battle have been produced, and its story has gone down in Irish history and folklore, the battle can also be considered to have artistic significance, and the site is considered to be of medium value. Although the landscape of the battlefield was not designed to have long reaching views, the layout and "difficult terrain" form an important element of the battlefield (*ibid* 2007, 632). As a result of this the setting of the battlefield is considered to contribute to its significance.

121. The settlement of Benburb contains a number of heritage assets which form key elements of the settlement. These relate to various elements of life in the settlement including the ecclesiastic and defensive/military heritage. The oldest of these sites is Benburb Castle (90) which is linked with the 17th century plantation which marked a major change in the settlement of the area. It stands on raised ground, is open to the public and is in State Care. It is considered to be of high value. The second asset in Benburb, the Servite Priory (98), stands on the opposite side of a valley. It is considered to be of no more than medium value. This religious holding was originally built as a private house in the 19th century, and was later used as a hospital during the Second World War before becoming a Servite Priory. The land between the castle and the priory is occupied by a plantation period demesne (89). This park runs along a section of the Blackwater River in Benburb, and forms an area of parkland. It is on the Register of Historic Parks, Gardens and Demesnes and is consequently of high value. A number of listed buildings are also recorded within Benburb, including a Presbyterian Church (91), St Patrick's church (99) and a number of private houses. These are all of high value.

122. All of the assets have historical significance as they form parts of the development of the settlement of Benburb, and form elements of its landscape. The castle, listed buildings and priory have architectural significance as the buildings that form the various assets represent various styles form the 17th century onwards. The castle also has archaeological significance as excavations at this site would provide further information relating to the history and development of the asset.

123. Most of the listed buildings and the priory are located within the village and their setting is limited to the village itself. The village setting only contributes in a minor way to the significance of these assets. The castle was located to have good views over the surrounding area. However, these views are largely limited to the valley of the Blackwater River, and views are restricted due to the surrounding woodland and more recent development of Benburb. The demesne is associated with the castle and therefore the setting of the parkland does not contribute to its significance to any great extent outside of that association.

12.4 Potential Impacts

12.4.1 Construction Phase

12.4.1.1 Overview

124. Several recorded cultural heritage sites within the wider study area have the potential to be impacted by the Proposed Development. The impact assessment criteria can be seen in Tables 12.2 to 12.4 above.

12.4.1.2 Substation Site

125. Only one heritage asset is recorded within the footprint of the proposed substation. This is the site of a lodge recorded from early 20^{th} century historic mapping. It is not anticipated that any remains of this lodge survive as they appear to have been built over or the building extended to such an extent that the original structure is no longer apparent. Therefore the magnitude of change is considered to be no change, resulting in a neutral significance of effect.

126. There is a potential that previously unrecorded archaeological sites may be discovered during construction. The potential for discovery is considered to be relatively low as no previously unrecorded sites were noted during the walkover survey.

12.4.1.3 Overhead Line and Towers

127. No recorded archaeological sites will be directly impacted by the proposed tower locations.

128. Although there are no direct physical impacts upon recorded archaeological sites, there is the potential for previously unrecorded archaeological sites to be discovered during construction. As the exact nature of any such sites is currently unknown the magnitude of impact cannot be determined at this stage.

<u>Access tracks</u>

129. No topsoil removal is required for the construction of access tracks. Where possible, existing tracks have been incorporated into the proposals and will be used. Any new tracks will be constructed on the surface. Therefore access track construction will not impact upon any archaeological sites.

<u>Existing Services</u>

130. In a number of areas undergrounding of existing overhead services will be required. None of these affect any recorded archaeological sites.

12.4.2 Operational Phase

12.4.2.1 Substation

131. There will be no impact on the setting of any heritage assets caused by the substation.

12.4.2.2 Overhead Line and Towers

132. A number of heritage assets within both the immediate and wider study areas will have their setting affected during operation of the proposed overhead line and towers.

133. The sites which will be affected by the Proposed Development are detailed in Table 12.5 below. Further description on these effects is discussed below the table.

134. A number of sites of high value were also assessed due to their public interest. These were all found to have a neutral significance of impact. These are the Ulster Canal (31), Haughey's Fort (81), The King's Stables (82), Navan Fort (83), Navan Area of Special Archaeological Interest (95), Moy Conservation Area (96) and the Battle of Yellow Ford (97). Sites in Benburb are also unaffected.

Table 12.5 Operational Impacts

Site	No. On Fig. 12.1-12.6	Potential Impact Type	Value	Magnitude of Change	Significance of Impact
164 & 166 Trew Mount Road. Listed Building	3 & 4	Permanent, Operational.	High	Minor negative	Slight adverse
142 Moy Road, Grade B1 listed building	8	Permanent, Operational.	High	Minor negative	Slight adverse
Gate Lodge for Tullydowey House. Listed Building	20	Permanent, Operational.	High	Moderate negative	Moderate adverse
Tullydowey House. Listed Building	21	Permanent, Operational.	High	Minor negative	Slight adverse
Mullyloughan house/ Glenaul House. Listed Building	35	Permanent, Operational.	Medium	Minor negative	Slight adverse
Rawes Fort. Scheduled Monument	65	Permanent, Operational.	High	Moderate negative	Moderate adverse
Rath	68	Permanent, Operational.	Medium	Moderate negative	Moderate adverse
Rath	71	Permanent, Operational.	Medium	Moderate negative	Moderate adverse
Mullan Fort. Scheduled Monument	79	Permanent, Operational.	High	Moderate negative	Moderate adverse
Possible enclosure at Ballydoo. Scheduled Monument	80	Permanent, Operational.	High	Minor negative	Slight adverse
The Argory. Registered Garden	84	Permanent, Operational.	High	Minor negative	Slight adverse
The Argory. Listed Building Grade B+	84a	Permanent, Operational.	High	Negligible	Slight adverse
Rath and souterrain at Lisglynn. Scheduled Monument	86	Permanent, Operational.	High	Minor negative	Slight adverse
Stone Tower, Grade B1 listed building	92	Permanent, Operational.	High	Minor negative	Slight adverse
The Grange. Listed Building Grade B.	93	Permanent, Operational.	High	Minor negative	Slight adverse

135. The Grade B listed estate cottages (3 & 4) are considered to be of high value. Both houses will have views of the proposed overhead line and towers, although this will be reduced due to surrounding trees and the topography of the area. The rolling topography also appears to block views of the proposed converter station. As a result the magnitude of change is considered to be minor negative, and this would result in a slight adverse significance of impact.

136. The listed building of 142 Moy Road (8) is considered to be of high value. As a farm building, it was not originally designed to have any far reaching views, with the setting of the asset being the courtyard in which it sits. There will be views of the proposed overhead line and towers, although this will be reduced due to surrounding trees and the topography of the area. As a result the magnitude of change is considered to be minor negative, and this would result in a significance of impact of slight adverse.

137. The gate lodge at Tullydowey House (20) is considered to be of high value. It is located near the main road, and forms a key element in one of the approaches to the main house, with its setting being the parkland of the house, and the access road on which it is located. As the asset is a gatehouse, it was not designed to have any far reaching views. However, the overhead line passes directly behind the lodge and a tower is located nearby. Therefore there will be a moderate negative magnitude of change, resulting in a significance of impact of moderate adverse. Further assessment is included in Appendix 12F.

138. The Grade B1 Tullydowey House (21) is considered to be of high value. Although the parkland and gardens that surround the asset form its setting, the asset would have been designed to have some

wider views of the surrounding landscape. However, the mature nature of the woodland that now surrounds the asset provides some screening and will limit views of the proposed overhead line and towers. As a result the magnitude of change is considered to be minor negative, resulting in a slight adverse significance of impact.

139. Mullyloughan House (35) is of high value. Although the house has some views over the surrounding landscape, including to the east and the area of the Proposed Development, these are limited by tree cover. This results in magnitude of change of minor negative, with the significance of impact of slight adverse.

140. Rawes Fort (65) is considered to be of high value. As the asset survives as a relatively well preserved earthwork in a prominent position, it is a visible from the surrounding area. When originally constructed the site was designed to be visible, and was also designed to have far reaching views. The elevated location of the asset allows it views over the surrounding landscape, including the area of the Proposed Development. However, the views of the proposed overhead line will be limited to the east and south, and will be further reduced by trees and shrubbery. As a result of this the magnitude of change is considered to be moderate negative, resulting in a moderate adverse significance of impact.

141. The rath (68) is considered to be of high value. Although the asset was designed to be a prominent feature in the landscape, some of the views from the asset have been reduced due to vegetation and tree growth on the site. However, the asset still commands good views, especially to the south, and will have views of the proposed overhead line and towers to the north-east, east, and south-east. As a result the magnitude of change is considered to be moderate negative, resulting in a moderate adverse significance of impact.

142. The rath (71) is considered to be of medium value. Although the site has been planted and remodelled to form a tree ring, it still forms a key element in the landscape. It was originally designed to have views over the landscape around it, but these have been partially reduced now due to the tree cover. However, it is still a dominant feature when viewed from the road. There will be views of the development from the asset, and the towers will become the dominant feature in the landscape. Therefore the magnitude of change is considered to be moderate negative. This will result in a moderate adverse significance of impact.

143. Mullan Fort (79) was designed to have views over the surrounding area and it still commands views over the landscape. Although the significance of the asset is partially derived from archaeological and historic information, there will still be partial views of the overhead line and towers from the asset. As a result the magnitude of change is considered to be moderate negative, resulting in a significance of impact of moderate adverse.

144. The enclosure (80) is of high value. Although the monument survives in a much reduced state, it may originally have had views across the landscape, and would have been visible from the surroundings. However, in its present state its significance is primarily derived from its archaeological significance. Therefore, although there will be some views of the Proposed Development from the asset, magnitude of change is considered to be minor negative, resulting in a significance of impact of slight adverse.

145. The Argory (84a) is considered to be high value. From ground level there will only be very limited views of the Proposed Development due to the amount of extant tree cover. Even in winter when leaf cover is minimal views will be very limited. While there are some limited views from upper storeys of the house these are unlikely to worsen the existing condition as the proposed line will be less dominant than other modern features (e.g. existing power lines, telegraph poles etc) already present. In addition, the distance of the asset from the development will reduce the impact on the setting of the asset. As a result the magnitude of change is considered to be negligible, resulting in a slight adverse significance of impact. Further assessment is included in Appendix 12F.

146. The gardens (84) that surround the Argory are considered to be of high value. Areas of the gardens were designed to be open and allow views out to the surrounding landscape. However, the distance from the grounds to the Proposed Development, along with the topography and surrounding tree cover/hedge lines, will limit the impact on the asset. Only occasional views will be had of the Proposed Development and an existing powerline already exists in these views. As a result the magnitude of change is considered to be minor negative, resulting in a slight adverse significance of impact.

147. The enclosure (85) surviving as a slight earthwork is considered to be of high value. Both the distance of the asset from the Proposed Development, and the intervening topography and tree cover in between will limit views of the Proposed Development. As a result there a magnitude of change of no change and the significance of impact is therefore considered to be neutral.

148. Lisglynn Fort (86) is considered to be of high value. As the asset still survives as an extant earthwork feature on an area of raised ground, it is visible from the surrounding area, and appears to have views over the landscape around it. While there will be views of the Proposed Development, these are only in one direction from the rath. The proposed towers will be located below the level of the skyline and therefore will not become a focal point in views from the asset. In addition, any views of the proposed overhead line and towers would be reduced due to the distance from the asset. The Proposed Development will not reduce the significance of the asset and as a result the magnitude of change is considered to be minor negative, resulting in a slight adverse significance of impact.

149. The “Stone Tower” (92) near Roxborough Castle is located on an area of high ground overlooking much of the landscape north of Moy. The Proposed Development will be located to the north of the asset, although any views of the overhead line, the towers and the substation will be limited due to the distance between them. As a result the magnitude of change is considered to be minor negative, resulting in a slight adverse significance of impact.

150. The Grange (93) is considered to be of high value due to its listed status. Although it was designed to have some outward views from the main house, many of these have been reduced due to the surrounding tree cover which forms part of the parkland. This cover, together with the distance from the overhead line and towers, and the general topography, will reduce the impacts on the significance of the asset. As a result the magnitude of change is considered to be minor negative. This would result in a slight adverse significance of impact.

151. It should be noted that some of the setting impacts differ from assessments made in the landscape section. This is because the landscape impact considers wide-ranging landscape views whereas the cultural heritage impacts consider the settings of individual sites.

12.4.2.3 Maintenance

152. There will be no impacts on archaeology and cultural heritage during maintenance of the towers.

12.5 Mitigation Measures

153. Where possible proposed tower locations were moved to avoid direct physical impacts upon cultural heritage features. This has ensured that there are no direct physical impacts upon previously recorded archaeological sites and features.

154. An archaeological watching brief will be undertaken during the excavation of the footings and foundations for all towers, at the site of the substation, at locations where undergrounding of services is required and other areas of intrusive works. Although no recorded sites will be directly affected, the potential remains for previously unrecorded sites to be located during construction. Any mechanical excavation will be undertaken using a toothless bucket under archaeological supervision. If archaeological remains or artefacts are discovered, sufficient time will be allowed for an archaeological team to appropriately excavate, clean and record the remains.

155. Although not affected by the Proposed Development, site 71, a rath, is located close to the stringing location in this area. Therefore the boundary of the Proposed Development will be fenced off during the construction of towers in this location to avoid accidental impact on the rath.

156. It is proposed to construct access tracks without removal of topsoil. Therefore no archaeological mitigation is required.

157. All archaeological mitigation will be agreed prior to commencement of works with NIEA and archaeological excavation will be carried out by an appropriately licensed archaeologist.

158. The setting of heritage assets is largely reliant upon long distance views, and therefore mitigation measures such as screen planting are not appropriate as they would adversely affect the context of the sites.

159. There are no appropriate mitigation measures for impacts to the setting of heritage assets.

12.6 Residual Impacts

12.6.1 Construction Phase

12.6.1.1 Substation

160. The significance of impact on cultural heritage by the construction and operation of the substation is considered to be neutral based upon currently recorded archaeological sites.

12.6.1.2 Overhead Line and Towers

161. There are no direct physical impacts on recorded archaeological sites and therefore the impact is considered to be neutral. Due to the short duration of construction works impacts on the setting of heritage assets in the construction phase have not been assessed.

12.6.2 Operational Phase

162. The residual magnitude of impacts will not change. The resulting significance of impact upon each of the sites is shown in Table 12.6 below.

Table 12.6 Residual Significance of Impacts

Site	No. On Fig. 12.1-12.6	Value	Residual Magnitude of Change	Residual Significance of Impact
164 & 166 Trew Mount Road. Listed Building	3 & 4	High	Minor negative	Slight adverse
142 Moy Road, Grade B1 listed building	8	High	Minor negative	Slight adverse
Gate Lodge for Tullydowey House. Listed Building	20	High	Intermediate negative	Moderate adverse
Tullydowey House. Listed Building	21	High	Minor negative	Slight adverse
Mullyloughan house/ Glenaul House. Listed Building	35	Medium	Minor negative	Slight adverse
Rawes Fort. Scheduled Monument	65	High	Intermediate negative	Moderate adverse
Rath	68	Medium	Intermediate negative	Moderate adverse
Rath	71	Medium	Intermediate negative	Moderate adverse
Mullan Fort. Scheduled Monument	79	High	Moderate negative	Moderate adverse
Possible enclosure at Ballydoo. Scheduled Monument	80	High	Minor negative	Slight adverse
The Argory. Registered Garden	84	High	Minor negative	Slight adverse
The Argory. Listed Building Grade B+	84a	High	Negligible	Slight adverse
Rath and souterrain at Lisglynn. Scheduled Monument	86	High	Minor negative	Slight adverse
Stone Tower, Grade B1 listed building	92	High	Minor negative	Slight adverse
The Grange, Grade B listed building	93	High	Minor negative	Slight adverse

12.7 Conclusions

163. An archaeological watching brief should be maintained during removal of topsoil and subsoil in all areas of disturbance. All sites will be fenced during construction to avoid accidental damage. The Proposed Development will impact the setting of several archaeological sites and built heritage features. The setting of heritage assets is largely reliant upon long distance views, and therefore mitigation measures such as screen planting are not appropriate as they would adversely affect the context of the sites and therefore there will be no reduction in the significance of impact upon individual sites.

164. The overall significance of impact is considered to be moderate adverse due to impacts upon the setting of designated sites within the wider area.

12.8 References

AGH (2011) http://www.ahg.gov.ie/en/NationalFamineCommemoration2011/Great%20Irish%20Famine-%20final%20presentation%20_2_.pdf

Bahn, P. (ed.) (1992) *Collins Dictionary of Archaeology* Glasgow: HarperCollins Publishing

Burgess, C.B. and Gerloff, S. (1981) *The Dirks and Rapiers of Great Britain and Ireland* Munich: C.H. Beck'sche Verlongsbuchhandlung.

Clerkin, S (2008) "Heritage of Monaghan County" in Bailey, M. E. (ed.) *Border Heritage: Tracing the Heritage of the City of Armagh and Monaghan County* Belfast: The Stationary Office.

Connolly, S. J. (ed.) (2002) *Oxford Companion to Irish History* Oxford: Oxford University Press.

Crawford, W. H. (2005) *The Impact of the Domestic Linen Industry in Ulster* Belfast: Ulster Historical Foundation.

Davies, O. (1941) "The Castle of Benburb" *Ulster Archaeology Society*, Third Series, Volume **4**: 31-34.

Department of the Environment Northern Ireland (1984) *Moy Conservation Area,* Omagh: Department of the Environment Northern Ireland Planning Office

DOE. (1999) *PPS 6 - Planning, Archaeology and the Built Environment*

Department for Transport (2007) *Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment Section 3 Part 2 Cultural Heritage* 208/07.

Edwards, N. (2004) *The Archaeology of Early Medieval Ireland* First published 1990. Cornwall: Routledge

Eogan, G. (1965) *Catalogue of Irish Bronze Swords* Dublin: National Museum of Ireland

Ghabhláin, S. N. (1996) "The Origins of Medieval Parishes in Gaelic Ireland: The Evidence from Kilfenora" *The Journal of the Royal Society of Antiquaries of Ireland* Volume **126**: 37-61.

Harbison, P. (1969) *The Daggers and Halberds of the Early Bronze Age in Ireland* Munich: C.H. Beck'sche Verlongsbuchhandlung

Institute for Archaeologists (2012) *Standards and Guidance for Historic Environment Desk-Based Assessments*

Kerr, T.R. (2007) *Early Christian Settlement in North-West Ulster* BAR British Series 430

Kerr, T.R., Swindles, G.T. & Plunkett, G. (2009) "Making hay while the sun shines? Socio-economic change, cereal production and climatic deterioration in Early Medieval Ireland" *Journal of Archaeological Science* **36**:2868-2874

and climatic deterioration in Early Medieval Ireland" *Journal of Archaeological Science* **36**:2868-2874

Lynch, C. (2001) *Scotland: A New History* London: Pimlico.

Lynn, C. (1993) “Navan Fort: Home of Gods and Goddesses?” in *Archaeology Ireland*, Volume 7, Number 1: 17-21.

McDonnell, J. T. (1979) “Another Look at the Battle of Benburb, 5 June 1646” *Armagh Diocesan Historical Society*, Volume **9** Issue 2: 362-390.

Mills, A.D. (2003) *Oxford Dictionary of British Place Names* Oxford: Oxford University Press

Rafferty, B. (1983) *A Catalogue of Irish Iron Age Antiquities* Munich: C.H. Beck’sche Verlongsbuchhandlung.

Historic Maps

Patterson Papers D/266

Ranfurly Estate Papers D/1932 and T/871

Survey of Tamlaght, 1845 (D/474/92).

Brief Survey of Cos. Armagh and Tyrone 1622 (T/2504/1).

Charlemont Papers T/1176

Estate Map of Dreemore, 1815 (T/871/22). Registered as missing.

Estate Map of Dungorman, 1815 (T871/23). Registered as missing

Estate Map of Stangmore, 1815 (T/871/47). Registered as missing.

Estate Maps for the Earl of Charlemont, 1824 (T/1176/5).

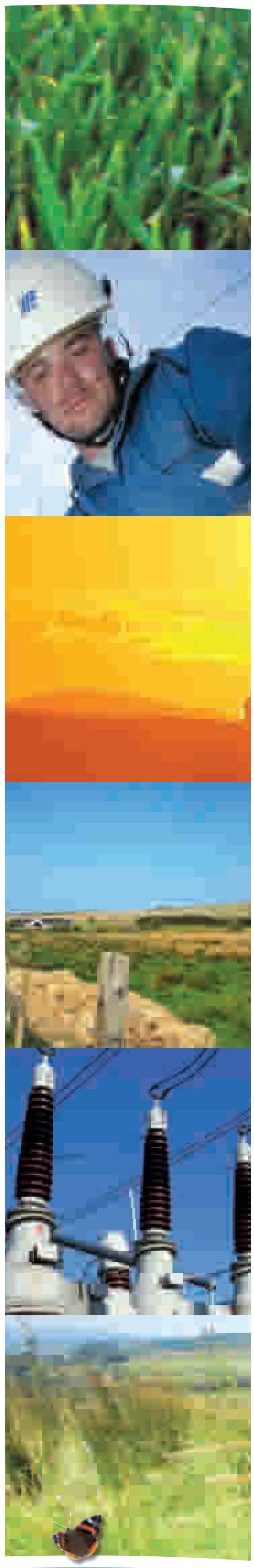
Estate Maps for the Earl of Charlemont, 1824 (T/1176/6).

Volume of maps covering 48 townlands of the Dungannon Estate, 1770 (D/1932/7/1).

Volume of maps of c.100 individual farms on the Dungannon Estate, 1820-1843 (D/1932/7/2).

Volume of maps of the Dungannon Estate, 1838-1842 (D/1932/7/3).

Volume of maps of townlands including Moyroe and Kinego, 1825 (D/1932/7/6). Registered as missing



Chapter 13

Landscape and Visual

Consolidated Environmental Statement

Volume 2

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13 Landscape And Visual

Chapter Executive Summary

The proposed overhead line and substation would be located within an area of Northern Ireland that is primarily agricultural, consisting of low rolling hills, shallow valleys and structured fields, which often have overgrown hedgerows and many mature trees. The rural hinterland close to the main settlement of Armagh area is populated with many scattered farms, dwellings and small commercial buildings. A few small villages are located along secondary and minor roads and around local educational or commercial centres. There are some valued and higher quality landscapes within the study area including a number of Registered Historic Parks, Gardens and Demesnes.

The route of the proposed overhead line was selected based on the results of a number of alternatives studies which examined the environmental, technical and economic constraints present between various route corridors, line route options, and design details. Landscape and visual impacts were two primary environmental constraints that influenced the selection of the preferred route corridor, the line route, and the components of the now proposed development.

Detailed routeing of the line has sought to achieve the best fit with the landscape using landform and vegetation whilst recognising the technical constraints of the construction and operation of an overhead line.

After construction, the towers and overhead lines would remain as significant visual elements in the landscape. Over time any vegetation cut back would re-grow and any new replacement planting would become established. Mitigation measures would reduce some visual impacts of the proposed substation and would see the embankments, earth bunds and entrance road heavily planted with predominantly native woodland. Over time, as the mitigation landscape matures, views of the substation would be filtered and assimilated back into the local landscape setting.

The landscape assessment indicates that there would be significant adverse impacts upon the landscape of some parts of the study area. There would also be significant adverse effects on the visual amenity afforded from many locations from within the immediate area adjacent to the line route. However, it is considered that the landscape and visual resource of the wider study area 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.

13.1 Introduction

1. This Chapter presents an assessment of the Proposed Development, substation, towers, overhead line and associated works, as set out in Chapter 5, in relation to landscape and visual amenity.

2. The landscape assessment describes the key components, features and characteristics that make up the various landscape types found within the study area and refers to statutory designations and consultation responses relating to landscape value and sensitivity. It provides an assessment of the potential impacts of the Proposed Development upon key landscape components and features. It also considers the extent to which loss of features and the introduction of the proposed overhead line and substation would influence perception of the landscape types and wider character of the study area. It assesses the effects on the overall pattern of elements that together contribute to landscape character and regional/local distinctiveness.

3. The visual assessment describes and evaluates the potential change in views of the existing landscape resulting from the Proposed Development once in operation. The assessment also describes the extent to which the Proposed Development would affect the visual amenity afforded to residents, visitors and users of the landscape within the study area.

4. The overall aims of this Chapter are to:

- describe the landscape planning policy context of the site;
- describe the existing landscape and visual resource;
- classify the existing landscape and visual resource into character areas;
- identify and assess the potential landscape and visual impacts of the development proposals; and,
- identify mitigation to be incorporated into the development proposals so that likely adverse impacts on the landscape or visual resources may be avoided or reduced; and,
- An assessment of residual impacts post-mitigation.

5. In recognition of the interrelationship between landscape and cultural heritage, the project Landscape Architects have worked with the project Archaeologists when assessing impacts that have particular heritage value. This has been particularly relevant when assessing the effects on Registered Historic Parks and Gardens but has also been important when considering the value of cultural heritage features across the study area and their relationship to landscape character sensitivity.

6. Landscape and Ecology also have an interrelationship and the project Landscape Architects have worked with the project Ecologists when assessing impacts that have a particular relationship to physical landscape effects. Information from site survey and field visits was shared between disciplines to aid understanding of the study area. In addition, detailed landscape mitigation proposals prepared for the proposed substation development were progressed in conjunction with ecologists, landscape architects and engineers to ensure that opportunities to minimise potential effects were recognised.

13.2 Methodology

13.2.1 Overview

7. The assessments of landscape and visual impacts are separate but related procedures. This section provides an overview of the methods and techniques used to identify baseline landscape and visual resources and the assessment of impacts upon these resources.

13.2.2 Scope of Assessment

8. The assessment considers the temporary impacts associated with the construction of the substation and overhead line as well as the permanent effects on existing landscape and visual resources. The ES reports the assessment of the Proposed Development. The design of the Proposed Development has resulted from a number of environmental constraints assessments that have considered a number of potential route corridors, line route options, and other components of the development. Landscape and visual interests were two primary environmental constraints that have influenced the selection of location and components of the proposed overhead line and substation.

9. The identification of a “preferred route corridor,” the selection of a proposed overhead line route, and component selection has therefore been the principal means by which the expected permanent and operational impacts of the overhead line have been mitigated. Integral elements of the design of the Proposed Development have been:

- avoidance of those landscapes, views or vistas considered to be particularly valuable or sensitive to the development of overhead lines;
- reduction of potential adverse impacts such as breaking the skyline through making the best use of local landform and vegetation to provide a backdrop against which visible sections of the proposed overhead line would be viewed; and,
- reduction of potential adverse impacts through the type of tower design and line routeing.

10. The Proposed Development design alternatives are described in detail in Chapter 4 Alternatives.

11. For the purposes of the assessment process, a distinction is drawn between landscape and visual impacts.

12. **Landscape impact** is determined according to the physical change to the existing vegetation, landform or other key components of the development area. These include direct impacts upon specific landscape elements (such as loss of woodland or hedgerows) or effects on local landscape character and designated areas of landscapes (conservation, historical and special interest sites). These are evaluated according to the degree of change and the inherent quality of the landscape.

13. **Visual impact** relates to specific changes in the character of view and effects of those changes on visual receptors (e.g. users of roads or rights of way, residents or users of recreational facilities, Scheduled Ancient Monument Sites, Listed Buildings and Conservation Areas) as these are protected by planning policy.

13.2.3 Consultation

14. As part of the EIA scoping process the opinions of statutory consultees (NIEA and DOE Landscape Architects) and other bodies were sought on the approach and scope of the landscape and visual assessment for the proposed overhead line. The guidelines provided within "'Guidelines for Landscape and Visual Impact Assessment"[131] (GLVIA) were confirmed by DOE Landscape Architects as the agreed method of approach for the assessment.

15. In addition to statutory consultation, consultation occurred with local councils, landowners, and other stakeholders. Detail of the consultations is contained in Chapter 6 and Appendix 6A.

13.2.4 Assessment Guidelines

16. The landscape and visual assessment has been undertaken with regard to the guidance contained within the following documents:

- Guidelines for Landscape and Visual Impact Assessment (GLVIA) 2nd Edition, Landscape Institute and Institute of Environmental Management and Assessment, 2002[132]; and,
- Landscape Character Assessment, Guidance for Scotland and England, Scottish Natural Heritage & The Countryside Agency, 2002[133].

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[131] (Landscape Institute and Institute of Environmental Management and Assessment, 2002)

[132] The release date for Guidelines for Landscape and Visual Impact Assessment (GLVIA) 3rd Edition, is April 2013. Landscape Institute guidance on transition to using GLVIA3 reads 'An assessment started using GLVIA2 should be completed using that edition.' GLVIA2 has therefore been used, as this assessment started and finished before the release of GLVIA3,

[133] In the absence of specific Northern Irish guidance on landscape and visual assessment, the guidance referenced here is best practice and applicable to Northern Ireland.

17. The GLVIA acknowledges the relationship between the perception of landscape character and the experience of visual receptors which include residents, visitors, people in their workplace, users of recreational facilities, people travelling through an area and other groups of viewers.

18. The principles of LVIA involve an appreciation of the existing landscape and its visual form, analysis of its condition and an assessment of its sensitivity to change, a thorough understanding of the development proposals, the magnitude of change that would result from the construction and operation of the proposals and the potential to mitigate impacts. There are three key stages to the assessment:

- Recording and analysis of the character, condition, value and sensitivity to change of the existing landscape and visual receptors;
- An assessment of the magnitude of change likely to result from the development; and,
- An assessment of the significance of impacts based on a combination of sensitivity of receptors and magnitude of change (including an assessment of mitigation and residual impacts).

13.2.5 Specific Assessment Tasks

19. A baseline study has been undertaken with the aim of describing and classifying the existing development area and surrounding context. This has included desk studies and detailed site surveys. The baseline context of the development area is described in terms of:

- **Landscape Planning Policy Context** set out in national, regional and local policy, (for general planning policy context refer to Chapter 3);
- **Landscape Character** which encompasses topography, water features, vegetation, public footpaths, the built environment and the existing character, quality and value of the landscape in which the proposals are sited; and,
- **Visual Context** which is determined with reference to potential visual receptors and their sensitivity.

20. A desktop study was undertaken drawing upon published National and Regional level publications, assessments and guidance to establish the broad planning and landscape context within which the existing development area is located (Refer to Section 13.2.7 Policy and Guidance Context).

21. Information was also gathered from the following sources:

- Northern Ireland Landscape Character Assessment (DOE, 2001);
- 1:50,000 scale Ordnance Survey of Northern Ireland Discovery Series, sheet 19;
- 1:50,000 scale Ordnance Survey of Northern Ireland Discovery Series, sheet 28;
- 1:1250 scale Ordnance Survey of Northern Ireland;
- Use was made of aerial photographs of the study area provided by NIE; and,
- Site surveys as described below.

22. In order to establish the baseline landscape and visual context, a more detailed field assessment of the area surrounding the development zone was undertaken. This assessment included identifying the existing landscape elements, the principal viewpoints which are accessible to the public and the sensitive receptors within the landscape. Observations were supported by a photographic survey from typical viewpoints.

23. Field assessments were undertaken during winter 2012 for the purposes of this assessment. Earlier local knowledge was gained from multiple field visits undertaken in 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012. Field visits were undertaken at various times of year and in various weather conditions.

24. These multiple visits represent a comprehensive set of field visits to the site and surrounding area and have provided the landscape and visual assessor with a thorough knowledge and understanding of the landscape context of the study area.

25. Initially the theoretical visibility of the development area was determined through desktop analysis however, field visits have assisted in the verification and recording of the extent of visibility of the development at different times of the year.

26. Representative viewpoint photography was taken during various field visits using the following equipment from publicly accessible locations - **2012 baseline photography (viewpoints 1-31, winter)** - Photographs captured on a Full Frame Canon EOS 5D MKII Digital SLR with 50mm lens using a tripod fitted with a levelled panoramic head calibrated for the nodal point of the camera/lens combination; **2010 baseline photography (viewpoints 32-34, winter)** – Photographs captured on a Canon EOS 400D digital SLR camera mounted on a tripod, with a 35mm lens calibrated to 50mm equivalent focal length; and **2007 baseline photography (viewpoints 1-4, summer)** – Photographs captured on a Nikon D70 digital SLR camera.

27. All photography was taken with the lens set at a viewing height of approximately 1.5m above ground level and locational data recorded with a hand-held GPS. We always ensure that photographic surveys are arranged when light and visibility conditions are at their clearest.

28. Photomontages have been produced using the development information as presented in Chapter 5 of this ES.

13.2.6 Landscape and Visual Assessment Methods

13.2.6.1 Zone of Theoretical Visibility

29. The purpose of identifying the Zone of Theoretical Visibility (ZTV) is to show those areas from which the Proposed Development would theoretically be visible. The ZTV assumes a bare land surface taking no account of the screening effects of trees, hedgerows or buildings and is based upon theoretical visibility of the Proposed Development.

30. Whilst the ZTV may show that the development is theoretically visible from a location, this is not in itself indicative of the type of impact or magnitude of effect. The ZTV is therefore augmented by field work to consider the nature and composition of existing views, local landform and vegetation that may shield visibility of the proposed overhead line, and further analysis of potential extents of visibility. The ZTV has been generated from a 10m Digital Terrain Model (DTM) using a Geographic Information System.

13.2.6.2 Landscape Character, Quality and Value

31. Landscape Character is a composite of physical and cultural elements. Landform, geology, hydrology, vegetation, land cover, land use pattern, cultural and historic features and associations combine to create a common ‘sense of place’ and identity which can be used to categorise the landscape into definable units (character areas). The level of detail and size of unit can be varied to reflect the scale of definition required. It can be applied at national, regional and local levels.

32. Landscape Quality relates to the intrinsic aesthetic appeal demonstrated by a character area, feature or component within the landscape. An assessment of Landscape Quality has been carried out based on a five point scale and evaluated against the following criteria:

- Highest Quality - Contributing together to create a stimulating composition which is aesthetically and scenically outstanding; or which is an outstanding example in the area of well cared for landscape or set of features;
- Very attractive - Contributing together to create a composition which is aesthetically and scenically pleasing; or which is a good example in the area of a reasonably well cared for landscape or set of features;
- Good - Contributing together to create a composition which is aesthetically and scenically unremarkable, or an area of or set of features which is neutral or of mixed character;

- Ordinary - Contributing together to create a composition which is aesthetically and scenically poor; or which is an example of an un-stimulating landscape or set of features; or with few or poorly related/ unrelated features; and
- Poor - Contributing together to create a composition which is aesthetically and scenically very poor; or which is an example of a monotonous unattractive visually conflicting or degraded landscape or set of features.

33. Value is frequently addressed by reference to international, national, regional and local designations determined by statutory and planning agencies. Absence of such a designation, however, does not infer a lack of quality or value. Consideration of accessibility and local scarcity could potentially render areas of nationally unremarkable quality highly valuable within a local context. Value is assessed as being High, Medium or Low. It should be noted that although the assessment may be influenced by landscape value it is not necessarily the case that a highly valued landscape is also a highly sensitive one.

13.2.6.3 Landscape Sensitivity to Change

34. The methodology used in this assessment adopts the terminology within current best practice of assessing "Sensitivity to Change" (GLVIA). The assessment of the landscape sensitivity to change remains specifically related to the proposal. The extent to which the landscape components would accommodate and tolerate the type of change which would be caused by the development proposed both during construction and during operation of the Proposed Development is assessed by consideration of the following factors:

- the change proposed;
- the ability of the landscape components which are physically affected to accommodate the change proposed; and,
- the ability of the wider landscape and its components to accommodate the change proposed.

35. GLVIA recommends evaluating quality, value and contribution to landscape character of the key elements or characteristics of the landscape as part of the sensitivity assessment. The assessment of landscape quality or condition should be based on judgements about the "*physical state of the landscape, and about its intactness, from visual, functional and ecological perspectives*.[134]" In this assessment professional judgement has been used to determine the extent to which quality or condition influences sensitivity to the type of development proposed.

36. Landscape sensitivity has been evaluated within the study area and is described by a 3-point scale using the criteria listed in Table 13.1 below.

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[134] Landscape Character Assessment, Guidance for Scotland and England, Scottish Natural Heritage & The Countryside Agency, 2002.

Table 13.1: Landscape Sensitivity Criteria

SENSITIVITY	CRITERIA
High	A landscape of particularly distinctive character susceptible to relatively small changes of the type proposed.
Medium	A landscape of moderately valued characteristics reasonably tolerant of change of the type proposed
Low	A relatively unimportant landscape which is potentially tolerant of substantial change of the type proposed.

13.2.6.4 Assessment of Physical Effects

37. Physical landscape effects are considered to be direct effects to the landscape fabric as a result of the Proposed Development, such as the removal of trees and hedges, field boundaries, earthworks, alteration of ground vegetation, trimming or alteration of existing planting. Physical effects have been considered during construction, in the winter year of commissioning and in summer Year 15 after commissioning. Physical effects are assessed at winter Year 1 to demonstrate worst case, that is with no leaf cover for potential screening and mitigation planting not yet mature. Assessment of summer Year 15 demonstrates the potential of mitigation planting to screen the Proposed Development allowing for leaf cover and maturity of plants.

38. The objective of the assessment of physical effects is to determine what the likely physical effects of the Proposed Development will be, which landscape elements will be affected, and whether these effects will be significant or not significant.

Sensitivity of Landscape Elements

39. The sensitivity of a physical landscape element is evaluated using a combination of landscape quality and value.

40. The **value** of a physical landscape element would tend towards a higher value if:

- It provides an important component part of the local landscape character;
- It lies within a landscape-related planning designation; and/or
- A landscape element is particularly rare, unusual or historic.

41. The **quality** of a physical landscape element is related to the existing condition of the element or feature and the quality could reduce if:

- A landscape element has been poorly managed;
- A landscape element is in poor condition;
- Landscape elements are the components of a degraded landscape; or
- Landscape elements together are considered unattractive or visually conflicting.

13.2.6.5 Visual Receptors

42. GLVIA recommends analysis of the nature of visual amenity of the study area and the identification of visual receptors that would potentially be affected by the Proposed Development. Visual amenity is a general measure of the presence or absence of features which, on their own or in combination, detract from the appearance of the existing landscape and features that, on their own or in combination, have a beneficial effect on the landscape.

43. Visual receptors are the people who experience visual amenity and include residents, visitors, vehicle travellers and other groups of viewers. The assessment has involved three stages:

- Identification of the zone of theoretical visibility (ZTV) for the proposed overhead line;
- Field assessment of visual amenity, visual receptors and ground-truthing of ZTV; and,
- Assessment of magnitude of change and significance of affect on visual receptors.

13.2.6.6 Field Assessment of Visual Receptors

44. Viewpoints representing a range of receptors were visited and surveyed using a standardised checklist. Factors considered included:

- Receptor type and number (dwelling/commercial property/footpath/open space);
- Relative height to the development;
- Existing View (composition and quality);
- Distance of view;
- Percentage and elements of development potentially visible;
- Angle of view (acute/perpendicular/average);
- Composition of the view (i.e. the arrangement and proportions of features within the available view) and position of the development in the view; and,
- Duration of view i.e. is the receptor static such as residents of housing, or mobile such as a pedestrian or vehicular traveller.

13.2.6.7 Study Area

45. The study area for the Landscape and Visual Impact Assessment has been determined as 5km through a combination of desk based analysis and fieldwork as described below.

46. The ZTVs indicate theoretical visibility beyond 5km from the proposed overhead line although visual assessment work carried out during field surveys have shown it is unlikely that potential impacts of the Proposed Development would be significant at distances beyond 5km. Vegetation, local variations in topography, inclement weather and lighting would shield or partially interrupt or obscure views of the Proposed Development. In addition, at distances of 5km or greater, the overhead line tower structures would not be prominent features or become focal points within views due to reduced perceptibility. The ZTVs indicate theoretical visibility from the highest point on each proposed tower.

47. The substation, as described in paragraph 170 of this chapter, has a potential visual influence within the wider landscape of the study area. An understanding of this has been obtained through field survey aided by the presence of existing elements in the landscape such as the existing trees and farm buildings that are located on high ground in the northern part of the site. The potential visual influence of the 275kV termination structures, which are described in Chapter 5 of this ES, within the wider landscape of the study area has been obtained through field survey aided by the presence of the existing 275kV overhead line tower that is located in the same area as the replacement termination structures. These existing elements and structures have been used as locational and height reference points to assist with the likely visibility of the substation and 275kV termination structures. This in turn has influenced the extent of the study area, selection of viewpoints and assessment of effects.

13.2.6.8 Sensitivity of Visual Receptors

48. Visual receptors consist of people who would potentially have views of the proposal. The sensitivity of visual receptors depends upon:

- The location and character of the viewpoint;
- The activity of the receptor; and,

- The importance of the view (which may be inferred by its inclusion as a viewpoint on an Ordnance Survey map or Guidebook).

49. Sensitivity to change considers the nature of the receptor, for example a residential dwelling is generally more sensitive to change than a factory unit. The importance of the view experienced by the receptor also contributes to an understanding of how sensitive that receptor is to change. The quality and value of the view are therefore considered.

50. In this assessment receptors are categorised in Table 13.2.

Table 13.2: Visual Sensitivity Criteria

SENSITIVITY	CRITERIA
High	Where the changed landscape is an important element in the view – Residential properties and areas of settlement. Receptors within sensitive landscapes (e.g. AONBs, Registered parks, gardens & demesnes of special historic interest or where value is assessed as high or outstanding)
Medium	Where the changed landscape is a moderately important element in the view – Road users, other transportation routes and rights of way within wider recreation and tourist areas. Areas of public open space / recreation areas.
Low	Where the changed landscape is a less important element in the view – Users of main roads and other arterial transportation routes. Places of work / industrial zones.

13.2.6.9 Landscape and Visual Magnitude of Change

51. Landscape magnitude of change is a measure of the degree of change within the landscape, the nature of the effect, and its duration. The magnitude of change upon landscape receptors is assessed using the criteria listed in Table 13.3 below:

Table 13.3: Landscape Impact Magnitude Criteria

MAGNITUDE	CRITERIA
High	Notable change in landscape characteristics over an extensive area ranging to a very intensive change over a more limited area
Medium	Moderate change in localised area
Low	Virtually imperceptible change in landscape components
Negligible	No discernible change in any component

52. Visual magnitude of change considers the extent of development visible, the percentage of the existing view newly occupied by the development, the influence of the development within the view and viewing distance from the receptor to the development. The magnitude of change upon visual receptors is assessed using the criteria listed in Table 13.4 overleaf:

Table 13.4: Visual Impact Magnitude Criteria

MAGNITUDE	CRITERIA
High	The development would cause a considerable change in the existing view over a wide area or an intensive change over a limited area
Medium	The development would cause minor changes to the existing view over a wide area or noticeable change over a limited area
Low	The development would cause very minor changes to the view over a wide area or minor changes over a limited area
Negligible	The development would cause a barely discernible change in the existing view

13.2.6.10 Assessment of Significance of Effect

53. The significance of impact is judged from a combination of sensitivity and magnitude of impact (as demonstrated in Table 13.5) for each of the landscape and visual receptors affected by the proposed overhead line. The thresholds of magnitude or sensitivity used in this assessment are High, Medium, Low, Negligible and None (magnitude only).

54. The findings are represented using a descriptive scale ranging from major - moderate - minor adverse through negligible to ascending scale of minor - moderate - major beneficial. This is summarised in Table 13.5 below which also illustrates the degree of significance for intermediate classes of magnitude of change.

55. Impacts can be detrimental where features or key characteristics such as established planting, old buildings or structures have to be removed. Alternatively, it can prove beneficial where derelict buildings or poorly maintained landscape features are repaired, replaced and maintained or there is the introduction of new tree planting and a landscape structure where none currently exists.

56. Account is taken of the effect that any mitigation measures, typically reinstatement planting, are likely to have in minimising potentially detrimental impacts or improving the landscape composition of the area.

Table 13.5: Significance of Landscape Impacts Matrix

Significance of Impacts		Sensitivity		
		High	**Medium**	**Low**
Magnitude of Change	**High**	Major	Moderate - Major	Moderate
	Medium – High	Mod - Major	Moderate	Minor - Moderate
	Medium	Moderate	Moderate	Minor
	Low – Medium	Moderate	Minor - Moderate	Minor - Negligible
	Low	Moderate	Minor	Negligible
	Low - Negligible	Minor - Moderate	Minor - Negligible	Negligible
	Negligible	Minor	Negligible	Negligible

57. Explanation of the landscape and visual impact ratings for each degree of significance is provided in Table 13.6 below:

Table 13.6: Categories of Landscape and Visual Significance of Effect

Degree Of Effect	Description Of Landscape Effect	Description Of Visual Effect
Major Beneficial (positive) impact:	- The proposals form an essential part of a strategy to redevelop a major area leading to the establishment of a new and attractive landscape.	- Where the Proposed Development would cause a very noticeable improvement in the existing view. - This will typically apply where the Proposed Development leads to the removal of a significant eyesore such as a derelict site or buildings and incorporate landscape improvements which substantially remodel and enhance the outlook for a large number of people.
Moderate beneficial (positive) impact:	- The Proposed Development significantly enhances the form and pattern of the landscape; - It further national objectives to regenerate degraded areas of landscape; and, - There is potential through mitigation, to establish a comprehensive landscape design which enhances the existing character of the area or introduces a new attractive character/identity.	- Where the Proposed Development would cause a noticeable improvement in the existing view. - This will typically apply where the Proposed Development incorporates landscape improvements which would largely reduce the visual impact of the proposals and enhance the outlook for a moderate number of people.
Minor beneficial (positive) impact:	- The Proposed Development fits well with the scale, landform and pattern of the existing landscape; - It incorporate measures for mitigation to ensure it would blend in well with the surrounding landscape or complement, restore or extend partially formed landscape character/framework; and, - Maintain or enhance existing landscape character in an area.	- Where the Proposed Development would cause a barely perceptible improvement in the existing view.
Negligible impact:	- The Proposed Development is well designed to complement the scale, landform and pattern of the landscape; - It incorporates measures for mitigation to ensure that the Proposed Development would blend in well with surrounding landscape features and elements; and, - It avoids conflict with national policies towards protection of the landscape.	- Where there is no discernible improvement or deterioration in the existing view.
Minor adverse (negative) impact:	- The Proposed Development is out of scale with the existing landscape; - It is partially visually obtrusive; - Detrimentally affect an area of recognised landscape quality; and, - It cannot be substantially mitigated for because of the nature of the proposal itself or the character of the wider landscape.	- Where the Proposed Development would cause a barely perceptible deterioration in the existing view. - This will typically occur where the receptor is at some distance from the proposals and the proposals newly appear in the view but not as point of principal focus. It would also occur where the Proposed Development is closely located to the viewpoint but are seen at an acute angle and at the extremity of the overall view.

Degree Of Effect	Description Of Landscape Effect	Description Of Visual Effect
Moderate adverse (negative) impact:	- The Proposed Development is out of scale with the landscape; - It is visually obtrusive and would have an adverse impact on the landscape; - Mitigation would not prevent the Proposed Development from scarring the landscape in the longer term as some features of interest would be partly destroyed or their setting diminished; and, - It would have an adverse impact on a landscape of recognised quality or on vulnerable and important characteristic features or elements.	- Where the Proposed Development would cause a noticeable deterioration in the existing view. - This will typically apply where the Proposed Development involves the removal of existing property or boundary planting thereby exposing the property to the proposals, but with views limited to bedrooms or rarely occupied rooms.
Major adverse (negative) impact:	- The Proposed Development would be clearly incompatible with the scale and pattern of the local landscape; - Would be visually intrusive and would disrupt fine and valued views of the area; - It is likely to degrade, diminish or even destroy the integrity of a range of characteristic features and elements or their setting; - It would be substantially damaging to a high quality or highly vulnerable landscape causing it to change and be considerably diminished in quality; and, - Cannot be adequately mitigated for.	- Where the Proposed Development would cause a very noticeable deterioration in the existing view. - This will typically occur where the Proposed Development close an existing view of local landscape and the new proposals would dominate the future view.

58. Where overall effects are predicted to be Moderate or higher, these are considered to be Significant for the purposes of the Environmental Impact Assessment Regulations. Effects of less than Moderate are not predicted to result in significant effects and are termed Not Significant. In terms of ratings for sensitivity, magnitude and significance of impacts, the thresholds represent points on a continuum. Intermediate ratings are used where appropriate to indicate impacts at the higher or lower end of a particular threshold.

13.2.6.11 Cumulative Assessment Method

59. Cumulative impacts are considered where the presence of other developments within the study area may have an impact on the perception of the landscape character of that area, or on views from sensitive receptors. Thirty-four representative viewpoints have been selected to provide some of the clearest views of the Proposed Development and the cumulative assessment is focused on the assessment from these identified receptors that lie within the 5km study area.

60. A number of cumulative developments of various types and scales have been included in this EIA for consideration in the assessment of cumulative effects, see Chapter 19 of this ES. The first step in the cumulative assessment is a filtering process to ascertain which of the identified cumulative developments have the potential to cause significant cumulative effects. Appendix 13B presents the filtering process for each of the cumulative developments identified in Chapter 19.

<u>Cumulative assessment criteria</u>

61. As with the assessment of effects of the Proposed Development in isolation, the significance of cumulative effects is determined through a combination of the sensitivity of the landscape receptor or view and the magnitude of change upon it. The sensitivity of landscape receptors and views is the same in the cumulative assessment as in the assessment of the Proposed Development in isolation.

62. The emphasis of the assessment is on the additional changes the Proposed Development may bring to the cumulative situation of other developments. The principle of magnitude of cumulative change thus makes it possible for the Proposed Development to have a major effect on a particular receptor, while having only a minor cumulative effect in conjunction with other developments.

63. The magnitude of cumulative change arising from the Proposed Development is assessed as High, Medium, Low and Negligible based on interpretation of the following largely quantifiable parameters:

- the number of cumulative developments visible;
- the distance to cumulative developments;
- the direction and distribution of cumulative developments; and,
- the landscape setting, context and degree of visual coalescence of cumulative developments.

Significance of Cumulative Effects

64. The significance of any cumulative effect identified has been assessed as major, moderate, minor or negligible, with intermediate categories. As in the case of non-cumulative effects, this is summarised in Tables 13.5 and 13.6 which also illustrates the degree of significance for intermediate classes of magnitude of change.

65. A significant cumulative effect will occur where the addition of the Proposed Development to the cumulative situation of other developments, will result in a landscape character or view experiencing overall cumulative effects predicted as moderate or higher.

66. The results of the Landscape and Visual cumulative impact assessment are presented in Chapter 19 of this ES. Chapter 19 should be in read in conjunction with this chapter and Appendix 13B so that the cumulative assessment can be fully understood.

13.2.7 Policy & Guidance Context

67. A study was undertaken drawing upon publications, assessments and guidance to establish the broad planning and landscape context within which the existing development area is located. It includes reference to:

- The Dungannon and South Tyrone Area plan 2010 (DOE March 2005);
- The Armagh Area Plan 2004 (DOE 1995) (and Armagh Area Plan 2018 Issue Paper [DOE March 2004]);
- The Monaghan County Development Plan 2007 – 2013 (and Draft Monaghan County Development Plan 2013-2019);
- Regional Development Strategy for Northern Ireland 2035, (DRD 2010);
- A Planning Strategy for Rural Northern Ireland (DOE 1993);
- PPS 6 Planning, Archaeology and the Built Environment (DOE March) 1999;
- PPS 21 Sustainable Development in the Countryside (DoE June 2010); and,
- Northern Ireland Biodiversity Strategy (August 2002).

13.2.8 Indication of Any Difficulties Encountered

68. The assessment was undertaken from publicly accessible locations such as roads, tracks and footpaths. Where physical access to a receptor was not possible, an assessment of potential impacts was derived from desk based research, map info, aerial photography and field visits, to the nearest

accessible point. In accordance with GLVIA 2002, where key data on project characteristics was lacking, explicit assumptions were based on the 'worst-case situation'.

69. The ZTV has been generated from a 10m Digital Terrain Model (DTM) using a Geographic Information System and as such, is limited by the accuracy of the input data. Due to the cross border nature of the site, two DTM products have been used to generate the ZTV. These are listed below, along with the vertical accuracy for each product:

70. OSNI 10m Digital Terrain Model

- 65% of the data is within +/- 1.0m accuracy;
- 95% of the data is within +/- 2.0m accuracy;
- 99% of the data is within +/- 3.0m accuracy; and,
- OSi National Height Model – 10m DTM +/- 2.5m vertical accuracy.

71. The ZTV is therefore augmented by field work for ground proofing.

72. For all of the viewpoints, winter photography is used to demonstrate the greater visual effect of the proposal or worst case[135] scenario. In addition to this, summer photography has been used for viewpoint photomontages 1-4, to help illustrate the mitigating effect of the landscape proposals specific to the substation.

73. Computer modelling is used to assist in the assessment process and to illustrate the effects of the development through the production of photomontages. The photographs, renders and photomontages used in this assessment are for illustrative purposes only and, whilst useful tools in the assessment, are not considered to be completely representative of what will be apparent to the human eye. The assessments are carried out from observations in the field rather than from photographs.

74. As the Viewpoints 30 and 34 are close to the border, it could be possible to view in the photomontages both the NIE and EirGrid towers at these positions. As EirGrid's proposed development has yet to crystallise sufficiently, NIE is unable to include the EirGrid towers within Viewpoints 30 and 34 at this time. The provided photomontages will be revised and reissued once EirGrid's proposal has crystallised sufficiently.

13.3 Baseline Conditions

13.3.1 Baseline Landscape Situation

13.3.1.1 Overview of Study Area

75. The study area (overview shown in Figure 13.2) lies primarily within County Armagh and includes the eastern fringe of Armagh City. A portion of the study area north of the Blackwater River is within County Tyrone. The linear corridor runs west from the proposed substation at Turleenan before turning south, to the east of Moy, passing through generally open, rural countryside to the east of Keady, prior to connecting to the southern corridor at the border with the Republic of Ireland. It avoids hilltops with prominent skylines and takes as direct a route as possible, limiting the length of overhead line required and reducing the requirement for larger angle towers.

76. The rural hinterland close to the main settlement of Armagh area is populated with many scattered farms, dwellings and small commercial buildings. Small villages are located along secondary and minor roads and around local educational or commercial centres.

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[135] Guidelines on Landscape and Visual Impact Assessment (GLVIA) Second Edition, Landscape Institute and Institute of Environmental Management and Assessment, 2002; Section 2.35 - General principles of good practice.

77. The land within the study area is primarily agricultural, consisting of low rolling hills, shallow valleys and structured fields, which often have overgrown hedgerows and many mature trees. Orchards are a prominent feature in the north of the study area.

78. The community is well served by a good transport network including A and B class roads:

- The M1 connecting Belfast and the west of the province runs through the north of the study area;
- The A28 runs in an east west direction between Caledon and Armagh;
- The A3 runs north-east between Middletown and Armagh;
- The A29 runs north south between Moy and Armagh;
- The B115 runs north-west south-east between Eglish and Armagh;
- The B106 runs north-west to south-east between Tamlaght and Keady; and,
- The B3 runs east west between Monaghan and Keady; and,
- Many minor roads and country lanes link rural communities to the wider transport network.

79. A disused railway route runs from Armagh to Glaslough. All that remains of the railway line within the study area are the main cuttings and bridge ramparts that enabled it to cut its way through the rolling countryside.

80. The River Blackwater, which includes part of the disused Ulster Canal, flows through part of the study area. The River Callan flows north through Armagh City before connecting to the River Blackwater.

81. There are already numerous small-scale telephone and electrical distribution lines that connect to the many scattered dwellings and settlements. This is typical of rural locations in Northern Ireland.

13.3.1.2 Landscape Designations

82. There are no national or international landscape designations within the study area.

83. The former green belts of Armagh and Dungannon lie within the study area. A Countryside Policy Area had been designated, and extends east from Armagh City to Tandragee. It lies out with the 5km study area so is not considered further within this assessment. PPS 21 Sustainable Development in the Countryside[136], will take precedence over these former Green Belt and Countryside Policy Areas. Relevant landscape and visual policies within PPS21 are policy CTY13 Integration and Design of Buildings in the Countryside and policy CTY14 Rural Character which are discussed in more detail in Chapter 3 Planning and Development Context.

84. The former Green Belts around Dungannon and Armagh are designated in the South Tyrone Area Plan 2010 and the Armagh Area Plan 2004. The boundaries of the former Green Belts and Countryside Policy Areas are indicated on Figure 13.1.

- Armagh City Former Green Belt; and,
- Dungannon Former Green Belt.

85. The purpose of these policies is to protect areas of the countryside from development pressure, maintain their rural character and protect the visual amenity of areas of landscape value. The sensitivity to change of the former Green Belts therefore is guided by the sensitivity of the Landscape Character Areas and urban fringes that they occupy.

[136] (DOE, 2010)

Register Historic Parks, Gardens and Demesnes

86. There are a number of Registered Historic Parks, Gardens and Demesnes occurring within the study area, which are listed in *The Register of Parks, Gardens and Demesnes of Special Historic Interest,* Northern Ireland. These comprise of:

- The Argory;
- The Manor House, Benburb;
- Armagh Palace; and,
- Tynan Abbey.

87. This Chapter considers the importance of landscape character within *The Register of Parks, Gardens and Demesnes of Special Historic Interest, Northern Ireland* and an assessment on this basis can be found in section 13.6.1.2. For an assessment of the setting of listed buildings and ancient monuments refer to Chapter 12 Cultural Heritage.

13.3.1.3 Landscape Character

88. The study area is covered by the Northern Ireland Landscape Character Assessment (2000). The Landscape Character Areas (LCAs) within the study area lie within the region described as the Central Lowlands. This region owes its large-scale morphology to the early Tertiary subsidence of the Lough Neagh Basin. There are no strong topographical barriers in the region and boundaries between LCAs tend to be subtle.

89. The countryside was analysed by evaluating each area of distinctive landscape character and identifying the main physical and human influences on the landscape and its existing condition and quality. Following on from this, collective conclusions were formed about the quality of the landscape and its sensitivity to change.

90. Landscape Character Areas are illustrated in Figure 13.2 and described below.

Landscape Character – Northern Ireland

91. The overhead line lies across the boundaries of two Landscape Character Areas (LCAs) as described within the Northern Ireland Landscape Character Assessment Series, Environment and Heritage Service, July 1999:

- LCA 47 Loughgall Orchard Belt; and,
- LCA 66 Armagh Drumlins.

92. The wider study area falls within four additional Landscape Character Areas (LCAs) as follows:

- LCA 45 Dungannon Drumlins and Hills;
- LCA 64 Lough Neagh Peatlands;
- LCA 68 Carrigatuke Hills; and,
- LCA 46 Blackwater Valley.

Key characteristics and descriptions from the Northern Ireland Landscape Character Assessment (2000) are summarised and cited in the following section.

93. LCA 47:Loughgall Orchard Belt

Key Characteristics

- Low rolling drumlins falling towards Lough Neagh crossed by numerous small river valleys and streams and separated by low lying areas of moss.

- Varied rural landscape pattern, with mixed farmland and horticulture; extensive orchards on sheltered drumlin slopes.
- Wooded designed estate landscapes, parklands and attractive loughs, hilltop copses, mature trees and neat clipped hedges.
- Two types of woodlands: demesnes woodland and wet woodland.
- Lowland raised bog is extensive across the north of the LCA. Almost all has been cut-over in the past, much has been colonised by birch woodland and little intact bog remains.
- Numerous scattered dwellings connected by hedge lined winding roads.
- Many traditional buildings including parish churches.
- Long views to Lough Neagh and Portadown area from hill tops.

Landscape Description

94. The Loughgall Orchard Belt extends from Portadown to the M1 motorway, the River Blackwater and Armagh. The area is characterized by low drumlins, which fall towards Lough Neagh to the north and to the slopes of the Blackwater valley to the west. It is crossed by numerous small river valleys and streams; tributaries of the Rivers Blackwater and Bann. The underlying geology is a mix of sedimentary and contemporaneous igneous rocks and gives rise to rich brown soils.

95. The upper slopes of the Loughgall Orchard belt are a mixture of pasture and arable fields, enclosed by hedgerows and some hedgerow trees. Roadside hedgerows are mostly well maintained and there are some short avenues of mature beech and ash trees. Blocks of attractive, well kept orchards are located on the steeper sheltered drumlin slopes with a favourable aspect. Regenerating alder, birch and willow are found on the moss and previous peat extraction has left a typical pattern of rectangular working sites linked by access tracks. There are numerous wooded estate landscapes, parklands, woodland and attractive loughs. Villages, farms and other dwellings are scattered along the sides of lanes and at the end of access tracks. Many cottages are of simple, traditional styles, with a narrow layout and whitewashed exterior.

96. Numerous large houses and churches are a feature of the area. Stone buildings and traditional gate posts are also quite common. Dwellings are connected by winding minor roads lined with hedges and roller coaster like ‘A’ roads. Two lines of existing towers cross the landscape.

97. This is a varied landscape, with a mix of landscape patterns and scales (small to medium). In some areas there are pleasant, long views across mixed farmland to farmsteads, churches and woodlands, but elsewhere, views are restricted by narrow tree and hedge lined roads or intervening areas of regenerating scrub.

98. Demesne woodland includes that at The Argory, a National Trust property. The planted woodlands are mainly of beech and oak with an understorey of predominantly non native species including rhododendron, cherry, laurel, and snowberry.

99. Lowland raised bog extends across the north of the LCA and southward into the Blackwater Valley.

Landscape Condition & Sensitivity to Change

100. The northern section of this LCA comprises low gently sloping drumlins. It has numerous small streams and the landscape character is generally quite open. The landscape condition is relatively good and the majority of the area has rolling landform with a well-maintained hedgerow structure and good tree cover. Further south, the drumlins become more pronounced and there are more orchards in the development area. From a landscape aspect, this area is more sensitive than the flatter land to the north. It also forms part of the Armagh Countryside Policy Area. The landscape on the edge of settlements is under pressure from new residential, urban and infrastructure developments.

<u>Sensitivity to Change</u>: Medium

<u>Landscape Quality</u>: Good overall with localised areas of Very Attractive

Landscape Value: Medium

101. LCA 66: Armagh Drumlins

Key Characteristics

- Extensive area of rolling drumlins overlooked by the Carrigatuke Hills to the south and crossed by numerous, small winding river valleys.
- Improved pasture separated by bushy hedgerows and tree belts.
- Numerous scattered dwellings and farms connected by network of winding, hedge-lined roads.
- Wooded historic estate and park landscapes.
- Woodlands are almost all long-established broadleaved or mixed and most are associated with present or former estates.
- Open views across landscape from higher points; intimate enclosed landscapes between hills.
- Significant archaeological sites and numerous scattered raths.

Landscape Description

102. This LCA lies within the region described as the Uplands and Drift Covered Lowlands of Down and Armagh. The generally subdued relief of the area provides the unity of this region. Relative relief is provided in the north by the Silurian hills, the Newtownhamilton Plateau in south Armagh, and the Caledonian igneous complex of Slieve Croob. Below 350m, there is an almost complete mantle of drumlins forming an internationally acknowledged type example of a 'drumlin swarm' well removed from the study area.

103. The Armagh Drumlins cover an extensive area of rolling north - south orientated drumlins. They are overlooked by the Carrigatuke Hills to the south and fall towards the Loughgall Orchard Belt and fringes of Lough Neagh to the north. The area is drained by numerous small winding streams that are tributaries of the Callan River. Occasional loughs and sedgy mosses occupy the hollows between drumlins. The landform becomes progressively lower and the drumlins more pronounced to the north. River and stream valleys, loughs and mosses are sensitive to changes in water quality and the water table, the latter being easily affected by development.

104. Land use is dominated by improved pastures, which are separated by overgrown hedgerows and tree belts with mature hedgerow trees a common feature across this LCA. Stone walls and stands of mature trees are associated with a number of wooded historic estates, well removed from the study area.

105. Woodlands occupy a small percentage of the LCA and almost all are broadleaved or mixed and most are associated with present or former estates.

106. There are numerous scattered dwellings and farms, connected by a network of winding, hedged roads. Large farm barns and ruined stone cottages are common features. The city of Armagh, with its tall spires, is a focus for local roads and views. The area also includes smaller settlements such as Keady and Richhill. New development is prominent on ridge-lines around the outskirts of Armagh. There are open views across the landscape from higher points, whilst the landscape between these ridges is intimate and enclosed. Archaeological features such as Navan Fort, on the outskirts of Armagh, are of national significance.

Landscape Condition & Sensitivity to Change

107. The locations of the numerous important archaeological sites are the most sensitive areas of this landscape. They are concentrated to the south and west of Armagh and include Navan Fort. Local skylines and drumlin summits are also relatively sensitive, particularly where they are the sites of ancient raths. River and stream valleys, loughs and mosses are sensitive to changes in water quality and water table, the latter being easily affected by development.

108. Within this LCA the corridor passes through a landscape of elongated drumlins, which are generally at a low elevation. Cumulatively, from higher ground, the drumlins form the image of a gently undulating plain. In the southern portion of the LCA the ground is higher. Along the most southerly part of the corridor the hedges are more mature, especially along the winding country roads that give the area a wooded appearance. Inter drumlin marshes are common. Along the most southerly part of the corridor, just north of the border, the landscape is more intimate with more pronounced drumlins, mature hedgerows and mature trees. Within this area there are some very attractive valleys views of which are restricted due to topography and vegetation and their visual influence is reduced.

<u>Sensitivity to Change</u>: High

<u>Landscape Quality</u>: Very Attractive with small areas of Highest Quality

<u>Landscape Value</u>: Medium with pockets of high value relating to drumlin summits and archaeological sites

109. <u>LCA 45:Dungannon Drumlins and Hills</u>

Key Characteristics

- Extensive area of rolling drumlins separated by rolling farmland landscape or areas of pasture and marshland.
- Irregular field pattern separated by hedgerows and hedgerow trees.
- Small broadleaf woodlands and angular conifer plantations.
- Farms and settlements sited in sheltered locations on lower slopes of drumlins connected by network of winding, hedge-lined roads.

Landscape Description

110. This landscape character area is a drumlin landscape. It is large in scale and the steep sided rounded hills link together in places creating distinctive drumlin groupings. Between the drumlins the land is low-lying and marshy and views are contained within the local landscape. On top of the drumlins longer views become available especially those that offer views across the tops of the smaller drumlins. The field pattern is irregular which is typical of this general locality and is defined by hedgerows and hedgerow trees, increasing the overall sense of enclosure.

111. The area has a varied small scale woodland cover including conifer plantations, broadleaf woodlands and mixed copses. Occasional avenues of mature trees can be found along some of the minor roads and lanes. Farmsteads and residential buildings which are often found in sheltered locations on the lower slopes of the drumlins and are linked by numerous winding roads.

Landscape Condition & Sensitivity to Change

112. The structure of the landscape and its overall condition is good particularly within the well drained, low-lying farmland to the south. The following features within the landscape are sensitive: hedgerows and hedgerow trees; wetlands and loughs particularly lough edges; small scale woodlands; drumlin summits due to visibility; and the distinctive character of the meandering minor roads.

<u>Sensitivity to Change</u>: Medium

<u>Landscape Quality</u>: Good quality landscape with small areas of Very Attractive Quality

<u>Landscape Value</u>: Medium with pockets of high value relating to drumlin summits

113. LCA 64:Lough Neagh Peatlands

Key Characteristics

- Low lying marshy landscape with small drumlins.
- The old canal, river channels and drainage patterns are strong visual features within the landscape.
- Patchwork of pasture, plantations, regenerating bog areas and small settlements.
- Numerous scattered smallholdings, villages and new residential areas on higher ground linked by embanked roads.
- High quality water edge landscape and wildlife habitats.

Landscape Description

114. The Lough Neagh Peatlands landscape character area lies on the southern shores of Lough Neagh. The landscape has been strongly influenced by the previous peat extraction and traditional road pattern, which mirrors that of the peat workings. The landform bears the scars of these extensive peat workings and distinctive changes in level can be found where extraction has taken place. These areas now have regenerating scrubland or farmland where drainage allows.

115. The drumlin landscape creates a pattern of meandering roads defining medium sized fields edged with mature hedgerows and hedgerow trees. The M1 cuts across the southern section of this character area and breaks this traditional pattern of field boundaries and meandering roads.

116. The peat beds have areas of horticulture and small orchards scattered across them as well as the associated traditional farmsteads. The small traditional villages are now being supplemented by new residential development which at times overwhelms the traditional settlement pattern.

Landscape Condition & Sensitivity to Change

117. This landscape is varied and has valuable shoreline landscapes on the edge of Lough Neagh both for scenic quality and wildlife interest. These shoreline landscapes fall within the 'Lough Neagh Shores Area of Scenic Quality'. Extensive areas are designated as an ASSI and the area forms part of the extensive Lough Neagh/Lough Beg Special Protection Area, which recognises its international significance as a habitat for breeding birds.

118. Open, flat areas are particularly sensitive to the visual impact of vertical elements. Mature hedgerows and field boundary scrub, however, help to contain views to new development and development can be sustained in small groupings when contained within existing planted areas.

119. Much of the sensitivity is focussed around the Lough Neagh shoreline with its interests in biodiversity and scenic quality. Development pressure is likely to come from continued residential developments that lie out-with settlement patterns. Any proposals should be sensitive in architectural style and their use of materials. Long views from elevated land to the south are also a major consideration to new development.

Sensitivity to Change: Medium

Landscape Quality: Good quality with areas of Very Attractive along the Lough Neagh shoreline

Landscape Value: Medium with pockets of high value relating to the Lough Neagh shoreline

120. LCA 68:Carrigatuke Hills

Key Characteristics

- Conifer plantations and peaty moorland create a patchwork of geometric blocks on the hills.
- Large scale landscape with rolling hills and deep wooded valleys.
- Many mature trees, tree-belts, and small woodlands on lower hills.
- Large houses, farms and buildings amongst rolling hills are linked by numerous winding roads.
- Long panoramic views over the surrounding lowlands.

Landscape Description

121. The Carrigatuke Hills landscape character area extends across southern Armagh. The higher hills are exposed and have a wild character. The landscape is made up of areas of blanket bog and heather moorland which together form a broad upland area. Conifer plantations exist on the higher slopes with smaller woodlands dominating the lower slopes. Mature trees and shelterbelts can be found throughout these lower rolling hill areas and in combination with the many hedgerows bounding the fields creates an enclosed local landscape character.

122. This strong field pattern is complimented by the many wooded streams and loughs which are attractive features of the valleys. These include the valleys of the Carnagh estate, Glen Anne and Ballymoye.

123. There are no small settlements and Newtownhamilton is the local market town. Farmsteads and residential buildings which are often at the end of long tracks are linked by numerous winding roads. There are open and long views over the surrounding lowlands from hill-tops within this character area in particular from Carrigatuke.

Landscape Condition & Sensitivity to Change

124. The structure of the landscape and its overall condition is good with consistently strong hedgerow and woodland structure throughout this landscape character area. The following features within the landscape are sensitive: hill tops due to visibility; wetland and bog areas; peat moorland; deciduous woodlands and shelterbelts; and streams and loughs.

Sensitivity to Change: Medium

Landscape Quality: Very Attractive with some areas of Good quality

Landscape Value: Medium with pockets of high value relating to hill summits

125. LCA 46:Blackwater Valley

Key Characteristics

- Within the flat marshy floodplain of the River Blackwater featuring wet meadows, pasture and bog landscape types.
- The landscape is enclosed by surrounding isolated drumlins.
- Attractive historic designed landscapes can be found within this character area providing picturesque riverside settings.
- Many mature trees, tree-belts, and small woodlands enclose and separate fields.
- Inaccessible, rural, peaceful and unspoilt landscape with few settlements.
- Restricted outward views due to meandering and hedge-banked lanes.

Landscape Description

126. The Blackwater Valley contains the flat marshy floodplain of the Blackwater River. Drumlins enclose the valley and hedge-banked lanes allow limited and restricted views, creating a secluded landscape. An abandoned canal, with numerous bridges follows the length of the valley. Numerous small streams flow between scattered drumlins forming islands on the floodplain. Many mature trees, tree-belts, hedgerows and small woodlands enclose and separate fields.

127. Historic wooded designed landscapes, large estate houses, parkland and lakes enjoy an attractive riverside setting, such as The Caledon Estate and Tynan Abbey. The village of Caledon is the largest settlement and there are not many other settlements or individual properties in the area. The character is rural and peaceful with exceptional scenic qualities.

Landscape Condition & Sensitivity to Change

128. The structure of the landscape and its overall condition is good with excellent examples of wetland and parkland throughout this landscape character area. Views of this landscape are limited as there is little opportunity to view it from higher ground; the enclosed nature of the valley also means that there are limited outward views from this landscape character area.

129. The following features within the landscape are sensitive: hedgerows and hedgerow trees; wetland and bog areas; designed landscapes; deciduous woodlands and shelterbelts; and canal, river and streams.

Sensitivity to Change: High

Landscape Quality: Very Attractive with small areas of Highest Quality

Landscape Value: Medium with pockets of high value relating to designed landscapes

13.3.1.4 Landscape Character – Republic of Ireland

130. The overhead line as it approaches the border with the Republic of Ireland falls within close proximity to the following Landscape Character Areas (LCAs) as defined in the Monaghan Landscape Character Assessment Report which was undertaken by Environmental Resources Management Ireland Limited in association with ERA – Maptec Ltd.

- LCA 6 Mullyash Uplands; and
- LCA 2 Blackwater Valley and Drumlin Farmland.

131. LCA 6:Mullyash Uplands

Key Characteristics

- A variable topography comprising a flat plateau in the western part of the LCA which extends eastwards towards the drumlin foothills leading to the summit of Mullyash Mountain.
- Drumlins in this LCA are steep sided and are strongly aligned in a north west to south east orientation thereby reflecting the direction of the ice flow during the ice ages.
- Loughs and watercourses are almost absent from this landscape apart from a larger lough featuring a crannog near Drumleck.
- Landscape pattern is strongly defined as small to medium scale pastoral fields bounded by cut hedgerows with occasional mature trees. This pattern is obliterated and replaced with solid coniferous forest at Mullyash.
- Large tracts of commercial coniferous forestry are present and reach up to the summit of Mullyash Mountain
- Long range views towards this mountain can be gained from many locations.
- Views of the Mourne Mountains can be gained from the eastern side of Mullyash Mountain.

Landscape Description

132. This landscape character area is located on the eastern side of County Monaghan. It extends from the Monaghan drumlin uplands as an elevated plateau and series of foothills leading up to and including the unique summit of Mullyash Mountain.

133. This is an open pastoral landscape located in an elevated plateau like setting with views towards Mullyash Mountain as a major focal point in the area. This landscape features a small scale field pattern bounded by neatly cut hedgerows. Farming activities and farm dwellings are present although overall, this is a quiet, tranquil and relatively remote landscape setting. The open plateau renders it visually exposed. Mullyash is a distinctive landmark mountain with a somewhat linear ridge summit which presents against the skyline. Unfortunately the beauty of this is greatly compromised by the presence of extensive coniferous forestry which is very much out of character with the area generally.

134. A network of small roads permeates this landscape. Settlements are small and often occupy intersecting roads or crossroads. Many of the dwellings are very traditional and feature white render or stone and many are well sited on the lower slopes of rolling hills or drumlins.

Landscape Condition & Sensitivity to Change

Sensitivity to Change: High

Landscape Quality: Very Attractive with small areas of Highest Quality

Landscape Value: Medium with pockets of high value relating to drumlin summits and archaeological sites

135. LCA 2:Blackwater Valley and Drumlin Farmland

Key Characteristics

- Within the flat marshy floodplain of the River Blackwater featuring wet meadows, pasture and drumlin farmland landscape types.
- Attractive historic villages can be found within this character area providing picturesque riverside settings.
- Occasional isolated small woodlands.
- Occasional loughs, some of which contain Crannogs.
- Many neatly cut hedgerows and mature trees enclose and separate fields.
- Stone walled boundaries to Historic demesnes or designed landscapes.

Landscape Description

136. The Blackwater Valley and Drumlin Farmland landscape character area contains the flat marshy floodplain of the Blackwater River. The river is fringed at specific locations with occasional clumps of deciduous woodland.

137. The landscape features many cut or well managed hedgerow lined fields given over to pasture and isolated small woodlands are also scattered across this landscape. Numerous small streams flow into this area feeding into the small to medium sized loughs.

138. The exposed nature of the gently rolling drumlins allows relatively open views. Historic wooded designed landscapes including Castle Leslie are a strong feature within the landscape. The character is rural and peaceful with exceptional scenic qualities.

Landscape Condition & Sensitivity to Change

Sensitivity to Change: High

Landscape Quality: Very Attractive with areas of Highest Quality

Landscape Value: Medium with pockets of high value relating to the setting of historic sites

13.3.1.5 A Summary of the Sensitivity to Change of the Study Area

139. The study area can be described as rural agricultural countryside with small to medium sized farm holdings; historic designed landscapes; scattered private dwellings; village settlements; small pockets of recreational development and, closer to Armagh City, commercial and industrial development. Routeing for this type of development is made difficult due to the number of scattered dwellings within the context of this landscape area.

140. The scale of the overall landscape within the study area is small to medium and the landscape character of all eight character areas within the study area is valued by local residents, landowners and passers-by. The landscape features within both the Loughgall Orchard Belt and the Armagh Drumlins LCAs through which the proposed overhead line and substation would be situated are also widely valued.

141. The following features or elements of the landscape in the study area within the LCA are sensitive to change as defined in the Northern Ireland Landscape Character Assessment (2000):

- Agricultural fields - due to loss of agricultural fields to housing;
- Rural character - due to loss of rural character for example as a result of increased ribbon development and poor siting of new buildings;
- Traditional hedge enclosures - due to loss of traditional hedge enclosures to the introduction of inappropriate materials such as fences and railings; and
- Roadside vegetation - due to loss of roadside hedges and trees as a result of road widening schemes and improvement of sight-lines at junctions.

13.3.2 Visual Baseline Situation

13.3.2.1 Overview

142. This section describes the visual character and amenity of the study area within which the Proposed Development would be located. It provides a general description of the existing visual amenity.

13.3.2.2 General Visual Amenity of the Study Area

143. The study area is populated with many scattered farms, dwellings and small commercial buildings. A few small villages are located along secondary and minor roads and around local educational or commercial centres. The River Blackwater, which includes part of the disused Ulster Canal, flows through part of the study area. The River Callan flows north through Armagh City before connecting to the River Blackwater.

144. The land within the study area is primarily agricultural, consisting of low rolling hills, shallow valleys and structured fields, which often have overgrown hedgerows and many mature trees. Drumlins are a prominent feature of the study area. The visual amenity of the study area varies and views are dependent on the amount of openness or enclosure that the drumlin landscape creates.

145. There are already numerous small-scale telephone and electrical distribution lines that connect to the many scattered dwellings and settlements. This is typical of rural locations in Northern Ireland.

13.3.2.3 Settlements

146. Armagh City (5.3km east of the line) is the largest settlement within the study area with Dungannon (5.7km), a similar sized settlement lying on the edge of the study area to the north – west. Moy (1.3km), Blackwatertown (1km), Benburb (1.6km), Killylea (2km), Milford (2.9km), Middletown (4.4km), Keady (4.6km) and Derrynoose (1.7km) are other key settlements in the study area.

147. Throughout the study area there are single and small clusters of residential properties and farm buildings. Where the proposed overhead line passes in close proximity to, or where there would potentially be uninterrupted views of, the Proposed Development the potential visual impact has been assessed.

13.3.2.4 Individual Properties

148. The study area of the proposed overhead line route includes a large number of individual properties, both houses and farmsteads. Individual properties tend to be concentrated along the edges of roads, however, there are still a large number of properties scattered more widely across the landscape, typically with residential dwellings and many farmhouses situated atop drumlins, accessed by private tracks. Properties vary in size from single storey to two or three storeys.

149. Extensive field study of the characteristics of the landscape has shown that due to the scale and topography of the drumlin landscape type that dominates the route, properties that lie within 500m of the overhead line route are more likely to have clear views of the proposals.

150. For this reason particular attention has been paid to properties within 500m of the proposals. Figure 13.7 shows the detailed study area of 500m either side of the line route and the individual property receptors located within this area. The 500m study area associated with the proposed substation and overhead line has been divided into ten sections. Each sheet refers to a section between towers and groups of receptors labelled alphabetically A-J with individual property receptors being given an ID number. Individual properties are described more fully in section 13.6.22 Individual Properties Assessment.

- Substation and Towers 1-8 – A1 - A24;
- Towers 9-19 – B1 - B43;
- Towers 20-30 – C1 - C63;
- Towers 31-40 – D1 - D36;
- Towers 41-51 – E1 - E60;
- Towers 52-61 – F1 - F33;
- Towers 62-71 – G1 - G42;
- Towers 72-81 – H1 - H44;
- Towers 82-92 – i1 - i27; and
- Towers 93-102 – J1 - J62.

13.3.2.5 Transport Corridors and Paths

<u>Roads</u>

151. The community is well served by a good transport network including A and B class roads, as follows; M1, N2, A28, A3, A29, A45, B115, B106, B3, R214, B34, B517, B45, B128, B28, B130, B210, B361, B32, R184 and R181.

<u>Paths</u>

152. There are several recreational paths, cycle ways and local walks in the study area, as follows; National Cycle route 91; National Cycle Route 95; Regional Cycle Route 11; The Ulster Way; River Blackwater Canoe Trail, The Monaghan Way and Beetlers Trail.

13.3.2.6 Viewpoint Locations

153. The guidelines provided within "Guidelines for Landscape and Visual Impact Assessment"[137] were confirmed by DOE as the agreed method of approach for the assessment and the viewpoints were selected following the methods provided within this guidance.

154. The assessment of impacts from key viewpoints within the study area is an essential component of the landscape and visual assessment. Thirty four viewpoints have been identified for inclusion in the assessment.

155. Viewpoints 1-31 are representative of existing and potential views that may be obtained by a range of different receptors along the route of the overhead line and provide information on general visual amenity within the study area. The viewpoints are from fixed locations and, if read in conjunction with the ZTV (Figures 13.3 to 13.5) and landscape character analysis, provide an indication of the potential impacts from the viewpoint and immediate surrounding area.

156. A detailed description of viewpoints is provided later in this chapter, by section 13.6.2.4. Assessment of Viewpoints.

157. In order to determine the potential for more distant transboundary impacts of the Proposed Development the following 'scenic views' (SV), identified in the Monaghan County Council Development Plan 2007 – 2013 have been included within the viewpoint assessment: (SV10) Scenic view from Castleshane Brae - Viewpoint 32; (SV11) Scenic view form Tully buck– Viewpoint 33; and (SV12-SV7) Scenic drive and views of open countryside from Mullyash Mountain– Viewpoint 34

158. All of the identified viewpoint locations for landscape and visual assessment are shown on Figure 13.6 and listed in Table 13.7 below.

[137] (Landscape Institute and Institute of Environmental Management and Assessment, 2002)

Table 13.7: Viewpoint Locations

Viewpoint	Location	Direction of View	Approximate Distance to Nearest Visible NIE Tower in View	Distance to Substation
1	Clonteevy Bridge over River Rhone on Trewmount Road (B106) - View towards substation	South		560m
2	Derrygally Way to east of Turleenan Substation - View towards substation	North - West		120m
3	Derrygally Way to south of Turleenan Substation – View towards substation	North		250m
4	Trewmount Road (B106) near site access road.	South		380m
5	Bonds Bridge over River Blackwater near the Argory	South - West	1670m	
6	Moy Road (A29) crossing	South	260m	
7	Culkeeran Road	North - East	460m	
8	Gorestown Road	North - East	170m	
9	Benburb Road	South	60m	
10	Benburb Road south of Ninewell Bridge	South - East	320m	
11	Clonfeacle Road (B128) crossing	South - East	470m	
12	Benburb Priory	East	2000m	
13	Artasooly Road looking towards Blackwater River Crossing	North - West	480m	
14	Artasooly Road at Tullymore Bridge	North - East	90m	
15	Artasooly Road and Maydown Road junction at Artasooly	East	1220m	
16	Battleford Road (B115) crossing	South - East	190m	
17	Killylea Road (A28) crossing	South - East	130m	
18	Killylea settlement (Fellows Grange Court)	East	2250m	
19	Navan Fort	South - West	2420m	
20	Monaghan Road (A3) east of Norton's Cross Roads	North - West	300m	
21	Monaghan Road (A3) crossing	South - West	180m	
22	Maddan Road south of Norton's Cross Roads	North	250m	
23	Cavanagarvan Road and Sheetrim Road Junction	North - East	170m	
24	Drumhillery Road crossing	North	200m	
25	Lagan Road west of Keady	West	3,260m	
26	Fergort Road (B3) crossing	South - East	340m	
27	East of Derrynoose	South - West	1,540m	
28	Derrynoose Road at Curragh Lane looking north	North	230m	
29	Derrynoose Road at Curragh Lane looking south	South	230m	
30	Crossbane Road	South - West	1,378m	
31	Crossaghy Road	North - East	1,610m	
32	Minor road north-east of Castleshane	East	5300m	
33	Scenic view from Tullybuck (Clontibret)	East	3700m	
34	Mullyash Mountain	North - West	8400m	

159. Distances to towers are approximate and may not be the closest tower within the view represented by the photomontage i.e. the closest tower may in fact be behind the viewer in some cases.

13.4 Potential Impacts

13.4.1 Potential Landscape Impacts

160. The extent to which the Proposed Development would affect the existing landscape varies significantly depending on the individual components of the Proposed Development and the capacity of the existing landscape to absorb these components. Two distinctive component types have been identified; the substation and the overhead line, both of which have been assessed.

161. The following section provides an assessment of the overall effect that the Proposed Development would have on landscape designations and landscape character during construction and once operational, 15 years after commissioning, in accordance with the impact criteria outlined in Section 13.3 above.

162. It is recognised that development of this type would inevitably result in adverse impacts on landscape resource. This section therefore focuses on the residual impacts i.e. those remaining taking into account mitigation.

13.4.1.2 Substation

General

163. The site is located at Turleenan townland, grid ref. H859582. It lies in the valley of the River Blackwater, 4.5km to the north-east of Moy and 6.25km from Dungannon. Armagh lies 13.5km to the south-east of the site. The site is in Landscape Character Area 47, the Loughgall Orchard Belt. It has a drumlin topography through which the River Blackwater flows north-east to Lough Neagh. The area is generally lightly populated, with scattered farmhouses and dwellings. Close to the River Blackwater the landscape is more open with long views over the surrounding countryside. The roads in the area are typified by hedges with trees. Areas of woodland and orchards are also elements in the local landscape. The Magherafelt – Tandragee 275kV overhead line currently runs north-west to south-east across the landscape.

164. The proposed substation would be accessed off the B106 Trew Mount Road along an existing laneway that would be raised above potential flood levels and upgraded to a 6m wide road with grass margins. It would be accessed via a gated area set back off the B106. The first 20m length of access road would be 10m wide to allow for vehicle movements reducing to 6m wide road with grass margins. The substation would occupy an area within a 193m x 134m fenced compound, although other intrinsic features are required to be built outside this area. In order to meet security requirements the substation compound would be surrounded by a double security fence. The substation site would be a newly created flat "platform", of 17.75m AOD level, positioned above and outside the derived 1 in 200 year flood plain level. The road which passes to the east of the site is at 14m AOD. To achieve a level platform a cutting would be built into the side of an existing drumlin on the western side of the site. A full description of the substation design is provided by Chapter 5 of this ES.

165. Two 275kV termination structures would be constructed at heights of 46m and 54m above ground level to transfer electricity from the existing Magherafelt –Tandragee 275kV overhead line to the Turleenan substation. Both would be located to the north-east of the proposed substation and would replace one existing intermediate tower.

166. The proposed overhead line would leave the substation to the south-west.

167. To facilitate the proposed works, temporary diversions of the existing grid would be required. Two temporary structures, as outlined in Chapter 5, will be required. Prior to the construction of the proposed 275kV towers, one side of the existing 275kV overhead line would be temporarily diverted on to temporary structures while the other would be disconnected for the duration of the works. This would allow the construction of the proposed 275kV structures and bases while maintaining use of the existing line in service. The temporary structures would be constructed within the substation

application area, approximately 35m from the location a period of 2-3 months duration and would be approximately 50m in height. The base of the temporary structures would be $1m^2$ with limited foundations secured with cable stays.

168. The existing overhead line would be uncoupled from the existing 275kV towers and mounted to the temporary towers. The maximum diversion of the line is approximately 10m (within the substation application area) and the diversion will cross over agricultural land and over the Trew Mount Road and Derrygally Way. Access to the existing tower locations outside of the substation area for the diversion works would be via the existing field access locations.

169. The proposed substation and associated towers would be of such scale and character that they would generally create a significant and adverse impact on the existing rural character of the substation site area. The potential landscape impacts would be:

1. the introduction of a large substation and associated towers on an existing rural landscape character;
2. the removal of land currently in agricultural use; and
3. the removal of natural landscape elements such as landform, hedgerows and trees.

170. During construction, landscape character would change. The construction activity would be very noticeable within the local area as would the change in use from farmland to a substation site. As described by Chapter 5 of this ES, the construction of the substation would be split into seven segments:

1. Site Entrance;
2. Access Roads;
3. Site Clearance, Landscaping and Preparation of Bund Construction;
4. Install Drainage and Ducting;
5. Construction of Roads and Bases within the Site;
6. Installation of Equipment and Construction of Buildings; and,
7. Completion of Access Road and Entrance, Including Final Surfacing.

171. The construction period would be of up to three years.

172. The proposed new ground level platform's steep embankments and deep cutting into the drumlin hillside would impact on the local landscape character. The construction of the substation buildings and associated structures would also impact the local landscape character. The creation of the new access road would also be built above existing ground levels on a raised linear corridor. All of these construction activities would require machinery and plant to facilitate their completion. Site compound and lay down areas would have an adverse impact for the duration of the construction period.

Operational Impacts of Substation

173. The area would change from agricultural land to the site of an electricity substation. However, the loss of agricultural land is not considered to be significant in the locality. Existing planting on the site, made up of a number of mature trees [8No], hedges [266 linear m], smaller trees in groups along hedgerows, improved grassland and rush dominated pasture, would be removed during site clearance operations.

174. The removal of existing vegetation would have an adverse impact on the landscape character in particular the loss of the mature trees and established hedgerows; these impacts would be addressed in the medium/long term through mitigation planting techniques.

175. The Proposed Development at Turleenan would have no physical impact on existing public rights of way, however, the proposed new platform's steep embankments and deep cutting into the drumlin hillside could have an adverse impact on the local landscape character.

13.4.1.3 Overhead Line

General

176. The overhead line route lies across two Landscape Character Areas as described in section 13.4.3 above. The capacity of each character area to accommodate change is a key consideration. This will vary locally according to land use, the pattern and scale of the landscape, the value placed on the landscape and the scope for landscape mitigation measures.

177. There would be a loss of localised vegetation to the tower sites including tree, shrub and hedge removal to allow for the construction of tower structures for supporting the overhead lines. Creation of temporary access tracks to the towers and sightline requirements would also result in the localised removal of vegetation including hedgerows and trees.

178. Temporary Low Voltage crossings –18 existing electricity lines would require to be undergrounded, which would be undertaken by open trench. This would result in removal of hedgerows with trees which would be reinstated post construction;

179. The CIVI-1 tower design is a variant of the existing tower type found in the study area. Further details on tower design and on the tower to be used in each location is contained in Chapter 5.

180. The proposed overhead line and associated towers would be of a scale and character that they would generally create an adverse impact on the existing rural character of the area immediately following the overhead line route. The potential landscape impacts would be:

1. The introduction of an overhead line and associated towers to an existing rural landscape character type;
2. Creation of temporary access tracks,
3. The removal of natural landscape elements such as landform, hedgerows and trees to accommodate the Proposed Development; and
4. Required tree surgery where the overhead line electrical clearances are potentially impacted by the proximity of trees.

Construction Impacts of Overhead Line

181. The construction period for the project is anticipated to be up to three years from the start of the site works. The construction period in any particular location along the overhead line route would be in the order of four to six months.

182. As described by Chapter 5 of this ES, construction of the overhead line would take place on two working fronts defined as:

- Section A – Towers 1 – 50; and,
- Section B – Towers 51 – 102.

183. The construction of the overhead line would be undertaken in four key stages, according to the following sequence, on a rolling programme:

- Stage 1 – Preparatory Site Work (1 - 7 working days);
- Stage 2 - Tower Foundations (3 – 6 working days);
- Stage 3 - Tower Assembly and Erection (3 – 4 working days);
- Stage 4 - Conductor/ Insulator Installation (7 working days); and,
- Stage 5 – Reinstatement of Land (1 - 5 working days).

184. The construction of the towers and overhead line would require the creation of temporary access tracks; vegetation clearance for access tracks and sightlines; the location of working areas for towers; vegetation removal at various tower locations; and, minor drainage works. It would result in construction activity in the landscape, with workers, supply vehicles, noise and disruption to traffic.

185. Impacts on the built environment would include the removal of some hedges to allow construction to take place, after which they would be reinstated where possible. Removal of landscape elements and features would result in an adverse impact on the localised landscape resource of the tower sites and access tracks. With regard to farming, there would be some temporary disruption to farmland and farming operations during the construction phase. The proposals would have no physical impact on existing public rights of way.

186. With reference to landscape character, there would be a temporary increase in activities related to construction with the implementation of a new line route in the landscape.

Permanent and Operational Impacts of Overhead Line

187. The proposed overhead line route would likely be a significant new feature in the landscape detracting from the quality of the local landscape character. The local landscape is already carrying many small-scale telephone and electrical distribution lines. Traversing the undulating drumlin topography, the line route would in some areas result in sky-lining where overhead structures such as towers and overhead lines would be visible against the open sky and so increase their visibility in the landscape. The proposed overhead line route would inevitably affect the local character of the area with, in some cases, a noticeable loss of landscape elements i.e. improved grassland, hedges, shrubs and trees. Vegetation clearance which would be required as ongoing maintenance for the Proposed Development is described by Chapter 5.

188. The degree of impact on the landscape by the overhead lines can be mitigated, particularly with regard to focused views and associated landscape character effects, by careful siting, avoiding sky-lining where possible, contrasting backcloth and proximity to primary viewing points. The choice of design of the proposed towers has been informed by a comparative visual appraisal of four optional lattice steel tower types, undertaken to establish which would be most sympathetic to the surrounding landscape.

13.4.2 Potential Visual Impacts

189. Development can change people’s direct experience of landscape depending on existing context, the scale, form, colour and texture of the development proposed, the nature of activity associated with the development, and the distance and angle of view.

190. Within the rural context of the study area, the proposals would generally only be visible when observed from close proximity, where seen as part of a long vista, or from elevated and overlooking viewpoints. The visibility of any development depends on its size, on the position of the viewer and on the size and position relative to the viewer of any intervening landscape elements.

191. The proposed overhead line and substation would have an impact on the landscape and due to their vertical dimension the tower structures would have a significant impact on the landscape and wider landscape setting. The landscape ranges from Good landscape through to Highest Quality landscape. These are highlighted previously in the Landscape Character Assessment.

192. There are two key issues relating to visual impacts:

- the extent to which the new overhead line and substation including associated towers and structures would intrude into existing views experienced by residents and day to day users of the area, and,
- the extent to which residents and travellers would be subjected to the impact within this landscape.

13.4.2.2 Visibility of the Proposed Overhead Line

Relevant Visibility Considerations

193. The nature of overhead line towers and their locations, as tall structures within a landscape, requires the assessment of impacts to be more complex than simply assessing whether the overhead line

towers are visible or not. There are a number of relevant considerations relating to the visibility of the overhead line towers and its relation with the landscape, which also inform the assessment. These include:

- **Backdrop:** Towers seen against a single backdrop, e.g. sky or large areas of similar landscape type, will generally appear more visually coherent than those viewed against a variety of backdrops.
- **Scale:** the scale of the receiving landscape has an impact on its ability to accommodate particular proposals. In general, the large scale of the towers tends to be better accommodated in a large scale and relatively simple landscape. In addition, uncomfortable comparisons of scale can be created where the towers are seen in close context of elements of a more domestic scale such as housing;
- **Focus:** specific viewpoints may focus in a particular direction. The location of the Proposed Development in relation to this focus can affect the significance of the impact, particularly as individual towers and indeed combinations of towers can form vertical focal points within the landscape;
- **Unity:** the relationship of the towers to each other affects whether the overhead line reads as a cohesive entity or as fragmented. Other vertical elements, such as existing transmission towers, telecommunications masts or wind turbines can also detract from the unity of the proposal and add to a sense of visual confusion; and,
- **Setting:** the combination of landform, foreground, background and features within a view, which provide the landscape setting, influences the nature of the impact of a tower or series of towers. Setting also relates to the complexity or simplicity of the landscape or view, the sense of remoteness or development, which provides the context for the proposal.

Zone of Theoretical Visibility Overview

194. Figures 13.3 – 13.4 illustrate the Zone of Theoretical Visibility (ZTV) for the entire length of the proposed overhead line. The ZTVs indicate only those areas from which the tower structures carrying the line would theoretically be visible and does not account for the shielding effects of trees, buildings and local topography. It should be noted that the nature of the views is not illustrated in the ZTV and consideration should be given to the photomontages, would illustrate the type of views likely to be had within 5km.

195. Open lattice steel towers, allow visibility of the background landscape or sky to be viewed through the structure and are consequently less visible than more solid structures of a similar size. As discussed in the above section, the more complex the background or backdrop, the more effectively the visual impact is reduced.

196. Tower structures such as the ones proposed would only effectively be screened by landscape elements or features that are located within close proximity to the receptor. Distant screening elements such as large areas of woodland would reduce the visual impacts; however, towers of the size proposed could be seen above the tops of woodland where topography allows.

197. The individual tower locations and heights have been used in calculations and the theoretical visibility of each tower has been calculated to a maximum distance of 10km. This provides an understanding of the worst case theoretical visibility along the 35km of overhead line route. The ZTVs have been calculated using the following terrain data - OSNI 10M Digital Terrain Model in Northern Ireland and OSi National Height Model 10m DTM / 10m Contour in the Republic of Ireland.

198. The land within the study area primarily consists of low rolling hills, shallow valleys and structured fields. The ZTV shows similar overall theoretical visibility results along the entire proposed route. This is as a result of similar types of landform being present throughout the study area and along the proposed route. There are however differences in the extent of this visibility. Theoretical visibility is generally greater to the north and east of the line route where landform is at a lower elevation. Closer to the border crossing, however, the zone of visibility narrows due to higher ground on either side.

199. In order to illustrate these subtle differences the ZTV has been split into 4 sections from north to south. The sections are as follows and illustrated in Figure 13.4:

Section 1: Turleenan Substation to Tullygoney

Section 2: Tullygoney to the Dismantled Rail Line at Cullentragh

Section 3: Dismantled Rail Line at Cullentragh to Ballymargy Bridge

Section 4: Ballymargy Bridge to the North / South border near Crossbane

13.4.2.3 Assessment of Potential Visual Impacts

200. Visual impacts on the landscape would arise from the construction of the substation, overhead line and associated towers, the direct impact on available views, the reaction of viewers who may be affected and the overall impact on visual amenity. The potential visual impacts would be:

1. intrusion of the development on the local visual amenity;
2. intrusion on the views of local residents; and
3 intrusion on local road users and impacts on local views and viewpoints.

13.4.2.4 Substation

201. Fig 5.1 shows the proposed Turleenan Substation Site in the context of the local area and identifies roads, rivers, topography and existing 275kV line. Photomontages 1-5 show a series of key viewpoints around the site that include before and after-views of the substation and once planting has become established (15 years).

Construction Impacts

202. The Proposed Development would result not only in the loss of agricultural grassland but create significant changes to existing local landform, resulting in substantial visual intrusion during the construction phase of the works. The visual appearance of the site would be transformed with the loss of vegetation and a new landscape created with embankments, cuttings, earth bunds and a raised land "platform". The extensive earthworks with stockpiles of soils, would, however be short term.

203. In addition, the activity of a busy construction site would result in short term substantial visual intrusion to local receptors and travellers. Construction works would also include the site infrastructure, with plant, towers, buildings and fencing creating an evolving visual scene that would be long term in nature.

Operational Impacts

204. The proposed substation site is mainly visible to receptors viewing it from the east and south – east as the localised topography does not allow views from the west and north. Views experienced by receptors to the north and west would be limited to the site entrance of the substation. There would be no views from Moy further to the south-west.

205. Overall, some receptors would have full views and others filtered views over the surrounding landscape, of which the proposed substation site would form a part. Existing intervening woodland blocks, hedges and trees would play a role in reducing visual impacts for some of these receptors. Mitigation planting would also help in reducing any visual impacts.

206. A local landmark in the area is a brick tower, which stands on top of a drumlin, 2.75km to the south in the townland of Clonmore. At this distance the substation would have little impact on the setting of the brick tower.

207. The proposed overhead line would terminate at this substation. The Magherafelt –Tandragee 275kV overhead line crosses the landscape here already, reducing the sensitivity of the baseline to this type of development as the proposed towers and line would not be a new feature in the landscape. However, this additional proposed overhead line route would further erode the landscape and visual quality of the area.

13.4.2.5 Overhead Line

208. The nature and scale of the existing landscape with its undulating drumlin topography, trees and hedges can be effective in limiting visibility within the landscape. This gives the current landscape a greater capacity to assimilate this type of development compared to a flat landscape with few vertical elements where visibility would be greater.

Construction Impacts

209. The towers and overhead line would clearly be visible in the landscape but the existing landscape has the capacity to reduce its impact to a certain degree as described earlier in paragraph 199. Nevertheless, the construction of the proposed overhead line route, both in terms of its length and the scale of the towers, would in the short term impose a significant and negative new element on this small to medium sized landscape.

210. The construction period would see progressive changes to the visual amenity beginning with the arrival of the contractor on site to carry out Preparatory Site Work, removal of vegetation and disturbance of ground. Tower Foundations, Tower Assembly and Erection, Conductor/Insulator Installation would create general activity of construction teams and management of their supplies as they erect the towers and associated overhead lines. These changes would have a visual impact on receptors. Lastly there would be Reinstatement of Land at the final stage of the construction period.

Operational Impacts

211. The visual impact assessment indicates that there would be significant adverse impacts upon the visual amenity of some parts of the study area. A key consideration in reducing these permanent visual impacts has been the selection of an appropriate tower structure to carry the overhead line. A comparative visual appraisal of four optional lattice steel tower type options was undertaken to find a tower type which would be most sympathetic to the surrounding landscape. The study provided an assessment of each option using a matrix system based on both quantitative and qualitative evaluation. It considered such factors as design features, height, weight, span lengths and footprint. Of these the CIVI tower was the preferred option. It was determined that this tower would have the least intrusive visual profile in the local landscape. This in turn would help to reduce the visual impact of the proposed overhead line route.

212. Further details on tower design and on which type of tower is used in each location is contained in Chapter 5.

213. Visual impacts on passers-by using local roads close to the proposed route corridor could include impacts from the loss of landscape elements, the temporary increase in traffic on local roads caused by vehicles working along the line route corridor and also from the impact of the new towers and overhead lines.

13.5 Mitigation Measures

13.5.1 General Landscape Mitigation

214. This assessment is based on the substation design shown on Figure 5.1 and overhead line route shown on Figure 1.5.

215. NIE has a committed approach to environmental management and the requirements that the principal contractor is expected to meet are identified in the Outline Construction Environmental Management Plan (OCEMP) (Appendix 5A).

216. The CEMP is the practical means by which the contractor will implement the environmental commitments made in this ES and will cover the construction of the Proposed Development and subsequent reinstatement of the site.

13.5.2 Substation Landscape Mitigation

13.5.2.1 Construction Landscape Mitigation

217. Planting proposals are set out in Figure 5.7, which is contained with the planning drawings. The planting proposals are also illustrated in viewpoint photomontages 1-5 at Year 1 and Year 15.

218. Proposed planting would be implemented in the first planting season following completion of the earth works to allow the planting to become established in advance of the substation construction. Plant species chosen would be fast growing native species to complement existing planting in the local area. In time the site would resemble one of the woodlands found in the local area and so mitigating measures would compensate for the loss of vegetation cover and resulting in greater biodiversity and a positive impact in the local area. Detailed planting proposals have taken cognisance of existing hedges and local pockets of woodland to deliver visual and environmental benefits as the proposals mature.

13.5.2.2 Operational Landscape Mitigation

219. The proposed planting would include blocks of woodland and selected tree planting, at the site entrance, along the approach road and surrounding the substation that would in time effectively screen views for receptors and travellers and integrate the site into the local landscape character. A range of plant sizes would be used to give a degree of maturity to the planting. Areas of open space would become meadow areas, created with grassland cut on a low maintenance regime to encourage species diversity.

220. The planting would be protected by rabbit proof fencing and would be subject to a management program to ensure objectives are met. These proposals have been designed in response to predicted landscape and visual impacts to assist in their amelioration. The planning drawings include details of the sections through the substation site and across the site showing the area of disturbed ground, proposed slopes and proposed changes to existing topography. The site would be maintained according to a five year maintenance schedule, which would ensure appropriate seasonal operations such as grass cutting, weed control, replacements, wind firming, and thinning to various densities, so as to establish an informal, naturalised and diverse planting screen. Appendix 5D contains indicates a proposed planting mix with a proposed maintenance schedule for the site.

13.5.3 Overhead Line Landscape Mitigation

13.5.3.1 Construction

221. Earthworks associated with the erection of towers and foundation construction would be limited to specific areas around the base of each tower. The site areas are particular to each tower location and whilst they are likely to be of a similar size, the specifics would vary depending on site conditions; however the maximum size of working area for construction of a tower is 1,225m^2.

222. These areas would be reinstated and vegetation replaced, however, vegetation may take several growing seasons before being completely restored. As a result of this restoration work it is likely that residual impacts from the earthworks would be limited during the operational phase.

223. Temporary access tracks and track-ways would be reinstated following construction of the line, however, as with earthworks limited residual impacts would likely be present during the early stages of the operational phase. The assessment of impacts associated with temporary earthworks and tracks is included in the assessment of overall impacts of the overhead line in the operational phase.

224. The minimum and maximum foundation sizes have been determined and are shown in detail in Appendix 5C.

225. Chapter 5 describes the methods that would be used to construct each component of the overhead line (e.g. earthworks, foundations, installation of the towers and stringing of conductors).

13.5.3.2 Operational

226. The alternatives studies have been the main form of mitigating the permanent and operational effects of the proposed overhead line.

227. The selection of the preferred tower structure was also undertaken based on an alternative assessment undertaken by a landscape architect.

228. An assessment of alternatives with a mind to the reduction of landscape and visual impacts was undertaken. This is described in detail in Chapter 4 of this ES. In summary, a number of alternative route corridor studies, in which landscape and visual issues were a primary focus, were undertaken in order to identify a preferred route corridor. This information was then used to assess the sensitivity of the existing landscape, and to identify key considerations for line routeing.

229. The preferred route corridor was refined through a line routeing process, which identified a proposed overhead line route including specified tower locations. A landscape architect was a key part of NIE's team during the line routeing process, and where possible line routeing decisions were made to reduce landscape and visual impacts. In trying to fit the line route into the landscape, the main objective was to keep the line route as straight as possible, in order to reduce the actual length of the final line route and avoid the use of angle towers, which are generally larger than intermediate towers. This in turn helps to reduce the actual number of towers and the number of towers in the landscape. However, due to technical and environmental constraints, including particularly the number of houses scattered throughout the study area, this was not always possible and the overhead line route has had to include deviations.

13.5.4 Visual Mitigation

230. This assessment is based on the substation design shown on Figure 5.1 and overhead line route shown on Figure 1.5.

231. NIE has a committed approach to environmental management and the requirements that the principal contractor is expected to meet are outlined in the Outline Construction Environmental Management Plan (OCEMP) (Appendix 5A).

232. The OCEMP is the practical means by which the contractor would implement the environmental commitments made in this ES and would cover the construction of the Proposed Development and subsequent reinstatement of affected lands.

13.5.5 Substation Visual Mitigation

13.5.5.1 Construction

233. Mitigation measures to reduce visual impacts of the proposed substation would see the embankments, earth bunds and entrance road heavily planted with native woodland, so that in time the substation would be screened from view and assimilated back into the local landscape setting. Advance planting of these new woodlands would reduce the potential adverse visual impacts of construction activity.

13.5.5.2 Operation

234. Selection of the most environmentally, technically and economically preferable site for the proposed substation was a priority. The proposed site has been carefully chosen to limit its impact on the landscape and views. The existing drumlin landform screens much of the site from the north and west. The site is more open to the south in the valley of the River Blackwater. Views of the substation would be restricted to a limited number of passers-by and residential receptors.

235. The proposed earth bunds and extensive planting proposals play an important role in limiting the visual impact of the substation. In considering the effectiveness of mitigation measures, particularly where planting is proposed for screening purposes, the difference between summer and winter views in this landscape is considered negligible because any proposed planting would be representative of dense

vegetation currently present in the area. Planting would be only marginally less effective at screening in winter than summer by virtue of its dense, twiggy nature, even in the absence of foliage in winter.

236. Planting would also help to reduce the impact of perimeter fencing and wherever possible existing hedgerows would be retained. Planted embankments and earth bunds 1m high would surround three sides of the site, helping to complete the visual enclosure of the site. It is accepted that the steep profile of earth bunds may create visual impacts as they can be at odds with smoother profiles in the landscape, however once planted their profiles would be softened as the planting matures and provides visual screening.

237. Mitigation of the subsequent residual visual effects of the completed development would be aided by the use of appropriate materials and finishes for the built elements, a combination of surrounding earthworks, to include earth mounding, around the site, and suitable hedge and tree screening.

238. These mitigation design measures are summarised below.

- Complete earth mounding and planting prior to the installation of substation components.
- Provide the minimum height of bunds to immediately screen the lower construction elements.
- Grade new landforms gradually into existing surrounding levels.
- New planting to complement existing visual character - use indigenous hedge and trees along with fast growing nurse and climax trees.
- Minimise the use of roadside signs relating to the completed development.
- All metal security fencing would be finished in galvanised/painted grey.
- Other field enclosures would be timber post with appropriate galvanised wire, and planted with local hedge and tree species, to match existing.
- Security lighting will be activated by movement sensors only and will be located to minimise lighting spillage and pollution on the local area.
- Reflective finishes on all construction elements have been avoided.

239. To further reduce the visual impact, the buildings have been designed to complement the building appearance and character local to the area, with particular regard to their scale, form and finish, as detailed in Chapter 5 of this ES.

240. The two proposed buildings are located within the northern section of the substation, adjacent to the proposed internal substation entrance. The buildings are screened from the south by the transformers and a 12m high concrete fire wall. The fire wall would be a visually dominant structure within the site and the finish of the buildings would not visually conflict with this structure.

241. The site is being cut into the hillside which results in the landform to the north and west screening the site, the structures and the buildings from view. The mature hedgerows and mixed woodland that are located off site to the east provide additional screening and the existing mature woodland structure combined with proposed planting would minimise visual impacts of the substation.

242. Further detail on visual substation mitigation is provided by Chapter 5 of this ES.

13.5.6 Overhead Line Visual Mitigation

13.5.6.1 Construction

243. At the end of the construction process, land affected by the working areas would be fully reinstated as pasture or planted to replace any vegetation lost as a result of the works. Care would be taken to ensure there would be no remaining areas of compacted land. Any fencing and/or hedging removed to accommodate working areas or access tracks would be replaced to an equivalent or better quality in keeping with the rural landscape upon completion of the construction period.

13.5.6.2 Operational

244. The extent to which tower structures appear visible within the landscape can vary according to a number of factors, including viewer distance, weather conditions and whether or not the towers are on the skyline or seen against a background. In order to mitigate these impacts, routeing of towers has taken advantage of, and responds to, opportunities for screening provided by landform and existing vegetation.

245. Topography has also been utilised as a form of mitigation. Careful siting of towers helps to prevent skylining (breaking the sky line) by avoiding prominent hilltops and ridges that can make towers and their associated lines appear to dominate the landscape. In line routeing, NIE have avoided skylining where at all possible. In an undulating drumlin landscape populated with rural dwellings and farms, however, this is not always achievable due to the constant changes in landform. Skilled and experienced line routeing personnel have been employed to keep this to a minimum on the proposed overhead line route.

246. The overhead line has been routed within the preferred route corridor, recognising the need to avoid visual impacts on the locations and aspects of individual dwellings, settlement, public amenities and housing developments. In all situations, where practical, the line route has been kept the maximum distance possible from individual dwellings in order to avoiding intruding on the amenity of public and private views.

247. Existing vegetation found within the study area also would play a key role in reducing the impact of towers and overhead lines. It was a deliberate policy to attempt to retain wherever possible existing vegetation. A 20m way leave underneath the overhead line route would be required. In addition, during operation, all vegetation within the 30m buffer zone would be retained wherever possible to a maximum height of 2m. Selective pruning, rather than removal of vegetation, would be carried out to avoid introducing unnaturally straight lines of vegetation loss in the landscape.

13.6 Residual Impacts

13.6.1 Residual Landscape Impacts

13.6.1.1 Physical Landscape Impacts

248. The physical effects of the Proposed Development are restricted to the area of the site where existing elements of the landscape may be changed. To allow for an assessment to focus on all the individual landscape elements that would be potentially disrupted, the assessment of physical effects has been carried out for each of the following sections of overhead line route:

- Substation and Towers 1-8;
- Towers 9-19;
- Towers 20-30;
- Towers 31-40;
- Towers 41-51;
- Towers 52-61;
- Towers 62-71;
- Towers 72-81;
- Towers 82-92; and,
- Towers 93-102.

249. The area of the affected vegetation can be seen in Figure 5.8 and is described in further detail in Chapter 10 (Ecology) of this ES.

250. The substation, overhead line and towers would result in temporary and permanent impacts to existing vegetation. The extent of the change to existing vegetation, whether temporary or permanent, has been analysed using a combination of GIS based desk study and field work. The types of changes which would be experienced across the study area are summarised below. It should be noted that a worst case situation has been assessed however, the construction of the overhead line and towers would seek to minimise the impacts to vegetation as far as possible.

251. The Proposed Development will have the following impacts on vegetation:

- Temporary Access Widening and Visibility Splays – if it is determined by the Department that temporary traffic measures are not to be used, existing accesses would be temporarily enlarged to accommodate the larger types of construction vehicles. Should this occur, it would result in the temporary loss of 701m of hedgerow and 36 individual trees (over the 34,000m line route), which will be replanted post construction. The visibility splays for the associated accesses would require that potentially 945m of hedgerow be trimmed so that the height does not exceed 2m. The majority of that length of hedgerow is currently maintained by the landowners at less than 2m so the length to be trimmed is likely to be much less;

- Temporary Low Voltage crossings – there are 18 existing electricity lines to be undergrounded, which will be undertaken by open trench and (where necessary) by thrust boring as described above. This will result in an impact to 89m of hedgerows and treelines, and the hedgerows will be reinstated post construction;

- Temporary Tower Working Areas – an area of 1225m^2 is required for the construction of each tower. The working areas have been designed to avoid hedgerows and trees as far as possible. However there will be a temporary impact with the removal of 826m of hedgerows and treelines and 9 individual trees (over the 34,000m line route). The hedgerows will be replaced with comparable fresh planting post construction;

- Permanent Tower Bases – the permanently affected area required for the towers is smaller than the required construction area. Of the area affected by construction, roughly 66% will be replanted post construction. It is possible for vegetation including hedgerows to grow under each of the proposed towers; however as worst case it has been assumed that 296m of hedgerows and treelines and 3 trees will be permanently removed;

- Permanent area under the overhead line – all vegetation under the conductors (a 20m swathe, 34.3km in length) will be trimmed so that the height does not exceed 2m. This is to ensure safety clearances are maintained and will form part of the ongoing maintenance of the proposed overhead line. This is standard practice and is done for all existing overhead lines. There are 8.9km of hedgerows and treelines to be maintained in this way and 34 individual trees. The majority of that length of hedgerow is currently maintained by the landowners at less than 2m so the length to be trimmed is likely to be much less; and;

- Permanent area adjacent to the overhead line – all vegetation adjacent to the conductors with the potential to fall onto the conductors will be trimmed to ensure safety clearances. This will form part of the ongoing maintenance of the proposed overhead line. This is standard practice and is done for all existing overhead lines. Less trimming will be required further from the conductors as there will be less potential for falling vegetation onto the overhead line. The trimming regime will involve a scalloping or profiling effect which will minimise the effect on vegetation. It is assumed that an area adjacent to the line and up to 30m from the position below the conductors (on either side) will be required to be examined for falling hazards. The level of trimming required will be directly related to the distance from the overhead line and the height of the vegetation – i.e. the further from the overhead line, the less vegetation that is required to be trimmed. Table 5.3 outlines the height of vegetation to be trimmed based on the distance from the conductors. The vast majority of this vegetation within the 30m zone will be unaffected because of its height and distance from the overhead line but for safety reasons, any branches, etc with the potential to fall on the overhead line will be trimmed. Hedgerows within the 30m zone are currently regularly maintained by landowners to an approximate height of between 1m and 3m and so will not require further trimming. It will be mature trees that will require trimming based on height and distance from the conductors as shown in Table 5.3 (see Chapter 5 of this ES).

Substation and Towers 1-8

252. Landscape character sensitivity is assessed as **Medium** for the Loughgall Orchard Belt LCA and the sensitivity of the physical landscape within the substation red line boundary and between towers 1 and 8 of the overhead line is considered to be **Medium.**

253. The topography of the substation site would be altered to accommodate the Proposed Development, access track and new termination towers. The northern, western and most of the southern perimeter of the substation would be cut into the hill. The cutting would be, from the elevated hill, a 1:2 slope, followed by a 3m level strip, and a 1:3 slope.

254. Landscape proposals would be put in place as soon as possible after the earthworks are complete to allow planting to mature and provide maximum screening during construction and operation.

255. The substation works will result in the loss of 6 existing mature trees and 538m of hedgerow, which will be compensated for by the proposed landscape planting (see Figure 5.7).

256. Hedgerows and hedgerow trees that would be removed to accommodate access to the tower sites for the proposed new 400kV overhead line would be replaced as part of the landscape mitigation. The mitigation planting described by section 13.5.2 and 13.5.3 and as shown by Figure 5.7 would be implemented at the earliest opportunity to offset these losses.

257. There would be a requirement to remove hedgerow between Towers 1 and 8 to allow temporary construction access to the tower sites and to reduce by trimming some hedgerows to a height of 2m.

258. The tower foundations, working areas and all other construction activities for each of the towers would be restricted to open fields and would therefore not require further removal of landscape elements such as hedgerows and trees.

259. Existing trees within the 20m buffer under the overhead line between Towers 1 and 7, would be felled. Trees between Towers 1 and 8 within a 30m buffer zone either side of conductors would also be pruned to avoid any potential for interference with conductors.

260. With the 20m buffer hedgerow and hedgerow with trees would be trimmed to a height of 2m between towers 1 and 8.

261. Within the 30m buffer zones hedgerow and hedgerow with trees would be trimmed to avoid any potential for interference with the conductors.

262. Taking into account the nature of the disturbance, it is anticipated that the Proposed Development would have a **Medium** magnitude of change upon the physical fabric of the landscape during construction, **Medium** in the winter year of commissioning and due to mitigation associated around the site access points would reduce to **Low** in Year 15 after commissioning when planting matures.

263. This would result in a physical landscape effect predicted to be **Moderate Adverse** during construction and in the winter year of commissioning and **Minor Adverse** in Year 15 after commissioning when planting matures.

Towers 9-19

264. Landscape character sensitivity is assessed as **Medium** for the Loughgall Orchard Belt LCA and between towers 9 and 19 sensitivity of the physical landscape is considered to be **Medium**.

265. Hedgerow and trees would be removed between Towers 9 and 19 to allow temporary construction access to the tower sites. In addition, hedgerows would be trimmed to a height of 2m to facilitate visibility splays. Hedgerows and hedgerow trees, removed to accommodate access to the tower sites, would be replaced as part of the landscape mitigation strategy.

266. The tower foundations, working areas and all other construction activities for most of the towers would be restricted to open fields and would therefore not require further removal of landscape elements such as hedgerows and trees.

267. Tree felling be would required within the 20m buffer under the overhead line between Towers 16 and 17. Trees would be selectively pruned between Towers 11 and 18 to avoid any potential for interference with conductors within 30m either side of conductors.

268. Hedgerow and hedgerow with trees would be trimmed between Towers 9 and 19 to avoid potential for interference within the 30m buffer area.

269. Taking into account the nature of the disturbance, it is anticipated that the Proposed Development would have **a Low - Medium** magnitude of change upon the physical fabric of the landscape during construction, **Low - Medium** in the winter year of commissioning and due to mitigation associated around the site access points would reduce to **Low** in Year 15 after commissioning when planting matures.

270. This would result in a physical landscape effect predicted to be **Minor** - **Moderate Adverse** during construction and in the winter year of commissioning and **Minor Adverse** in Year 15 after commissioning when planting matures.

Towers 20-30

271. Landscape character sensitivity is assessed as **Medium** for the Loughgall Orchard Belt LCA and between towers 20 and 30 sensitivity of the physical landscape is considered to be **Medium.**

272. Hedgerow would be removed between towers 20 and 30 to allow temporary construction access to the tower sites. There would also be some requirement to trim hedgerows to a height of 2m.

273. One tree would have to be removed at Tower 30 to accommodate transportation access arrangements. Hedgerows and hedgerow trees, removed to accommodate access to the tower sites, would be replaced as part of the landscape mitigation strategy.

274. The tower foundations, working areas and all other construction activities for most of the towers would be restricted to open fields and would therefore not require further removal of landscape elements such as hedgerows and trees.

275. An area of willow/alder woodland to the north and east of Tower 26 would require limited lopping to enable stringing of the line, but woodland extent and structure will persist.

276. Trees located between towers 19 and 20, and between Towers 28 and 29 would be removed.

277. Some tree pruning to avoid any potential for interference with conductors within the 30m buffers either side of conductors would be required.

278. Hedgerows within the 20m buffer zone would be trimmed to maintain a max height of 2m.

279. Within the 30m buffers, hedgerow and hedgerows with trees would require to be trimmed to avoid potential interference with the conductors.

280. Taking into account the nature of the disturbance, it is anticipated that the Proposed Development would have a **Low - Medium** magnitude of change upon the physical fabric of the landscape during construction, **Low - Medium** in the winter year of commissioning and due to mitigation associated around the site access points would reduce to **Low** in Year 15 after commissioning when planting matures.

281. This would result in a physical landscape effect predicted to be **Minor - Moderate Adverse** during construction and in the winter year of commissioning and **Minor Adverse** in Year 15 after commissioning when planting matures.

Towers 31-40

282. Landscape character sensitivity is assessed as **Medium** for the Loughgall Orchard Belt LCA between Towers 31 and 37. After Tower 37, the route enters Landscape Character Area 66, the Armagh Drumlins with a **High** landscape character sensitivity. The sensitivity of the physical landscape is considered to be **Medium** to **High**, giving this section of the route an overall sensitivity of **Medium** to **High.**

283. Hedgerow would be removed between Towers 31 and 40 to allow temporary construction access to the tower sites. Hedgerow would require to be trimmed to 2m height. 1 no. tree would be removed to facilitate access to Tower 30. Hedgerows and hedgerow trees, removed to accommodate access to the tower sites, would be replaced as part of the landscape mitigation strategy.

284. The tower foundations, working areas and all other construction activities for each of the towers would be restricted to open fields and would therefore not require further removal of landscape elements such as hedgerows and trees.

285. There would be minimal tree removal within the 20m buffer between tower 40 and 41.

286. To avoid any potential for interference with conductors within the 30m buffers either side of conductors, approximately a small number of trees would be required to be selectively pruned. These trees are located between towers 39 and 40.

287. Within the 20m and 30m buffer zones hedgerow and hedgerow trees would be selectively trimmed to avoid potential interference with the conductors and overhead line.

288. Taking into account the nature of the disturbance, it is anticipated that the Proposed Development would have a **Low** magnitude of change upon the physical fabric of the landscape during construction, **Low** in the winter year of commissioning and due to mitigation associated around the site access points would reduce to **Negligible** in Year 15 after commissioning when planting matures.

289. This would result in a physical landscape effect predicted to be **Minor Moderate Adverse** during construction and in the winter year of commissioning and reduce to **Minor Adverse** in Year 15 after commissioning when planting matures.

Towers 41-51

290. Landscape character sensitivity is assessed as **High** for the Armagh Drumlins LCA and between towers 41 and 51 sensitivity of the physical landscape is considered to be **High**.

291. Hedgerow and hedgerow trees will be removed between Towers 41 and 51 to allow temporary construction access to the tower sites. Some trimming would be required to hedgerows to 2m height. Any hedgerows and hedgerow trees, removed to accommodate access to the tower sites, would be replaced as part of the landscape mitigation strategy.

292. The tower foundations, working areas and all other construction activities for each of the towers would be restricted to open fields and would therefore not require further removal of landscape elements such as hedgerows and trees.

293. There would be limited tree loss between Tower 42 and 43 and between Towers 47 and 48 within the 20m buffer.

294. A small number of trees would be selectively pruned to avoid any potential for interference with conductors within 30m either side of conductors.

295. Hedgerows and hedgerow with trees would be trimmed to a height of 2m between within the 20m buffer.

296. Within the 30m buffer zones hedgerow would be selectively trimmed.

297. Taking into account the nature of the disturbance, it is anticipated that the Proposed Development would have a **Low** magnitude of change upon the physical fabric of the landscape during construction, **Low** in the winter year of commissioning and due to mitigation associated around the site access points would reduce to **Negligible** in Year 15 after commissioning when planting matures.

298. This would result in a physical landscape effect predicted to be **Moderate Adverse** during construction and in the winter year of commissioning and **Minor Adverse** in Year 15 after commissioning when planting matures.

Towers 52 - 61

299. Landscape character sensitivity is assessed as **High** for the Armagh Drumlins LCA and between towers 52 and 61 sensitivity of the physical landscape is considered to be **Medium – High**.

300. There would be some hedgerow removal between Towers 52 and 61 to allow temporary construction access to the tower sites. Hedgerows would require to be trimmed to 2m height. The hedgerows removed to accommodate access to the tower sites, would be replaced as part of the landscape mitigation strategy.

301. The tower foundations, working areas and all other construction activities for each of the towers, with the exception of Tower 53, would be restricted to open fields and would therefore not require further removal of landscape elements such as hedgerows and trees.

302. Hedgerow located by Tower 53 would require to be removed.

303. There would be some tree removal within the 20m buffer. Within the 20m buffer zone trimming of hedgerow and hedgerow trees would occur.

304. To avoid any potential for interference with conductors within the 30m buffers either side of conductors, a small number of trees would be required to be selectively pruned between Towers 54 and 56 and Towers 58 and 59.

305. Within the 30m buffer zones hedgerow would be selectively trimmed.

306. Taking into account the nature of the disturbance, it is anticipated that the Proposed Development would have a **Low** magnitude of change upon the physical fabric of the landscape during construction, **Low** in the winter year of commissioning and due to mitigation associated around the site access points would reduce to **Low – Negligible** in Year 15 after commissioning when planting matures.

307. This would result in a physical landscape effect predicted to be **Minor - Moderate Adverse** during construction and in the winter year of commissioning and remain **Minor Adverse** in Year 15 after commissioning when planting matures.

Towers 62-71

308. Landscape character sensitivity is assessed as **High** for the Armagh Drumlins LCA and between Towers 62 and 71 sensitivity of the physical landscape is considered to be **Medium – High**.

309. Hedgerow would be removed between Towers 62 and 71 to allow temporary construction access to the tower sites. Hedgerow would require to be trimmed to 2m height. In addition, 1no. tree would require to be removed at Tower 62.

310. Hedgerows and hedgerow trees, removed to accommodate access to the tower sites, would be replaced as part of the landscape mitigation strategy.

311. The tower foundations, working areas and all other construction activities for all but four of the towers would be restricted to open fields and would therefore not require further removal of landscape elements such as hedgerows and trees.

312. There would be limited hedgerow removal at Towers 62, 65, 66 and 68.

313. A small number of trees would require to be felled within the 20m buffer under the overhead line. Trees to be felled are located between Towers 64 and 65.

314. Selectively pruning of trees, to avoid any potential for interference with conductors within the 30m buffers either side of conductors at Towers 64 and 65 would be required.

315. A localised area of alder woodland plantation located to the north and south of tower 72 would be felled during construction. The vegetation would be trimmed within the 20m buffer

316. Limited selective pruning of trees within the 30m buffer, would be required to avoid any potential for interference with conductors.

317. Within the 20m buffer zone of Towers 62 and 71, hedgerow and hedgerow with trees would be trimmed to maintain a max height of 2m.

318. Within the 30m buffer zones of Towers 62 and 71, hedgerow and hedgerow with trees would be selectively trimmed.

319. Taking into account the nature of the disturbance, it is anticipated that the Proposed Development would have a **Low** magnitude of change upon the physical fabric of the landscape during construction, **Low** in the winter year of commissioning and due to mitigation associated around the site access points would reduce to **Low-Negligible** in Year 15 after commissioning when planting matures.

320. This would result in a physical landscape effect predicted to be **Minor - Moderate Adverse** during construction and in the winter year of commissioning and **Minor** in Year 15 after commissioning when planting matures.

<u>Towers 72-81</u>

321. Landscape character sensitivity is assessed as **High** for the Armagh Drumlins LCA and between towers 72 and 81 sensitivity of the physical landscape is considered to be **Medium – High**

322. Hedgerow would be removed between Towers 72 and 81 to allow temporary construction access to the tower sites. Some trimming of hedgerow to 2m height would be required. 1no. tree would require to be removed at Tower 72.

323. Hedgerows and hedgerow trees, removed to accommodate access to the tower sites, would be replaced as part of the landscape mitigation strategy.

324. The tower foundations, working areas and all other construction activities for each of the towers would be restricted to open fields. There would however be vegetation losses at Towers 78, 79, 80 and 81.

325. Within the 20m buffer zone of towers 72 and 81, hedgerow and hedgerow with trees would be trimmed to maintain a max height of 2m.

326. Within the 30m buffer zones of towers 72 and 81, hedgerow and hedgerow with trees would be selectively trimmed.

327. In this section, 1no.tree would require to be felled within the 20m buffer under the overhead line at tower 74.

328. There would no requirement for any tree pruning within the 30m buffers either side of conductors.

329. Taking into account the nature of the disturbance, it is anticipated that the Proposed Development would have a **Low – Negligible** magnitude of change upon the physical fabric of the landscape during construction, **Low – Negligible** in the winter year of commissioning and due to mitigation associated around the site access points would reduce to **Negligible** in Year 15 after commissioning when planting matures.

330. This would result in a physical landscape effect predicted to be **Minor Adverse** during construction and in the winter year of commissioning and **Negligible** in Year 15 after commissioning when planting matures.

<u>Towers 82-92</u>

331. Landscape character sensitivity is assessed as **High** for the Armagh Drumlins LCA and between towers 82 and 92 sensitivity of the physical landscape is considered to be **Medium.**

332. There would be removal of some hedgerow between Towers 82 and 92 to allow temporary construction access to the tower sites. Hedgerow would also require to be trimmed to 2m height.

333. Trees would be required to be removed to enable access at Tower 82, Tower 83, Tower 86, Tower 87 and Tower 88.

334. Hedgerows and hedgerow trees, removed to accommodate access to the tower sites, would be replaced as part of the landscape mitigation strategy.

335. The tower foundations, working areas and all other construction activities for each of the towers would be restricted to open fields and would therefore not require further removal of landscape elements such as hedgerows and trees.

336. Within the 20m buffer, trees would be trimmed to a height of 2m.

337. Limited selective tree pruning would be required within the 30m buffers either side of conductors. The selective pruning would occur at Tower 82 and between Towers 85 and 88.

338. Within the 20m buffer zone of Towers 82 and 92, hedgerow and hedgerow with trees would be trimmed to maintain a max height of 2m.

339. Within the 30m buffer zones of Towers 82 and 92, hedgerow and hedgerow with trees would be selectively trimmed.

340. Taking into account the nature of the disturbance, it is anticipated that the Proposed Development would have a **Low - Negligible** magnitude of change upon the physical fabric of the landscape during construction, **Low - Negligible** in the winter year of commissioning and due to mitigation associated around the site access points would reduce to **Negligible** in Year 15 after commissioning when planting matures.

341. This would result in a physical landscape effect predicted to be **Minor – Negligible Adverse** during construction and in the winter year of commissioning and **Minor Adverse** in Year 15 after commissioning when planting matures.

<u>Towers 93-102</u>

342. Landscape character sensitivity is assessed as **High** for the Armagh Drumlins LCA and between towers 93 and 102 sensitivity of the physical landscape is considered to be **High**.

343. There would be hedgerow removal between Towers 93 and 102 to allow construction access to the tower sites. Hedgerow would require to be trimmed to 2m height.

344. One tree would be required to be removed to enable access at Tower 95.

345. Hedgerows and hedgerow trees, removed to accommodate access to the tower sites, would be replaced as part of the landscape mitigation strategy.

346. The tower foundations, working areas and all other construction activities for each of the towers would be restricted to open fields and would therefore not require further removal of landscape elements such as hedgerows and trees.

347. Within the 20m buffer zone to Towers 93 and 102, hedgerow and hedgerow with trees would be trimmed to maintain a max height of 2m. Localised tree felling would occur between Towers 92 and 93 and between Towers 100 and 101.

348. Within the 30m buffer zones of Towers 93 and 102, hedgerow and hedgerow with trees would be selectively trimmed to avoid interference with the conductors.

349. Selective tree pruning would occur around Tower 93, between Towers 95 and 98 and between Towers 100 and 101.

350. Taking into account the nature of the disturbance, it is anticipated that the Proposed Development would have a **Low** magnitude of change upon the physical fabric of the landscape during construction, **Low** in the winter year of commissioning and due to mitigation associated around the site access points would reduce to **Negligible** in Year 15 after commissioning when planting matures.

351. This would result in a physical landscape effect predicted to be **Moderate Adverse** during construction and in the winter year of commissioning and **Minor Adverse** in Year 15 after commissioning when planting matures.

13.6.1.2 Impacts upon Designated Landscapes

Local Landscape Policy Areas

Armagh City Former Green Belt

352. The Armagh City former Green Belt lies within the Armagh Drumlins LCA and as a consequence sensitivity to change within the former Green Belt is considered to be **High.** The overhead line route would not cross the former Green Belt although it would be viewed from elevated parts of its westernmost boundary. Due to the large scale and undulating topography of the landscape, however, the proposal would not noticeably conflict with the overall former area's rural character. The magnitude of change for the proposed overhead line and towers is therefore considered to be **Negligible** during construction, Year 1 and Year 15 for the Armagh City former Green Belt.

353. The impacts of the proposed overhead line and towers would be **Minor Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

Dungannon Former Green Belt

354. The Dungannon former Green Belt lies across the Loughgall Orchard Belt LCA and the Dungannon Drumlins and Hills LCA and as a consequence sensitivity to change within the former Green Belt is considered to be **Medium - High.** The overhead line and substation would not cross the former Green Belt although the overhead line route would be viewed from elevated parts of the easternmost boundary of the Dungannon former Green Belt. The Proposed Development would create a moderate change to rural character and landscape value in a localised area but to a lesser degree within the overall former green belt, due to the large scale and undulating topography of the landscape. The magnitude of change for the proposed overhead line and towers is therefore considered to be **Low - Negligible** during construction, Year 1 and Year 15 for the Dungannon former Green Belt.

355. The impacts of the proposed overhead line and towers would be **Minor Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

Register of Historic Parks, Gardens and Demesnes

356. This section comprises an assessment of the effect the development would have on the landscape character of the Register of Historic Parks, Gardens and Demesnes within the study area, however, for an assessment of the setting of listed buildings and ancient monuments refer to Chapter 12 Cultural Heritage.

The Argory

357. The Argory, built in the 1820s has panoramic views from its hillside location and is open all year. In addition to the house itself a number of other buildings surround the property, including a stable yard with harness room. The grounds feature many recreational activities including; garden, woodland and riverside walks; adventure playground; picnic areas and an environmental sculpture trail.

358. The Argory is a quality designed landscape and the layout comprises of a variety of tree and shrub species and provides diverse wildlife habitats. The views are directed south and overlook the well kept gardens and 320 acre wooded estate bordering the River Blackwater.

359. The Argory is a **High** value designated landscape and considered to be a designed landscape of **Highest Quality** which is an outstanding example in the area of a well cared for landscape and set of features. The Argory is well contained within a wooded estate and outward looking views are limited. The surrounding landscape has within it an existing overhead line of similar size and scale, which lies to the west and south and within the context of this proposal. The sensitivity to change of this type of development is therefore **Medium**.

360. The Zone of Theoretical Visibility (as discussed in more detail in section 13.4.2.2) shows that the western edge of the estate does indicate theoretical visibility. Viewpoint 5 is taken from Bonds Bridge which lies close to the western edges of the estate. The intervening vegetation and topography limits the available views of the proposals to specific locations along the boundaries of the estate. The overhead line and towers when viewed from this location would not compromise the overall character of the Argory estate and the substation would only be visible from the south west corner of the estate along the river's edge footpath network.

361. The construction activities for both the substation and the overhead line would both be viewed from this location. The construction magnitude of change is assessed as **Low - Medium** for the substation and for the overhead line and towers. As a result, construction impacts are assessed as **Minor - Moderate Adverse** for both the substation and the overhead line and towers.

362. The magnitude of change for the proposed substation and overhead line route in the winter year of commissioning is considered to be **Low – Medium**. As a result, the impacts are assessed as **Minor - Moderate Adverse** for both the substation and the overhead line and towers in the winter year of commissioning.

363. Mitigation opportunities exist in relation to the substation in the form of extensive tree and shrub screen planting. The magnitude in summer 15 years after commissioning relating to the substation, therefore, is considered to be **Low** resulting in an impact of **Minor Adverse** in summer 15 years after commissioning as planting matures. The substation mitigation measures would not reduce the magnitude of effect in relation to the overhead line and towers and the magnitude would remain **Low – Medium** in summer 15 years after commissioning. As a result the impacts are assessed as **Minor - Moderate Adverse** for the overhead line and towers in summer 15 years after commissioning. Taking the individual assessments of the substation and overhead line into account, the overall magnitude in summer 15 years after commissioning is **Low-Medium**, resulting in a **Minor - Moderate Adverse** impact for this viewpoint location.

The Manor House, Benburb

364. Benburb Valley Park is situated in the centre of Benburb Village. The park extends along both sides of the river Blackwater from Milltown to Maydown Bridge. Set in the grounds of Benburb Valley Park are the Servite Priory (previously to 1948 known as the Manor House), the conference centre and the Castle. Across the 90 acre estate, landscape features include; woodlands, derelict sections of the former Ulster Canal and beautiful stretches of river. Activities include; walking, canoeing and the Priory attracts groups who participate in spiritual courses.

365. Views within the valley park are focused to the southeast towards the proposal although intervening vegetation within the estate reduces these views to specific locations where longer more panoramic views are available.

366. This registered site is a **High** value designated landscape and considered to be a designed landscape of **Very Attractive** quality which is a good example in the area of a well cared for landscape and set of features. Vistas from within the grounds are elevated and directed towards the development, the sensitivity to change therefore is **High**.

367. The ZTV shows that the easternmost and elevated areas of the valley park, does indicate theoretical influence. Viewpoint 12 is taken from close to the Servite priory within the grounds and is representative of the views experienced. The intervening vegetation and topography limit the available views to specific locations and the scale of the towers when viewed from this location would not compromise the overall landscape character of the valley park.

368. The magnitude of change for the proposed overhead line and towers is therefore considered to be **Low - Medium** during construction. There are localised opportunities for mitigation in the form of tree and shrub planting associated with the landscape reinstatement works to the individual tower sites, including replacement planting for some of the landscape elements lost during the site clearance. The magnitude of change in relation to the overall character of the Benburb valley park, however, would remain **Low – Medium** in Year 1 and Year 15.

369. The impacts of the proposed overhead line and towers would therefore be **Moderate Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

Armagh Palace

370. Armagh Palace was designed and built in the late 18th century. Today the palace itself is home to the district council offices and rarely open to visits. The demesne grounds now feature recreational areas with activities that include; walking, eco and orienteering trails and picnic areas.

371. Views within the estate are focused within the grounds and the intervening woodland, topography and urban edges of Armagh City obstruct any potential views towards the proposed overhead line route.

372. Armagh Palace is a **High** value designated landscape and considered to be a landscape of **Very Attractive** quality which is a good example in the area of a well cared for landscape and set of features. The palace grounds, however, are well contained and within the urban context of the City the sensitivity to change of this type of development is therefore **Medium**.

373. The ZTV shows that the western edges of the palace grounds does indicate theoretical influence, however due to the distance and intervening landscape including mature woodland, localised topography and the built up urban edges of Armagh City, views would be screened. The magnitude of change is therefore considered to be **Negligible** during construction, Year 1 and Year 15.

374. The impacts of the proposed overhead line and towers would therefore be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

Tynan Abbey

375. Tynan Abbey, was the home of the Stronge family until the 1980s. It was a large neo-gothic-romantic castle built circa 1750 and situated outside the village of Tynan. The castle was surrounded by an extensive estate including park-land and a lake.

376. Tynan Abbey was demolished in 1998, due to the unstable structure of the ruin. All that remains is the arch of the front door surround. The several thousand acres estate remains in the possession of the Stronge family. The estate is characterised by distinctive parkland landscape, mature woodlands, gate lodges, estate buildings and boundary walls which have combined to create a rich landscape character. Views are contained within the landscape by extensive mature tree and shrub boundary planting.

377. Tynan Abbey is a **High** value designated landscape and considered to be a designed landscape of **Very Attractive** quality which is a good example in the area of a well cared for landscape and set of features. The estate, however, is well contained and the sensitivity to change of this type of development is therefore **Medium**.

378. The ZTV shows that the eastern edge of the parkland does indicate theoretical influence, however due to the distance and intervening landscape including extensive mature tree and shrub boundary planting views would be screened. The magnitude of change is therefore considered to be **Negligible** during construction, Year 1 and Year 15.

379. The impacts of the proposed overhead line and towers would therefore be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

13.6.1.3 Impacts upon Landscape Character

<u>Northern Ireland Landscape Character</u>

LCA 47: Loughgall Orchard Belt

380. Landscape Impacts would occur in the context of the Loughgall Orchard Belt LCA which has *Good* quality landscape overall with localised areas of *Very Attractive* landscape. Sensitivity to change within this character area is **Medium**. This area is characterised by rolling drumlins falling towards Lough Neagh crossed by numerous small river valleys and streams and separated by low lying areas of moss.

381. The substation proposals would have an extremely noticeable effect on the landscape at a local level and the magnitude of change is considered to be **High** during construction and in the winter year of commissioning. As a result, the impacts of the proposed substation would be **Moderate - Major Adverse** during the construction stage and in the winter year of commissioning. There are opportunities for mitigation in the form of tree and shrub screen planting associated with the substation boundary treatments and replacement planting for some of the landscape elements lost during the site clearance. The magnitude would therefore reduce to **Medium – High** resulting in impacts of **Moderate Adverse** in summer 15 years after commissioning when planting matures.

382. The overhead line would introduce a noticeable linear feature which would cross the landscape and to some degree conflict with the landscape character of the area. The magnitude of change for the

proposed overhead line is therefore considered to be **Medium** during construction, in the winter year of commissioning for the Loughgall Orchard Belt LCA. As a result, the impacts of the proposed overhead line would be **Moderate Adverse** during the construction stage and in the winter year of commissioning. There are localised opportunities for mitigation in the form of tree and shrub planting associated with the landscape reinstatement works to the individual tower sites, including replacement planting for some of the landscape elements lost during the site clearance. The magnitude of change in relation to the overall landscape character, however, would remain **Medium**. The impacts, therefore, would be **Moderate Adverse** in summer 15 years after commissioning.

383. Taking the individual assessments of the substation and overhead line into account, the overall magnitude would be **High** during construction, resulting in a **Moderate – Major Adverse** impact. In winter year of commissioning and summer 15 years after commissioning the magnitude would be **Medium-High**, resulting in a **Moderate Adverse** impact for this viewpoint location.

LCA 66: Armagh Drumlins

384. Landscape Impacts would occur in the context of the Armagh Drumlins LCA which has *Very Attractive* quality landscape overall with small areas of *Highest Quality* landscape. Sensitivity to change within this character area is **High**. The crossing of the Drumlin Landscape, where the small scale pasture fields and undulations in topography would to some extent be compromised by the overhead line proposals, increases the awareness of this development within a limited area close to the line route.

385. The magnitude of change is considered to be **Medium - High** during construction, in the winter year of commissioning and in summer 15 years after commissioning. There are localised opportunities for mitigation in the form of tree and shrub planting associated with the landscape reinstatement works to the individual tower sites, including replacement planting for some of the landscape elements lost during the site clearance. The magnitude of change in relation to the overall landscape character, however, would remain **Medium – High** and the resulting impacts of the proposed overhead line and towers would therefore be **Moderate – Major Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

LCA 45: Dungannon Drumlins and Hills

386. Landscape Impacts would occur in the context of the Dungannon Drumlins and Hills LCA which has *Good* quality landscape overall with small areas of *Very Attractive* quality landscape. Sensitivity to change within this character area is **Medium**.

387. The overhead line does not cross this character area, although it comes within 330m to the west of the northern section of the line. The ZTV shows that the eastern edge of the character area does indicate theoretical influence. Due to the distance and intervening topography of the predominantly drumlin landscape views would be limited to the very eastern edges.

388. The magnitude of change is considered to be **Low** during construction, in the winter year of commissioning and in summer 15 years after commissioning. There are localised opportunities for mitigation in the form of tree and shrub planting associated with the landscape reinstatement works to the individual tower sites, including replacement planting for some of the landscape elements lost during the site clearance. The magnitude of change in relation to the overall landscape character, however, would remain **Low** and the resulting impacts of the proposed overhead line and towers would therefore be **Minor Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

LCA 64: Lough Neagh Peatlands

389. Landscape Impacts would occur in the context of the Lough Neagh Peatlands LCA which has *Good* quality landscape overall with small areas of *Very Attractive* quality landscape along the Lough Neagh shoreline. Sensitivity to change within this character area is **Medium**.

390. The overhead line does not cross this character area and the nearest parts of the LCA lie approximately 2.6km to the north of the substation and the northern section of the line. The ZTV shows that the southern edge of the character area does indicate minor theoretical influence. Due to the distance and intervening topography of the predominantly drumlin landscape views would be limited to more elevated parts of the very southern edges.

391. The magnitude of change is considered to be **Low - Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning. There are localised opportunities for mitigation in the form of tree and shrub planting associated with the landscape reinstatement works to the individual tower sites, including replacement planting for some of the landscape elements lost during the site clearance. The magnitude of change in relation to the overall landscape character, however, would remain **Low – Negligible** and the resulting impacts of the proposed overhead line and towers would be **Negligible – Minor Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

LCA 68: Carrigatuke Hills

392. Landscape Impacts would occur in the context of the Carrigatuke Hills LCA which has *Very Attractive* quality landscape overall with some areas of *Good* quality landscape. Sensitivity to change within this character area is **Medium**.

393. The overhead line does not cross this character area and the nearest parts of the LCA lie approximately 2.4km to the east of the southern section of the line. The ZTV shows that very few areas of the character area indicate theoretical influence.

394. The magnitude of change is therefore considered to be **Negligible** during construction, Year 1 and Year 15. The impacts of the proposed overhead line and towers would therefore be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning for the Carrigatuke Hills LCA.

LCA 46: Blackwater Valley

395. Landscape Impacts would occur in the context of the Blackwater Valley LCA which has *Very Attractive* quality landscape overall with small areas of *Highest Quality* landscape. Sensitivity to change within this character area is **High**.

396. The overhead line does not cross this character area and it lies beyond 4km to the west of the middle section of the line. The ZTV shows that very few areas of the character area indicate theoretical influence.

397. The magnitude of change is therefore considered to be **Negligible** during construction, Year 1 and Year 15. The impacts of the proposed overhead line and towers would therefore be **Minor Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning for the Blackwater Valley LCA.

Republic of Ireland Landscape Character

LCA 6: Mullyash Uplands

398. Landscape Impacts would occur in the context of the Mullyash Uplands LCA which has *Very Attractive* quality landscape overall with small areas of *Highest Quality* landscape. Sensitivity to change within this character area is **High**.

399. The proposed overhead line terminates at the edge of this character area at the boundary between Northern Ireland and the Republic of Ireland. The ZTV indicates theoretical influence within a localised area. The area close to the proposals is enclosed by local topography and is contained within the drumlin valley landscape that is typical of this area. Due to the intervening topography of the predominantly drumlin landscape views would be limited.

400. The magnitude of change is considered to be **Medium** during construction, in the winter year of commissioning and in summer 15 years after commissioning. There are localised opportunities for mitigation in the form of tree and shrub planting associated with the landscape reinstatement works to the individual tower sites, including replacement planting for some of the landscape elements lost during the site clearance. The magnitude of change in relation to the overall landscape character, however, would remain **Medium** and the resulting impacts of the proposed overhead line and towers would be **Moderate Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

LCA 2: Blackwater Valley and Drumlin Farmland

401. Landscape Impacts would occur in the context of the Blackwater Valley and Drumlin Farmland LCA which has *Very Attractive* quality landscape overall with small areas of *Highest Quality* landscape. Sensitivity to change within this character area is **High**.

402. The proposed overhead line does not cross this character area and the nearest parts of the LCA lie approximately 2.3km to the west of the southern section of the line. The ZTV shows that very few areas of the character area indicate theoretical influence.

403. The magnitude of change is therefore considered to be **Negligible** during construction, Year 1 and Year 15. The impacts of the proposed overhead line and towers would therefore be **Minor Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning for the Blackwater Valley and Drumlin Farmland LCA.

13.6.1.4 Summary of Residual Impacts on Landscape

404. This section provides an assessment of the overall impact that the development would have on the landscape character areas during construction and once operational. The assumption is that the impacts are adverse unless otherwise stated.

405. Likely long term residual impacts on landscape resulting from the Proposed Development are as follows:

- the loss of land currently in agricultural use;
- the loss of natural landscape elements such as landform, hedgerows and trees;
- the introduction of an overhead line, a large substation and associated towers to an existing rural landscape character type;
- creation of the permanent substation access road; and,
- the loss and reduction of vegetation to accommodate necessary electrical clearances.

406. The significance of these impacts is summarised in Table 13.8 below.

Table 13.8: Summary of Landscape Residual Impacts

Landscape Type	Sensitivity	CONSTRUCTION		OPERATION (Year 1)		OPERATION (Year 15)		Significance
		Magnitude of Change	Impact	Magnitude of Change	Impact	Magnitude of Change	Impact	
Physical Landscape Effects								
Substation and Towers 1-8	Medium	Medium	Moderate Adverse	Medium	Moderate Adverse	Low	Minor Adverse	Not Significant
Towers 9-19	Medium	Low - Medium	Minor – Moderate Adverse	Low - Medium	Minor – Moderate Adverse	Low	Minor Adverse	Not significant
Towers 20-30	Medium	Low - Medium	Minor – Moderate Adverse	Low - Medium	Minor – Moderate Adverse	Low	Minor Adverse	Not significant
Towers 31-40	Medium – High	Low	Minor – Moderate Adverse	Low	Minor – Moderate Adverse	Negligible	Minor Adverse	Not significant
Towers 41-51	High	Low	Moderate Adverse	Low	Moderate Adverse	Negligible	Minor Adverse	Not Significant
Towers 52-61	Medium – High	Low	Minor - Moderate Adverse	Low	Minor - Moderate Adverse	Low - Negligible	Minor Adverse	Not Significant
Towers 62-71	Medium – High	Low	Minor -Moderate Adverse	Low	Minor -Moderate Adverse	Low - Negligible	Minor Adverse	Not Significant
Towers 72-81	Medium – High	Low - Negligible	Minor Adverse	Low - Negligible	Minor Adverse	Negligible	Negligible	Not Significant
Towers 82-92	Medium	Low - Negligible	Minor – Negligible Adverse	Low - Negligible	Minor – Negligible Adverse	Negligible	Minor Adverse	Not Significant
Towers 93-102	High	Low	Moderate Adverse	Low	Moderate Adverse	Negligible	Minor Adverse	Not Significant
Designated Landscapes								
Armagh City Former Green Belt	High	Negligible	Minor Adverse	Negligible	Minor Adverse	Negligible	Minor Adverse	Not Significant
Dungannon Green Former Belt	Medium - High	Low - Negligible	Minor Adverse	Low - Negligible	Minor Adverse	Low - Negligible	Minor Adverse	Not Significant

Landscape Type	Sensitivity	CONSTRUCTION		OPERATION (Year 1)		OPERATION (Year 15)		Significance
		Magnitude of Change	Impact	Magnitude of Change	Impact	Magnitude of Change	Impact	
The Argory	Medium	Low - Medium	Minor - Moderate Adverse	Low - Medium	Minor - Moderate Adverse	Low - Medium	Minor - Moderate Adverse	Not Significant
The Manor House, Benburb	High	Low - Medium	Moderate Adverse	Low - Medium	Moderate Adverse	Low - Medium	Moderate Adverse	Significant
Armagh Palace	Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
Tynan Abbey	Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
Northern Ireland Landscape Character Areas								
LCA 47 Loughgall Orchard Belt	Medium	High	Moderate - Major Adverse	Medium - High	Moderate Adverse	Medium - High	Moderate Adverse	Significant
LCA 66 Armagh Drumlins	High	Medium - High	Moderate - Major Adverse	Medium - High	Moderate - Major Adverse	Medium - High	Moderate - Major Adverse	Significant
LCA 45 Dungannon Drumlins and Hills	Medium	Low	Minor Adverse	Low	Minor Adverse	Low	Minor Adverse	Not Significant
LCA 64 Lough Neagh Peatlands	Medium	Low - Negligible	Negligible - Minor Adverse	Low - Negligible	Negligible - Minor Adverse	Low - Negligible	Negligible - Minor Adverse	Not Significant
LCA 68 Carrigatuke Hills	Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
LCA 46 Blackwater Valley	High	Negligible	Minor Adverse	Negligible	Minor Adverse	Negligible	Minor Adverse	Not Significant
Republic of Ireland Landscape Character Areas								
LCA 6 Mullyash Uplands	High	Medium	Moderate Adverse	Medium	Moderate Adverse	Medium	Moderate Adverse	Significant
LCA 2 Blackwater Valley and Drumlin Farmland	High	Negligible	Minor Adverse	Negligible	Minor Adverse	Negligible	Minor Adverse	Not Significant

407. **Major** to **Moderate** adverse long term landscape impacts have, for the purposes of this assessment, been considered **significant.** This is by virtue of sensitivity and expected magnitude of change to the proposed substation and proposed towers and overhead line.

408. **Negligible** to **Minor** adverse long term landscape impacts have, for the purposes of this assessment, been considered **not significant**.

13.6.2 Residual Visual Impacts

13.6.2.1 Assessment of Settlements

<u>Settlement Areas</u>

Armagh City (5.3km)

409. Armagh City is the largest settlement which lies on the eastern edges of the study area and at nearly 5km away from the line considered to be of **Medium** sensitivity to the proposed overhead line route. There are no predicted views from this settlement or from its edges and the magnitude of change is therefore considered to be **Negligible** during construction, Year 1 and Year 15. The impacts of the proposed overhead line and towers would therefore be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning for the Blackwater Valley LCA.

Dungannon (5.7km)

410. Dungannon is a town that lies on the north – west edges of the study area and at 5km away from the line is considered to be of **Medium** sensitivity to the proposed overhead line route. There are no predicted views from this settlement or from its edges and the magnitude of change is therefore considered to be **Negligible** during construction, Year 1 and Year 15. The impacts of the proposed overhead line and towers would therefore be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning for the Blackwater Valley LCA.

Moy (1.3km)

411. Moy lies within the heart of the northern section of the proposed route and study area. This is a town with a strong identity with a well known and distinct town square. The sensitivity to change therefore is considered to be of **High** sensitivity to the proposed overhead line route. There are no predicted views from the town centre and views from the edges of this settlement would be limited by the distinctive drumlin landscape which it occupies.

412. The magnitude of change is therefore considered to be **Low - Medium** during construction, Year 1 and Year 15. The impacts of the proposed overhead line and towers would therefore be **Moderate Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning for the Blackwater Valley LCA.

Blackwatertown (1km)

413. Blackwatertown lies approximately 4km south of Moy and within the southern part of the Loughgall Orchard Belt LCA. This town is situated on the old road from Armagh city to Dungannon, and also on the river Blackwater, from which it takes its name. It is connected by a stone bridge with the village of Clonfeacle, now forming part of the town. The sensitivity to change therefore is considered to be of **High** sensitivity to the proposed overhead line route. There are limited predicted views from elevated parts of the town centre and views from the western edges of this settlement would be partly obscured by the drumlin landscape to the west.

414. The magnitude of change is therefore considered to be **Low - Medium** during construction, Year 1 and Year 15. The impacts of the proposed overhead line and towers would therefore be **Moderate Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning for the Blackwater Valley LCA.

Benburb (1.6km)

415. Benburb lies approximately 5km south west of Moy on the meeting point of the Loughgall Orchard Belt LCA, the Armagh Drumlins LCA and the Dungannon Drumlin and Hills LCA. The Benburb Valley Park is located within the town centre and is represented by viewpoint 12. The sensitivity to change is considered to be of **High** sensitivity to the proposed overhead line route. There are no predicted views from the town centre although views from the eastern edges of this settlement would be long and panoramic across the drumlin landscape viewed to the east.

416. The magnitude of change is considered to be **Medium – High** during construction and **Medium** in the winter year of commissioning and in summer 15 years after commissioning.

417. The overhead line visual impacts, therefore, would be **Moderate - Major Adverse** during construction, **Moderate Adverse** in the winter year of commissioning remaining **Moderate Adverse** in summer 15 years after commissioning.

Killylea (2km)

418. Killylea lies approximately 7.8km west of Armagh City and within the Armagh Drumlins LCA. This town is situated on the A28 and near the dismantled railway line. The sensitivity to change is considered to be of **High** sensitivity to the proposed overhead line route. The town of Killylea is represented by viewpoint 18. There are limited predicted views from the town centre and views from the eastern edges of this settlement would be distant and panoramic across the drumlin landscape to the east.

419. The magnitude of change is therefore considered to be **Low - Medium** during construction, Year 1 and Year 15. The impacts of the proposed overhead line and towers would therefore be **Moderate Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning for the Blackwater Valley LCA.

Milford (2.9km)

420. The small settlement of Milford lies approximately 2.5km south - west of Armagh City and within the Armagh Drumlins LCA, situated on the A3. The sensitivity to change is considered to be of **Medium** sensitivity to the proposed overhead line route due to the increased enclosure created by the surrounding drumlins and intervening vegetation. There are limited predicted views from this settlement and where there are views they would be distant and viewed across the drumlin landscape to the west.

421. The magnitude of change is therefore considered to be **Low - Medium** during construction, Year 1 and Year 15. The impacts of the proposed overhead line and towers would therefore be **Minor - Moderate Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning for the Blackwater Valley LCA.

Middletown (4.4km)

422. The village of Middletown is a small settlement which lies on the western edges of the study area and at over 4km away from the line is considered to be of **Medium** sensitivity to the proposed overhead line route. The ZTV shows that there are few predicted views from this settlement or from its edges and the magnitude of change is therefore considered to be **Negligible** during construction, Year 1 and Year 15. The impacts of the proposed overhead line and towers would therefore be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning for the Blackwater Valley LCA.

Keady (4.6km)

423. Keady is a medium sized settlement which lies on the eastern edges of the study area and at over 4km away from the line is considered to be of **Medium** sensitivity to the proposed overhead line route. The ZTV shows that there are no predicted views from this settlement or from its edges and the magnitude of change is therefore considered to be **Negligible** during construction, Year 1 and Year 15. The impacts of the proposed overhead line and towers would therefore be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning for the Blackwater Valley LCA.

Derrynoose (1.7km)

424. The small town of Derrynoose lies approximately 3km north of the border with the Republic of Ireland and within the Armagh Drumlins LCA. Viewpoint 27 looks across the settlement from an elevated position to the east. The settlement lies within the drumlin landscape in a shallow valley. The sensitivity to change is considered to be of **High** sensitivity to the proposed overhead line route.

425. There are predicted views throughout the settlement although views from the western edges of the settlement would be closer and more frequent. The magnitude of change is considered to be **High** during construction and **Medium - High** in the winter year of commissioning and in summer 15 years after commissioning.

426. The overhead line visual impacts, therefore, would be **Major Adverse** during construction, **Moderate - Major Adverse** in the winter year of commissioning remaining **Moderate - Major Adverse** in summer 15 years after commissioning.

13.6.2.2 Assessment of Individual Properties

Individual properties

427. There are a number of individual farmsteads and residential properties potentially influenced by the Proposed Development that have been identified through analysis of the Zone of Theoretical Visibility (ZTV) mapping and informed by extensive field visits to the locale. Extensive field study of the characteristics of the landscape has shown that, due to the scale and topography of the drumlin landscape type that dominates the route, properties that lie within 500m either side of the overhead line route are more likely to have clear views of the proposals. For this reason particular attention has been paid to properties within 500m of the proposals. The visual baseline of the route is discussed in Section 13.3.2 of this chapter. The Zone of Theoretical Visibility (ZTV) is described Section 13.4.2.2 of this chapter and shown by Figures 13.3 and 13.4.

428. The study area of the proposed overhead line route includes a large number of individual properties, both houses and farmsteads. Individual properties tend to be concentrated along the edges of roads, however, there are still a large number of properties scattered more widely across the landscape, typically with residential dwellings and many farmhouses situated atop drumlins, accessed by private tracks. Properties include typically single or two storey dwellings, many with private gardens and farmsteads which can be situated adjacent to transport corridors or tend to be set back from the public roads and approached along private access tracks.

429. A total of 427 properties were assessed that lie within 500m of the proposed overhead line route, and have been identified as A1 – A25, B1 – B43, C1 – C66, D1 – D35, E1 – E60, F1 – F33, G1 – G42+, H1 – H43, I1 – I27 and J1 – J62.

430. Properties which had not been included within Addendum 11.1 Individual Properties Field Assessment published in 2011 have been identified numerically, with a +.

431. Planning approval has been given to the 11 following individual properties. As construction of these properties had not at the time of assessment been completed, potential effects were assessed as worst case scenario which assumes these 11 properties would have ground floor windows which face the Proposed Development with no screening from garden vegetation to filter views . These 10 properties are listed as follows: D11+, E8+, E10+, E11+, E31+, H10+, H11+, H14+, H41+, J25+ at time of assessment, had planning approval but not yet built. Individual property receptor C64 was under construction, not completed.

432. In addition, a total of 27 properties were excluded from the assessment as they were found to be derelict or farm buildings. The properties within this category are as follows:- A25, B11, B27, B28, B43, C2, C8, C11, C23, D36, E2, E41, E59, F1, F6, F9, F13, F30, G2, G15, G35, H8, H44, I2, I22, I23, J45.

433. Several properties located in the Republic of Ireland have the potential to be influenced by the proposed NIE overhead line and towers. There are properties identified as J50, J51, J51+, J52 and J62.

434. Figure 13.7 shows the detailed study area of 500m either side of centreline of the overhead line route and is discussed in the following section.

Towers 1-8 [see Figure 13.7, Properties A1-A25]

435. The proposed overhead line route leaves Turleenan Substation via tower T01 [Tower 01] and travels south-west, before turning west at T2, close to Derrygally Way. Five residential receptors located to the north and west of Turleenan Substation (A11, A14, A14+, A15, A16 and A17) would have views of the proposed substation development. Properties to the south of the line route would have views of the tower structures (receptors A1 through to A8). The line route then turns north-west before crossing over the busy B106 Trewmount Road [Moy Road] in a small depression in the landscape. Towers T2 and T03 have been kept well back from the road to lessen the impact on road users. To the north of the line route there is a group of 12No dwellings and outbuildings (receptors A9 through to A17), some with views of the tower structures.

436. The proposed overhead line route continues north-west to T04, where it swings south-west through the townland of Lisroan, where T05 is located. There is higher ground to the south-west. Hedges and trees are more mature in this area, which helps to reduce visibility in the landscape. One property (receptor A8+) is located close to T04 and T05. The line route continues to T06, where it turns towards the north-west to T07, before crossing over the narrow Major Lane. There are 3No dwellings, A18 through to A20, to the north of the line route which would have views of T05, 06 & 07.

437. Passing over Major Lane, the line route continues north-west before passing over a small river to T08, which is situated on the side of Violet Hill, from where it turns south-west. There are 5No dwellings A21 through to A25 along Major Lane, to the south of the line route.

<u>Construction effects would be as follows:</u>

- **Negligible** magnitude of change, **Minor Adverse** impact - A6, A10, A11
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** impact - A7, A8, A18, A24
- **Low magnitude** of change, **Moderate Adverse** impact - A1, A3, A4, A13, A14, A14+, A16, A17, A22
- **Medium** magnitude of change, **Moderate Adverse** impact - A5, A15, A19, A20, A23
- **High – Medium** magnitude of change**, Moderate-Major Adverse** impact - A12, A21
- **High** magnitude of change, **Major Adverse** impact - A2, A8+, A9

<u>Summary of Impacts –Winter Year 1 and Summer Year 15:</u>

- **Negligible** magnitude of change**, Minor Adverse** impact - A3, A4, A6, A10, A11, A14, A14+, A15
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** - A1, A7, A8, A16, A18, A24, A25
- **Low** magnitude of change, **Moderate Adverse** impact - A13, A17, A22,
- **Medium** magnitude of change, **Moderate Adverse** impact - A5, A19, A23
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - A2, A12, A20, A21
- **High** magnitude of change, **Major Adverse** impact - A8+, A9

Towers 9-19 [see Figure 13.7, Properties B1-B42]

438. The line route continues south-west, with T09 & T10 both set back from the busy A29 Road, to restrict views of the towers for road users. There are 2No dwellings to the south of the line route, to the east of the A29, B1 and B3. To the north of the line route there are 7No dwellings B4 through to B8.

439. On the western side of the A29, dwellings B9 through to B10 occupy higher ground on Culkeeran Road. The line route continues south-west along a shallow valley where T11, T12 & T13 are sited in remote locations. The line route takes advantage of existing planting to reduce impact. There are 3No dwellings, B11 through to B13, to the north-west of T11&12. Further to the west lie another 8No dwellings, B14 through to B20.

440. At T14 the line route turns south-east and crosses over Gorestown Road. This tower structure and the overhead lines crossing over the road would be visible to road users; however it would be seen against the hillside and dense hedgerows. There are 4No dwellings to the east of the line route B23 through to B25.

441. To the south of Gorestown Road the line route rises up a hillside to T15, to the west of a small wood, before descending to a number of towers, T16 –T19, lying in a narrow valley. At T17 the route turns south-west before crossing over Culverog Road in the townland of Anagasna Glebe, before continuing to T19, from where the line route swings south-east.

442. Dwellings occupy the higher ground on either side of the valley; however, mature trees and hedges often restrict visibility. On the western side of the valley there are 7No dwellings B26 through to B33. On the eastern side of the valley there are 8No dwellings B35 through to B42, some of which are likely to have direct views or glimpses of the line route along the valley floor; however intervening planting would have an important role in limiting visibility.

Construction effects would be as follows:

- **No change, No Effect -** B7+, B11, B17, B17+
- **Negligible** magnitude of change, **Minor Adverse** - B1, B6, B6+, B7, B12, B23+, B35+, B40, B41, B42,
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** impact -B10, B24, B25, B26, B32
- **Low** magnitude of change, **Moderate Adverse** impact - B5, B8, B21, B33, B39
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact -B3, B4, B9, B9+, B14, B15, B16, B18, B19, B20, B29, B30, B30+, B36, B36+
- **High** magnitude of change, **Major Adverse** impact - B23, B35

Summary of Impacts –Winter Year 1 and Summer Year 15:

- **No change, No Effect** B7+, B11, B17, B17+
- **Negligible** magnitude of change, **Minor Adverse** impact - B1, B6, B6+, B7, B10, B12, B21, B23+, B24, B25, B35+, B40, B41
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** impact - B8, B26, B32
- **Low** magnitude of change, **Moderate Adverse** impact - B5, B33, B42
- **Medium** magnitude of change, **Moderate Adverse** impact - B30, B30+, B31, B39
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - B3, B4, B9, B9+, B14, B15, B16, B18, B19, B20, B23, B29, B36, B36+

Towers 20-30 [see Figure 13.7, Properties C1-C66]

443. To the west of T19 there are 3No properties C1-3. At T19 the line route changes direction and swings south-east before rising over a drumlin to T20, before descending to T21 from where it crosses over Benburb Road. T22 is set back from the roadside. To the west of T20 and T21 a large number of agricultural outbuildings have recently been constructed, giving a more industrial appearance to the local landscape in this area.

444. There are 7No dwellings and outbuilding C4-10 to the west of the line route along Tobermesson Road. To the east of the line route there are 11No dwellings C12 through to C22 on both sides of Benburb Road.

445. At T23, located in the townland of Derrryoghill close to one of the tributaries of the River Blackwater, the line route turns south-west. Dwellings C23, C25 and C25+ are situated to the east of this section of the line route.

446. To the north-west of the line route, there are 5No dwellings C26 through to C31, some on higher ground, which would have more open views of the line route. Further to the south-west another 7No dwellings C32 through to C39 are located on higher ground with views over the landscape. The line route crosses over Drumlee Road beyond T25 and continues through a small wood to T26, before turning south-east and continuing to T27 and T28. The line route then heads due south to T29, after which it crosses over Clonfeacle Road.

447. To the east of the line route there are 7No dwellings, C40 through to C46, on either side of Drumlee Road, some of which would have views of the development from the rear, side and front. Road users would have views of the line as it crosses the road and the towers, which would be set back from the roadside. T26 has been located behind a small area of woodland, which would help to screen it from the road.

448. Further dwellings to the east of the line route include 11No dwellings, some of which are located on the hillside, C47 through to C57. To the west of T29 there is a garden centre and dwelling C58.

449. After crossing Clonfeacle Road the line route continues south to T30 after passing over, Tullydowey Road. There are two dwellings to the east of the line route on this road C60 & C61. Below T30 the line route runs along a narrow valley with a development of 10No dwellings to the west of the line route, including C62, 63, 65 and 66.

<u>Construction effects would be as follows:</u>

- **Negligible** magnitude of change, **Minor Adverse** impact - C14, C64
- **Low** magnitude of change, **Moderate Adverse** impact - C7, C22
- **Medium** magnitude of change, **Moderate Adverse** impact - C1, C2, C3, C4, C5, C6, C8, C30
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - C9, C10, C12, C13, C15, C16, C17, C18, C25, C25+, C26, C26+, C28, C29, C31, C32, C33, C34, C35, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C53, C55, C56, C57, C58, C62, C63, C65, C66
- **High** magnitude of change, **Major Adverse** impact - C19, C20, C21, C23, C52, C54, C60, C61

<u>Summary of Impacts –Winter Year 1 and Summer Year 15:</u>

- **Negligible** magnitude of change, **Minor Adverse** impact - C14, C64
- **Low** magnitude of change, **Moderate Adverse** impact - C4, C7, C22, C30
- **Medium** magnitude of change, **Moderate Adverse** impact - C1, C2, C3, C5, C6, C8, C31, C34
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - C9, C10, C12, C13, C15, C16, C17, C18, C19, C20, C21, C25, C25+, C26, C26+, C28, C29, C32, C33, C35, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C60, C61, C62, C63, C65
- **High** magnitude of change, **Major Adverse** impact - C23, C66

Towers 31-40 [see Figure 13.7, Properties D1-D35]

450. To the west of towers T30 & T31, 6No dwelling D1 through to D6 would have views of T30 and T31 partly seen against the backdrop of the hillside and trees, however the towers would also be visible rising above the skyline. Dwelling D7 to the east of the line route, would be partially screened by outbuildings and existing trees.

451. Beyond T32, the line route crosses over the River Backwater. Towers T32 & T33 would be set back from the riverside to lessen visual impacts on the river course. At T33 the line route turns to the south-east and follows lower ground to detour around a large drumlin keeping it off the skyline. To the east of T33 & T34 there are 6No dwellings and outbuildings, D8 through to D12+, located on higher ground above the floodplain, which would have views towards the line route.

452. To the west there are 9No dwellings, D13 through to D21, located on the side of a drumlin. Mature hedges and trees will play an important role in limiting views from these dwellings. The line route continues south with T35 to T37 from where it turns south-west and continues to T39, where it turns further to the south and crosses over Ballymartrim Water. There are 7No dwellings to the north-west of T37, D23 through to D29. To the east of the line route there are 5No dwellings, D30 through to D32+, that would have glimpses of the line route through intervening buildings and trees.

453. The line route then passes into Landscape Character Area 66, the Armagh Drumlins. Dwelling D33, a large period house known as Glenaul Park, has views north along the valley with T37, T38 and T39 visible. At T39 the line route turns in a south-westerly direction behind a row of mature trees to T40, beyond which it passes over Tullysaran Road. Two dwellings, D34 and D35, to the west of the road would have views of the line route, T40 and T41.

<u>Construction effects would be as follows:</u>

- **Negligible** magnitude of change, **Minor Adverse** impact - D12, D12+, D19, D24, D25
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** impact - D23
- **Low** magnitude of change, **Moderate Adverse** impact - D8, D26, D31, D32+, D34
- **Medium** magnitude of change, **Moderate Adverse** impact - D9, D13, D14
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - D1, D2, D3, D4, D5, D6, D7, D15, D16, D17, D18, D27, D28, D29, D30, D30+, D32
- **High** magnitude of change, **Major Adverse** impact D10, D11, D11+, D20, D21, D33, D35

<u>Summary of Impacts –Winter Year 1 and Summer Year 15:</u>

- **Negligible** magnitude of change, **Minor Adverse** impact - D12, D12+, D19, D24, D25
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** impact - D23
- **Low** magnitude of change, **Moderate Adverse** impact - D8, D26, D31, D32+, D34
- **Medium** magnitude of change, **Moderate Adverse** impact - D9, D13, D14
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - D1, D2, D3, D4, D5, D6, D7, D8+, D10, D11, D11+, D15, D16, D17, D18, D20, D21, D27, D28, D29, D30, D30+, D32, D33, D35

Towers 41-51 [see Figure 13.7, Properties E1-E60]

454. Beyond T41 the line route heads due south and rises up the hillside where mature trees and hedges help to limit visibility in the local landscape. To the east of this tower, there are 8No dwellings E1 through to E9.

455. Further south along Tullysaran Road, to the east of the line route, there are 8No dwellings, E10 through to E19. The line route, with T41 & T42 passes through the townland of Lisbane. To the west are 5No dwellings, E20 through to E25. Intervening trees would help to lessen impacts for these receptors.

456. Beyond T44 the line route crosses over the B115, Battleford Road, which links Eglish to Armagh. There are 7No dwellings, E26 through to E33, to the east of the road and there are 5No dwellings, E34 through to E39, to the south-west of the road. Descending from T47 the line route cuts through a small commercial complex, including dwelling E43, where it crosses a narrow road linking Bracknagh and Lisdown Road and runs along lower ground to T48 and T49.

457. There are 4No dwellings, E44 through to E47, on the higher ground on Bracknagh Road, which would have open views of the line route and T47, T48 & T49 and would be seen against the opposite hillside. To the east of the line route, often on higher ground, there are 11No dwellings, E49 through to E58, along Lisdown Road.

458. Just before T49 the line route crosses over a disused railway line, containing a mature belt of trees, before turning to the south-west and running through more open countryside.

Construction effects would be as follows:

- **Negligible** magnitude of change, **Minor Adverse** impact - E22, ,E23, E26, E27, E28, E30,
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** impact - E29, E53, E53+, E54
- **Low** magnitude of change, **Moderate Adverse** impact - E24, E31+, E36, E49, E49+, E55, E56
- **Medium** magnitude of change, **Moderate Adverse** impact - E5, E6, E57, E58
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - E3, E4, E7, E9, E10, E10+, E11, E11+, E12, E13, E15, E16, E18, E19, E20, E25, E31, E34, E35, E37, E40, E44, E45, E46, E47, E50, E52, E60
- **High** magnitude of change, **Major Adverse** impact - E1, E8, E8+, E33, E43

Summary of Impacts –Winter Year 1 and Summer Year 15:

- **Negligible** magnitude of change, **Minor Adverse** impact - E22, E23, E26, E27, E28, E30
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** impact - E29, E53, E53+, E54,
- **Low** magnitude of change, **Moderate Adverse** impact - E24, E31+, E36, E46, E47, E49, E49+, E55, E56
- **Medium** magnitude of change, **Moderate Adverse** impact - E5, E6, E57, E58
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - E3, E4, E7, E8+, E9, E10, E10+, E11, E11+, E12, E13, E15, E16, E18, E19, E20, E25, E31, E33, E34, E35, E37, E40, E44, E45, E50, E52, E60
- **High** magnitude of change, **Major Adverse** impact - E1, E8, E43

Towers 51-61 [see Figure 13.7, Properties F1-F33]

459. Between T51 and T52, in the townland of Cullentragh, the line route crosses over Navan Fort Road, beyond which it turns to the south-east.

460. On the western side of the line route there are 7No dwellings, F1 through to F7. To the east there are a further 4No dwellings, F8 through to F12. The line route with T53 & T54 continues south-east, beyond which it passes over the A28 Killylea - Armagh Road. To the west of the road crossing there are 2No dwellings, F15 and F16.

461. From T55 the line route rises up a hillside and then continues down a narrow valley with T55-T58. Beyond T58, in the townland of Lisdrumard, the line route continues in a more south-westerly direction along the valley floor with T59, T60 & T61. This is an enclosed landscape with mature hedgerows and relatively few dwellings. To the west of the line route there are 6No dwellings, F17 through to F23. Twelve dwellings, to the east of the line route on higher ground, F24 through to F31+, would also have views of the line route. Two dwellings, F32 & F33, to the west of T58 & 59 would also have views of the line route.

Construction effects would be as follows:

- **Negligible** magnitude of change, **Minor Adverse** impact - F1, F2, F11, F24, F24+, F27, F27+, F28, F28
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** impact- F5, F12
- **Low** magnitude of change, **Moderate Adverse** impact - F19, F25, F29
- **Medium – Low** magnitude of change**, Moderate Adverse** impact - F3
- **Medium** magnitude of change, **Moderate Adverse** impact - F10
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - F4, F6, F7, F15, F18, F20, F22, F23, F26, F26+, F31+, F32, F33
- **High** magnitude of change, **Major Adverse** impact - F8, F16, F31

Summary of Impacts –Winter Year 1 and Summer Year 15:

- **Negligible** magnitude of change, **Minor Adverse** impact - F1, F2, F11, F24, F24+, F27, F27+, F28, F28+
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** impact - F5, F12
- **Low** magnitude of change, **Moderate Adverse** impact F3, F19, F25, F29
- **Medium** magnitude of change, **Moderate Adverse** impact - F10
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - F4, F6, F7, F15, F16, F18, F20, F22, F23, F26, F26+, F31+, F32, F33
- **High** magnitude of change, **Major Adverse** impact - F8, F31

Towers 62-71 [see Figure 13.7, Properties G1-G42]

462. At T62 the line route heads south-west down the valley, with higher ground on either side. Dwellings G1 through to G8 would experience views of the line route. The route passes over a low lying area known as Brootally Bog before reaching T65 and T66 where the line route crosses over Brootally Road. To the south-east of the road there are 3No dwellings, G9 through to G11 and to the north-west of the road there are 3No dwellings G12 through to G14. The line route continues south-west through open farmland with neat hedges and isolated trees and higher ground on either side. At T68 the route turns further to the south-west and crosses over Dernalea Road before starting to rise up the hillside with higher ground to the east, which would provide a good backdrop to the line route in the landscape. 2No

dwellings, G16 and G17, opposite T67 will have elevated views of the proposed overhead line route. To the east of T68 there are 6No dwellings, G18 through to G21.

463. Continuing further south-west there are 10No dwellings, G23 through to G34, to the west of the line route, some with panoramic views over the countryside. To the east of T69-T71 there are 7No dwellings, G35 through to G42. At T71 to keep the line route off the rising ground the route swings further to the south, in the direction of Tamlaght.

Construction effects would be as follows:

- **Negligible** magnitude of change, **Minor Adverse** impact - G1+, G4, G9, G20, G23, G25, G39
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** impact - G12
- **Low** magnitude of change, **Moderate Adverse** impact - G6, G7, G8, G11, G19, G21, G34, G35, G37
- **Medium** magnitude of change, **Moderate Adverse** impact - G13, G14, G19+, G24, G26, G27, G32, G41, G42
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - G1, G3, G5, G18, G18+, G30, G33, G42+
- **High** magnitude of change, **Major Adverse** impact - G10, G16, G17, G28, G36, G40

Summary of Impacts –Winter Year 1 and Summer Year 15:

- **Negligible** magnitude of change, **Minor Adverse** impact - G1+, G4, G9, G20, G23, G25, G39
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** impact - G12
- **Low** magnitude of change, **Moderate Adverse** impact - G6, G7, G8, G11, G19, G21, G34, G35, G37, G41
- **Medium** magnitude of change, **Moderate Adverse** impact - G13, G14, G19+, G24, G26, G27, G32, G42
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - G1, G3, G5, G16, G17, G18, G18+, G30, G33, G36, G40, G42+
- **High** magnitude of change, **Major Adverse** impact - G10, G28

T***owers 72-81 [see Figure 13.7, Properties H2-H43]***

464. The line route passes over the A3 Monaghan Road between T72 & T73 and Maddan Road before reaching T74, to the east of Norton's Crossroads. There are 2No dwellings, H2 and H3, to the east of the A3 road crossing.

465. To the south-west of the road crossing there are 13No dwellings, H5 through to H17. The undulating nature of the landscape and overgrown hedges will help to limit visual impacts.

466. Beyond T74, the line route swings more to the west and crosses a landscape with pockets of woodland and pastureland, with tree lines and hedges of ash, holly and hawthorn which, are largely intact but unkempt. In this area the drumlins are higher and more prominent in the landscape. Field sizes become smaller, creating a more intimate landscape setting.

467. On the eastern side of the valley 7No dwellings, H19 through to H27 would have views of the line route. At T76, which is located on a low drumlin, the line swings to the south-east to avoid a higher linear drumlin to the west and a small wood to the east. To the west of the line route there are 10No dwellings, H28 through to H39. Close to T81 there are 6No dwellings, H40 through to H43, to the east of the line route.

<u>Construction effects would be as follows:</u>

- **No change**, **No Effect** - H12+, H32
- **Negligible** magnitude of change**, Minor Adverse** impact - H6, H7, H13, H19, H42+
- **Low** magnitude of change, **Moderate Adverse** impact - H9, H18, H21, H40, H41, H41+ H42,
- **Medium** magnitude of change, **Moderate Adverse** impact **-** H10, H14, H34, H43
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - H2, H3, H11, H11+, H12, H15, H16, H17, H24, H26, H27, H28, H29, H30, H33, H36, H38, H39
- **High** magnitude of change, **Major Adverse** impact **-** H5, H22, H23, H35

<u>Summary of Impacts –Winter Year 1 and Summer Year 15:</u>

- **No change, No Effect** - H12+, H32
- **Negligible** magnitude of change, **Minor Adverse** impact - H6, H7, H13, H19, H42+
- **Low** magnitude of change, **Moderate Adverse** impact - H9, H18, H21, H34, H40, H41, H41+, H42
- **Medium** magnitude of change, **Moderate Adverse** impact - H10, H14, H43
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - H2, H3, H11, H11+ H12, H15, H16, H17, H24, H26, H27, H28, H29, H30, H33, H36, H38, H39
- **High** magnitude of change**, Major Adverse** impact **-** H5, H22, H23, H35

Towers 82-92 [see Figure 13.7, Properties i1-i27]

468. At T83 the line route turns to the south-east and rises up a narrow valley avoiding he higher ground on either side before crossing over Sheetrim Road with T84 set back off the roadside. It continues uphill to T85, from where it turns sharply to the south-west before crossing over Drumhillery Road and continuing uphill. This section of the line route would impact on 12No dwellings, i1 through to i13, on either side of the route.

469. The line route continues south-west with 3No dwellings, i14 through to i16, to the west of the line route and to the east of the line route 5No dwellings, i18 through to i24, would have views of the proposed overhead line route.

470. The line route crosses over Tivenacree Road and continues along lower ground to T89. At T89 the line route changes direction again and heads south in a straight line, along a narrow valley between the townlands of Tullyhirm and Tivenacree in an area with few dwellings.

471. Dwelling i7 would have filtered views of the line to the rear of the property. From T89 the line route continues in a southerly direction to the border crossing. To the east of T89 &T90 there are 3No dwellings, i25 through to i27, would have views of the proposed overhead line route.

<u>Construction effects would be as follows:</u>

- **No Change No effect** i3+
- **Negligible** magnitude of change, **Minor Adverse** impact i1, i3
- **Low** magnitude of change, **Moderate Adverse** impact - i4, i5, i13, i26, i27
- **Medium** magnitude of change, **Moderate Adverse** impact – i14, i24,
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - i10, i15, i16, i18, i19, i20
- **High** magnitude of change, **Major Adverse** impact **-** i6, i7, i7+, i9, i12, i25

Summary of Impacts –Winter Year 1 and Summer Year 15:

- **No change, No Effect** - i3+
- **Negligible** magnitude of change, **Minor Adverse** impact - i1, iI3
- **Low** magnitude of change, **Moderate Adverse** impact - i4, i5, i13, i26, i27
- **Medium** magnitude of change, **Moderate Adverse** impact - i14, i24
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - i9, i10, i12, i15, i16, i18, i19, i20, i21, i25
- **High** magnitude of change, **Major Adverse** impact – i6, i7, i7+

Towers 93-102 [see Figure 13.7, Properties J1-J62]

472. Beyond T93 the line route starts to rise up the valley side to avoid the wetland areas of Fergort Lough and Listrakelt to the west. The line route would be elevated in the landscape, running along a linear drumlin, but when viewed from the west, higher ground to the east would keep it off the skyline.

473. The line route between T92-T95 would impact on 10No dwellings, J1 through to J8, to the west of the route. To the east 8No dwellings, J9 through to J18, would have views of the proposed overhead line route.

474. The landscape is more open here with some small isolated drumlins. There is higher ground to the east and lower ground to the west. There are a number of dwellings along Listrakelt Road, which runs parallel to the line route. To the west of the line route, between T95-T98 there are 14No dwellings J19 through to J34 and between T97 &T99 there are 11No dwellings, J35 through to 44+.

475. To the west of the line route between T99-T102, there are 7No dwellings, J46 through to J52 and to the east of the line route there are 9No dwellings, J53 through to J61, with likely views of the proposed overhead line route.

Construction effects would be as follows:

- **No change, No Effect** - J57
- **Negligible** magnitude of change, **Minor Adverse** impact - J2, J8, J53, J53+, J56+, J59, J59+
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** impact - J9, J15, J19, J20, J26, J26+, J35, J35+, J36, J57+, J60
- **Low** magnitude of change, **Moderate Adverse** impact - J1, J1+, J4, J4+, J6, J10, J12, J25, J25+, J34, J43, J55.
- **Medium – Low** magnitude of change, **Moderate Adverse** impact - J23
- **Medium** magnitude of change, **Moderate Adverse** impact - J3, J18, J22, J44, J56
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - J5, J7, J13, J14, J27, J28, J30, J31, J32, J33, J37, J38, J44+, J46, J47, J48, J50, J51, J51+, J52, J61
- **High** magnitude of change, **Major Adverse** impact - J16, J39, J40, J41, J42, J62

Summary of Impacts –Winter Year 1 and Summer Year 15:

- **No change, No Effect** - J57
- **Negligible** magnitude of change, **Minor Adverse** impact - J2, J8, J53, J53+, J56+, J59, J59+
- **Low-Negligible** magnitude of change, **Minor-Moderate Adverse** impact - J1+, J9, J15, J19, J20, J26, J26+, J35+, J36, J57+, J60
- **Low** magnitude of change, **Moderate Adverse** impact - J1, J4, J4+, J6, J10, J12, J25, J25+, J34, J35, J43, J55

- **Medium – Low** magnitude of change, **Moderate Adverse** impact - J23
- **Medium** magnitude of change, **Moderate Adverse** impact - J3, J18, J22, J44, J56
- **High – Medium** magnitude of change, **Moderate-Major Adverse** impact - J5, J7, J13, J14, J16, J27, J28, J30, J31, J32, J33, J37, J38, J39, J40, J41, J42, J44+, J46, J47, J48, J50, J51, J51+, J52, J61, J62

Summary of Individual Properties Assessment

476. Overall in Year 15 (Summer) there will be:

- 19 properties that experience a major adverse impact;
- 201 properties that experience a moderate - major adverse impact;
- 103 properties that experience a moderate adverse impact;
- 31 properties that experience a minor - moderate adverse impact;
- 64 properties that experience a minor adverse impact; and,
- 9 properties that experience no effect.

13.6.2.3 Assessment of Transport Corridors and Paths

Roads

477. The main road corridors are largely located within the drumlin valleys in the study area. Where roads travel over more elevated parts of the drumlin landscape, views experienced are more distant.

The M1

Representative Views

478. None

Baseline Description

479. The M1 connects Belfast and the west of the province running through the far north of the study area. There are very limited opportunities for views across the wider landscape towards the proposal and even when the M1 crosses more elevated positions presenting longer views, the distance from the proposed overhead line route would severely limit any potential views. The M1 is considered to be of **Low** sensitivity.

Assessment of Impact

480. The M1 does not cross the proposed overhead line route. It is situated to the north of the proposals and never directly faces the proposal. Overall the magnitude of change is considered to be **Negligible** during construction, Year 1 and Year 15. The impacts of the proposed overhead line and towers would therefore be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

The N2 (RoI)

<u>Representative Views</u>

481. None

<u>Baseline Description</u>

482. The N2 cuts across the south western corner of the study area from Castleshane to south of Lisnagunshin. The N2 is considered to be of **Low** sensitivity.

<u>Assessment of Impact</u>

483. The ZTV shows that theoretical visibility is limited to patches close to Clontibret and Tullybuck although in reality much of this section of road lies in cutting and view towards the Proposed Development would be oblique glimpses experienced at high speeds. The magnitude of change is considered to be **Negligible** during construction, Year 1 and Year 15 and the resulting impacts of the proposed overhead line and towers would be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

The A28

<u>Representative Views</u>

484. Viewpoint 17

<u>Baseline Description</u>

485. The A28 runs in an east to west direction between Caledon and Armagh. Viewpoint 17 looks east along the A28 in a more enclosed landscape where mature trees add variety to the local scene. Existing trees would help to lesson impacts for travellers. The A28 is considered to be of **Low** sensitivity.

<u>Assessment of Impact</u>

486. The A28 crosses the proposed overhead line route north of Drumgar. When at this location or when within 50m of the proposed overhead line approaching from the either the east or west, the magnitude of change is considered to be **Medium** during construction and **Low – Medium** in Year 1 and Year 15. Overall, however, the magnitude of change is considered to be **Low** during construction, Year 1 and Year 15.

487. The overhead line visual impacts, therefore, would be **Negligible** during construction and in the winter year of commissioning and remain **Negligible** in summer 15 years after commissioning.

The A3

<u>Representative Views</u>

488. Viewpoints 20 and 21

<u>Baseline Description</u>

489. The A3 runs in a north - east direction between Middletown and Armagh. Viewpoints 20 and 21 are located near Norton’s crossroads along the A3 as the road crosses the path of the overhead line. The A3 is considered to be of **Low** sensitivity.

<u>Assessment of Impact</u>

490. The A3 crosses the proposed overhead line route near Norton’s crossroads. When at this location or when within 50-100m of the proposed overhead line approaching from the west or within 350-400m of the proposed overhead line approaching from the east, the magnitude of change is considered to be **High** during construction and **Medium - High** in Year 1 and Year 15. Overall, however, the magnitude of change is considered to be **Medium** during construction, Year 1 and Year 15.

491. The overhead line visual impacts, therefore, would be **Minor Adverse** during construction and in the winter year of commissioning and remain **Minor Adverse** in summer 15 years after commissioning.

The A29

Representative Views

492. Viewpoint 6

Baseline Description

493. The A29 runs in a north to south direction between Moy and Armagh. Viewpoint 6 is located north of Moy near Culkeeran House along the A29 as the road crosses the path of the overhead line. The A29 is considered to be of **Low** sensitivity.

Assessment of Impact

494. The A29 crosses the proposed overhead line route north of Moy. When at this location or when within 300m of the proposed overhead line approaching from the north west, the magnitude of change is considered to be **Medium - High** during construction and **Medium** in Year 1 and Year 15. Overall, however, the magnitude of change is considered to be **Low** during construction, Year 1 and Year 15.

495. The overhead line visual impacts, therefore, would be **Negligible** during construction and in the winter year of commissioning and remain **Negligible** in summer 15 years after commissioning.

The A45

Representative Views

496. None

Baseline Description

497. A small section of the A45 lies within the northern part of the study area as it connects with the M1 at junction 14. Road users are considered to be of **Low** sensitivity.

Assessment of Impact

498. The A45 does not cross the proposed overhead line route. It is situated to the north of the proposals, at the edges of the study area and areas of theoretical visibility are in reality screened by the intervening M1 corridor. The magnitude of change is therefore considered to be **No Change** during construction, Year 1 and Year 15. As a result, **No Impact** has been assessed for construction, winter year of commissioning and summer 15 years after commissioning.

The B115

Representative Views

499. Viewpoint 16

Baseline Description

500. The B115 runs in a north-west to south-east direction between Eglish and Armagh. Viewpoint 16 is located near Lisbane along the B115 as the road crosses the path of the proposed overhead line. The B115 is considered to be of **Medium** sensitivity.

Assessment of Impact

501. The B115 crosses the proposed overhead line route near Lisbane. When at this location or when within 150-200m of the proposed overhead line approaching from either side, the magnitude of change would be **High** during construction, Year 1 and Year 15. Overall, however, the magnitude of change is considered to be **Low - Medium** during construction, Year 1 and Year 15.

502. The overhead line visual impacts, therefore, would be **Minor - Moderate Adverse** during construction and in the winter year of commissioning and remain **Minor - Moderate Adverse** in summer 15 years after commissioning.

The B106

Representative Views

503. Viewpoints 1, 4, 9, and 10

Baseline Description

504. The B106 runs in a north to south direction between Coalisland and Benburb. Viewpoints 1 and 4 are located near the substation along the B106 and viewpoints 9 and 10 are located along the B106 near Ninewell Bridge as the road crosses the path of the overhead line. The B106 is considered to be of **Medium** sensitivity.

Assessment of Impact

505. The B106 passes the substation at its entrance. When near viewpoints 1&4 or when travelling south along the B106 between viewpoints 1&4, the magnitude of change would be **High** during construction and **High – Medium** in Year 1 and Year 15.

506. The B106 crosses the proposed overhead line route near Ninewell Bridge. When near viewpoints 9&10 or when travelling in either direction along the B106 between viewpoints 9&10, the magnitude of change would be **High** during construction, Year 1 and Year 15. The overall magnitude of change, however, including other sections of this route is considered to be **Medium** during construction and Year 1 and **Low – Medium** in Year 15 due to mitigation opportunities in relation to the substation.

507. The impacts of the proposed overhead line and towers would therefore be **Moderate Adverse** during construction, in the winter year of commissioning and reduce to **Minor - Moderate Adverse** in summer 15 years after commissioning as planting matures.

The B3 / R214 (RoI)

Representative Views

508. Viewpoint 27

Baseline Description

509. The B3/R214 runs in an east to west direction between Monaghan and Keady. Viewpoint 27 is located near Derrynoose Church along the B3 as the road crosses the path of the overhead line. The B3/R214 is considered to be of **Medium** sensitivity.

Assessment of Impact

510. The B3 crosses the proposed overhead line route near Derrynoose Church. When at this location or when within approximately 4-500m to the west of this location the magnitude of change would be **High** during construction and **Medium – High** in Year 1 and Year 15. The ZTV shows limited theoretical visibility along the section of R214 that lies within the study area.

511. Taking this into account, the overall magnitude of change is considered to be **Low - Medium** during construction, Year 1 and Year 15 for this route. The overhead line visual impacts, therefore, would be **Minor - Moderate Adverse** during construction and in the winter year of commissioning and remain **Minor - Moderate Adverse** in summer 15 years after commissioning.

The B34

Representative Views

512. None

Baseline Description

513. A section of the B34 lies within the northern part of the study area from Laghey Corner to Dungannon, crossing the M1. The B34 is considered to be of **Medium** sensitivity.

Assessment of Impact

514. The B34 does not cross the proposed overhead line route. It is situated to the north of the proposals and areas of theoretical visibility are in reality screened by the M1 corridor and successive layers of intervening vegetation. The magnitude of change is therefore considered to be **No Change** during construction, Year 1 and Year 15. As a result, **No Impact** has been assessed for construction, winter year of commissioning and summer 15 years after commissioning.

The B517

Representative Views

515. None

Baseline Description

516. A small section of the B517 lies within the northern part of the study area to the south of Dungannon. The B517 is considered to be of **Medium** sensitivity.

Assessment of Impact

517. The ZTV shows that the B517 has no theoretical visibility and the magnitude of change is therefore considered to be **No Change** during construction, Year 1 and Year 15. As a result, **No Impact** has been assessed for construction, winter year of commissioning and summer 15 years after commissioning.

The B45

Representative Views

518. None

Baseline Description

519. The B45 is situated to the west of the proposed overhead line route and a section of it lies within the northern part of the study area to the south west of Dungannon. The B45 is considered to be of **Medium** sensitivity.

Assessment of Impact

520. The ZTV shows that the section of the B45 within the study area has no theoretical visibility and the magnitude of change is therefore considered to be **No Change** during construction, Year 1 and Year 15. As a result, **No Impact** has been assessed for construction, winter year of commissioning and summer 15 years after commissioning.

The B128

Representative Views

521. Viewpoint 11

Baseline Description

522. The B128 runs in an east to west direction between the A29 at Macready's Corner through Blackwatertown and Benburb before leaving the study area to the west near Goak Hill. The B128 is considered to be of **Medium** sensitivity.

Assessment of Impact

523. The B128 crosses the proposed overhead line route between Blackwatertown and Benburb. When at this location or when within approximately 500m of the proposed overhead line approaching from the west or 100m from the east, the magnitude of change is considered to be **Medium** during construction and **Low – Medium** in Year 1 and Year 15. When considering the entire route that lies within the study area, however, the overall magnitude of change is considered to be **Low** during construction, Year 1 and Year 15.

524. The resulting impacts, therefore, would be **Minor Adverse** during construction and in the winter year of commissioning and remain **Minor Adverse** in summer 15 years after commissioning.

The B28

Representative Views

525. None

Baseline Description

526. The B28 is located in the north east of the study area. It connects to the A29 near Charlemont Bridge travels south east passing Callan Bridge then winds its way north east before leaving the study area near Sinclairs Hill. Road users are considered to be of **Medium** sensitivity.

Assessment of Impact

527. The B28 does not cross the proposed overhead line route and the ZTV shows long sections of theoretical visibility, largely between Charlemont Bridge and Callan Bridge. Long views are available where the road is more elevated in relation to its surroundings such as near College Hall and west of Callan Bridge. The Proposed Development would however appear as a small element on the distant horizon and the magnitude of change is considered to be **Negligible** during construction, Year 1 and Year 15. The resulting impacts of the proposed overhead line and towers would be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

The B130

Representative Views

528. None

Baseline Description

529. The B130 connects Benburb to the A45 just to the south of the M1. The B130 is considered to be of **Medium** sensitivity.

Assessment of Impact

530. The B130 does not cross the proposed overhead line route and the ZTV shows only patches of theoretical visibility, largely to the north of Benburb. In reality, the majority of these areas of theoretical visibility are screened by intervening layers of vegetation that lie on successive horizons in the direction of the proposed overhead line route.

531. Overall, therefore, the magnitude of change is considered to be **Negligible** during construction, Year 1 and Year 15 and the resulting impacts of the proposed overhead line and towers would be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

The B210

Representative Views

532. None

Baseline Description

533. The B210 is situated to the west of the proposed overhead line route and a section of it lies between Middletown and Tynan Abbey. The B210 is considered to be of **Medium** sensitivity.

Assessment of Impact

534. The ZTV shows that the section of the B210 within the study area has very limited theoretical visibility and at distances of greater than 4km from the development the magnitude of change is considered to be **Negligible** during construction, Year 1 and Year 15 and the resulting impacts of the proposed overhead line and towers would be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

The B361

Representative Views

535. None

Baseline Description

536. The B361 is a small section of road north of Keady. The B361 is considered to be of **Medium** sensitivity.

Assessment of Impact

537. The ZTV shows limited theoretical visibility and at distances of greater than 4km from the development the magnitude of change is considered to be **Negligible** during construction, Year 1 and Year 15 and the resulting impacts of the proposed overhead line and towers would be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

The B32 / R181(RoI)

Representative Views

538. None

Baseline Description

539. The B32/R181 is situated to the east of the proposed overhead line route travelling south from the B3 at ‘The Man of War’ past Connor’s Hill and leaving the study area to the south of Creaghanroe in the Republic of Ireland. The B32/R181 is considered to be of **Medium** sensitivity.

Assessment of Impact

540. The ZTV shows that none of the R181 within the study area has theoretical visibility and one patch of theoretical visibility occurs on the B32 north of Carnagh Country House. The magnitude of change is considered to be **Negligible** during construction, Year 1 and Year 15 and the resulting impacts of the proposed overhead line and towers would be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

The R184 (RoI)

Representative Views

541. None

Baseline Description

542. The R184 is situated in the south western corner of the study area, running from Scotch Corner it connects to the N2 near Clontibret. The R184 is considered to be of **Medium** sensitivity.

Assessment of Impact

543. The ZTV shows theoretical visibility along much of the section of road that lies within the study area.

544. At distances of between 3.8km and 5km the proposed overhead line towers would be barely distinguishable and the magnitude of change is considered to be **Negligible** during construction, Year 1 and Year 15. The resulting impacts of the proposed overhead line and towers would be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

Paths

The Ulster Way / National Cycle route 91

Representative Views

545. Viewpoint 18

Baseline Description

546. National Cycle Route 91 roughly follows the same route as the Ulster Way. The Ulster Way is a well recognised and historic route within this area of Northern Ireland. The section that crosses the study area is listed as a link section and walkers are provided with the following advice on the walkNI website[138] – 'This is a Link section therefore walkers are advised to make use of the public transport links between Scarva and Aughnacloy'.

547. Both the Ulster Way and National Cycle Route 91 enter the study area from the east at Armagh. They travel past Navan Fort and then follow a series of minor roads until they reach Tynan. The routes also pass through Killylea, represented by viewpoint 18.

548. This route crosses the drumlin landscape which at times in this particular area is quite wooded with limited views across the wider landscape. When the route crosses the drumlin summits open and long views become available.

549. Cyclists / Walkers are considered to be of **Medium** sensitivity to this type of Proposed Development, although a large proportion of this route is situated within the valleys of the drumlin landscape or screened by vegetation, reducing the overall sensitivity. The national importance of the Ulster Way, however, affects the sensitivity which is considered to be **Medium** despite the localised screening.

Assessment of Impact

550. The routes cross the proposed overhead line route north of the A28 on a local road. When at this location or when approaching it from either the east or west within 100m, the magnitude of change would be **High** during construction, Year 1 and Year 15. Overall, however, the magnitude of change is considered to be **Low - Medium** during construction, Year 1 and Year 15.

551. The overhead line visual impacts, therefore, would be **Minor – Moderate Adverse** during construction and in the winter year of commissioning and remain **Minor – Moderate Adverse** in summer 15 years after commissioning.

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[138] http://www.walkni.com/ulsterway/sections/scarva-to-aughnacloy/

National Cycle Route 95

Representative Views

552. Viewpoint 12 lies close to route 95 but does not fully represent it as much of the cycle route is screened by either roadside vegetation or localised drumlin topography. Viewpoint 12 does, however, provide an indication of a worst case view.

Baseline Description

553. The National Cycle Route 95 travels along the western side of the study area from Tynan, through Benburb continuing to Dungannon at the north – west of the study area.

554. This length of cycle route is situated in a north – south orientation following the drumlin valleys to the west of the proposal. There are very limited opportunities for views across the wider landscape towards the proposal apart from when the route crosses the drumlin summits opening up longer views.

555. Cyclists / Walkers are considered to be of **Medium** sensitivity to this type of Proposed Development however due to the path spending a large proportion of its time within the valleys of the drumlin landscape or screened by vegetation, the sensitivity is considered to be **Low**.

Assessment of Impact

556. The cycle route does not cross the proposed overhead line route. It rarely comes within close proximity adjacent to the route and hardly ever directly faces the Proposed Development. Overall the magnitude of change is considered to be **Negligible** during construction, Year 1 and Year 15.

557. The overhead line visual impacts, therefore, would be **Negligible** during construction and in the winter year of commissioning and remain **Negligible** in summer 15 years after commissioning.

Regional Cycle Route 11

Representative Views

558. Viewpoints 5 and 13

Baseline Description

559. Regional Cycle Route 11 enters the study area from the north – east of the Argory Estate. It travels past the Argory, viewpoint 5, and then follows a series of minor roads until it reaches Benburb where it turns south towards Caledon. The route also passes by Moy and travels through Blackwatertown, before crossing the proposed overhead line route near Benburb. It crosses the drumlin landscape which at times has limited views across the wider landscape although when the route crosses the drumlin summits open and long views become available.

560. Cyclists / Walkers are considered to be of **Medium** sensitivity to this type of Proposed Development however due to the path spending a large proportion of its time within the valleys of the drumlin landscape or screened by vegetation, the sensitivity is considered to be **Low**.

Assessment of Impact

561. Regional Cycle Route 11, passes near to the substation along the banks of the River Blackwater. When travelling along this section of these routes the magnitude of change would be **Medium** during construction. Mitigation opportunities exist in relation to the substation in the form of extensive tree and shrub screen planting. The magnitude of change along this section of route is therefore considered **Medium – Low** in Year 1 and **Low** in Year 15.

562. Regional Cycle Route 11, crosses the proposed overhead line route south of the B128 on a minor road. When at this location or when approaching it from either the east or west within 100-200m, the magnitude of change would be **Medium** during construction, in Year 1 and in Year 15.

563. Taking this into account and when considering the entire section of route that lies within the study area, the overall magnitude of change is considered to be **Medium - Low** during construction, **Low** in Year 1 and **Low – Negligible** in Year 15.

564. The impacts, therefore, would be **Negligible - Minor Adverse** during the construction period, **Negligible** in the winter year of commissioning and **Negligible** in summer 15 years after commissioning as planting matures.

River Blackwater Canoe Trail

<u>Representative Views</u>

565. Viewpoints 5 and 13

<u>Baseline Description</u>

566. The Blackwater Canoe Trail is situated along the River Blackwater. It enters the study area from north – east of the Argory Estate. It travels past the Argory, viewpoint 5, and then follows the River Blackwater until it reaches Benburb.

567. There are stretches of the River Blackwater that have considerable bankside scrub vegetation which limits views across the drumlin landscape that it occupies. When the drumlin valleys flatten out near Tullymore Bridge open and long views become available.

Overall, the sensitivity is considered to be **Medium** for the Blackwater Canoe Trail.

568. The Blackwater Canoe Trail passes near to the substation near to The Argory estate as it travels along the River Blackwater. When travelling along this section the magnitude of change would be **Low - Medium** during construction. Mitigation opportunities exist in relation to the substation in the form of extensive tree and shrub screen planting. The magnitude of change along this section of route is therefore considered **Low** in Year 1 and **Low - Negligible** in Year 15.

569. The Blackwater Canoe Trail crosses the proposed overhead line route north of the Tullymore Bridge. When at this location or when approaching it from either the east or west within 100-200m, the magnitude of change would be **High** during construction and **Medium** in Year 1 and in Year 15.

570. Taking this into account and when considering the entire section of route that lies within the study area, the overall magnitude of change is considered to be **Medium** during construction, **Medium - Low** in Year 1 and **Low** in Year 15.

571. The impacts, therefore, would be **Moderate Adverse** during the construction period, **Minor - Moderate Adverse** in the winter year of commissioning and **Minor Adverse** in summer 15 years after commissioning as planting matures.

The Monaghan Way (RoI)

<u>Representative Views</u>

572. Viewpoints 31 and 34

<u>Baseline Description</u>

573. The Monaghan Way enters the study area from the east of Castleshane. It travels through Crossaghy (viewpoint 31), heads east to the south of tower 102 and then leaves the study area at Loughbrattoge East before continuing on to Mullyash Mountain (viewpoint 34). The route is primarily situated on minor roads but cuts cross-country for small sections also. It crosses the drumlin landscape which at times has limited views across the wider landscape although when the route crosses the drumlin summits open and long views become available.

574. A large proportion of this route is situated within the valleys of the drumlin landscape or screened by vegetation. The sensitivity of the Monaghan Way is considered to be **Medium.**

<u>Assessment of Impact</u>

575. When close to Viewpoint 31 or on sections of the road named Lemgare, the magnitude of change would be **Medium - High** during construction, in Year 1 and in Year 15. When considering the entire section of route that lies within the study area, however, the overall magnitude of change is considered to be **Medium - Low** during construction in Year 1 and in Year 15.

576. The impacts, therefore, would be **Minor - Moderate Adverse** during the construction period in the winter year of commissioning and in summer 15 years after commissioning.

The Beetlers Trail

Representative Views

577. None

Baseline Description

578. The Beetlers Trail is a circular walking and cycling route north of Keady, approximately 14.5km in length with only the western half of the route in the study area. The sensitivity of the Beetlers Trail is considered to be **Medium.**

Assessment of Impact

579. The ZTV shows small patches of theoretical visibility along the section route that lies within the study area. At distances of between 4km and 5km the proposed overhead line towers would be barely distinguishable and the magnitude of change is considered to be **Negligible** during construction, Year 1 and Year 15. The resulting impacts of the proposed overhead line and towers would be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

13.6.2.4 Assessment of Viewpoints

Viewpoint 1: Clonteevy Bridge over River Rhone on Trewmount Road (B106)

Existing View and Sensitivity of Receptors

Grid Reference:	E285759, N358789	It is representative of:
View Direction:	South	• Landscape Character Area - Loughgall Orchard Belt • Sequential routes - B106 • Settlements - Local Farmsteads

580. Views from this location of the substation and overhead line route are viewed predominately by the road user at an oblique transient view. The sensitivity therefore is considered to be **Medium** for this viewpoint location.

Predicted Visibility

581. The substation would be located behind the higher ground in the distance. One existing 275kV tower would be removed and replaced by two lattice structure termination towers. The two proposed termination towers would be new features within this landscape and are larger than the existing 275kV towers. The proposed 400kV overhead line (towers 1 and 2) would only be visible in the distance and within the context of the existing overhead line and the proposed termination towers.

582. In the year immediately following completion of the substation and overhead line construction, the substation buildings and the fire wall would be partially visible beyond the intervening sloping ground. The proposed woodland planting would screen the substation buildings from view, partially screen tower 1 and completely screen tower 2 at Year 15.

Assessment of Impact

Construction

583. The construction activities for both the substation and the overhead line would be viewed from this location, in particular the construction of the termination towers. The magnitude of change is assessed as **High** for the substation and **High** for the overhead line and towers. As a result, construction impacts are assessed as **Moderate - Major Adverse** for both the substation and the overhead line and towers.

Operational (Year 1)

584. The substation location is partially screened by intervening topography and once construction activities cease the magnitude of change relating to the substation would reduce slightly although the magnitude

would remain **High.** The resulting impact would be **Moderate – Major Adverse** for the substation in Year 1 after commissioning.

585. The proposed overhead line towers would be viewed within the context of existing overhead line towers although in the winter year of commissioning would be noticeable new features from this location, in particular the two termination towers. The magnitude of change therefore is assessed as **High** resulting in **Moderate – Major Adverse** impact for the overhead line and towers in Year 1 after commissioning.

586. Taking the individual assessments of the substation and overhead line into account, the overall impacts in Year 1 after commissioning would be **Moderate – Major Adverse** for this viewpoint location.

Operational (Year 15)

587. Mitigation opportunities exist in relation to the substation in the form of extensive tree and shrub screen planting and the magnitude of change would reduce to **Low** resulting in **Minor Adverse** impacts for the substation in summer 15 years after commissioning as planting matures.

588. These same mitigation measures would also partially screen the overhead line towers that sit beyond the horizon in the distance although the two proposed termination towers would still be noticeable features in the foreground landscape and the magnitude of change would therefore remain **High.** As a result the impacts are assessed as **Moderate – Major Adverse** for the overhead line and towers in summer 15 years after commissioning.

589. Taking the individual assessments of the substation and overhead line into account, the overall impacts in summer 15 years after commissioning would be **Moderate – Major Adverse** for this viewpoint location.

Viewpoint 2: Derrygally Way to east of Turleenan Substation

Existing View and Sensitivity of Receptors

Grid Reference:	E285858, N357995	It is representative of:
View Direction:	North - West	• Landscape Character Area - Loughgall Orchard Belt • Sequential routes - Derrygally Way • Settlements - Local Farmsteads

590. View looking north - west from Derrygally Way, across open rolling fields with hedges, post and wire fences, isolated mature trees and farm buildings visible on skyline to the north-west. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

591. In the year immediately following completion of the substation and overhead line construction, the substation would be visible in the foreground of the view and at this distance the individual components of the substation would be clearly visible. Overhead line tower 1 would be visible in the foreground of the view close to the substation site, with towers 2, 3 and 5 appearing within the middle - distance reducing in scale as the overhead line route travels south west away from the viewer.

592. The existing farm building, group of mature trees and a large section of the hillside would be removed to accommodate the proposed substation. Proposed intervening earth bunds and planting would help to screen the substation site over time and by Year 15 the majority of the structures would be screened.

Assessment of Impact

Construction

593. The construction activities for both the substation and the overhead line would be viewed from this location and the magnitude of change is assessed as **High** for the substation and **High** for the overhead line and towers. As a result, construction impacts are assessed as **Moderate - Major Adverse** for both the substation and the overhead line and towers.

Operational (Year 1)

594. Once construction activities cease the magnitude of change relating to the substation would reduce slightly although the magnitude would remain **High.** The resulting impact would be **Moderate – Major Adverse** for the substation in Year 1 after commissioning.

595. The proposed overhead line towers would be noticeable in foreground views from this location and the magnitude of change is assessed as **High** resulting in **Moderate – Major Adverse** impact for the overhead line and towers in Year 1 after commissioning.

596. Taking the individual assessments of the substation and overhead line into account, the overall impacts in Year 1 after commissioning would be **Moderate – Major Adverse** for this viewpoint location.

Operational (Year 15)

597. Mitigation opportunities exist in relation to the substation in the form of extensive tree and shrub screen planting and the magnitude of change would reduce to **Medium** resulting in **Moderate Adverse** impacts for the substation in summer 15 years after commissioning as planting matures.

598. The substation mitigation planting would partially screen the overhead line towers from this location, although the magnitude of change would remain **High.** As a result the impacts are assessed as **Moderate – Major Adverse** for the overhead line and towers in summer 15 years after commissioning.

599. Taking the individual assessments of the substation and overhead line into account, the overall impacts in summer 15 years after commissioning would be **Moderate – Major Adverse** for this viewpoint location.

Viewpoint 3: Derrygally Way to south of Turleenan Substation

Existing View and Sensitivity of Receptors

Grid Reference:	E285750, N357792	It is representative of:
View Direction:	North	• Landscape Character Area - Loughgall Orchard Belt • Sequential routes - Derrygally Way • Settlements - Local Farmsteads

600. View looking north from Derrygally Way across open rolling fields with hedges and isolated trees with the farm building visible on skyline to the north-west. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

601. The proposed substation site would be located in the middle part of the hillside. In the year immediately following completion of the substation and overhead line construction, the substation, tower 1 and both lattice termination towers would be visible in the foreground of the view and at this distance the individual components of the substation would be clearly visible. Overhead line towers 2, 3, 4 and 5 would appear within the middle - distance in views west (away from the substation site), towers reducing in scale as the overhead line route travels away from the viewer.

602. The existing farm building, group of mature trees and a large section of the hillside within the centre of this view would be removed to accommodate the proposed substation. Proposed planting would help to screen the substation site over time and by Year 15 the majority of the structures would be screened.

Assessment of Impact

Construction

603. The construction activities for both the substation and the overhead line would be viewed from this location and the magnitude of change is assessed as **High** for the substation and **High** for the overhead line and towers. As a result, construction impacts are assessed as **Moderate - Major Adverse** for both the substation and the overhead line and towers.

Operational (Year 1)

604. Once construction activities cease the magnitude of change relating to the substation would reduce slightly although the magnitude would remain **High.** The resulting impact would be **Moderate – Major Adverse** for the substation in Year 1 after commissioning.

605. The proposed overhead line towers would be noticeable in foreground views from this location and the magnitude of change is assessed as **High** resulting in **Moderate – Major Adverse** impact for the overhead line and towers in Year 1 after commissioning.

606. Taking the individual assessments of the substation and overhead line into account, the overall impacts in Year 1 after commissioning would be **Moderate – Major Adverse** for this viewpoint location.

607. *Operational (Year 15)*

608. Mitigation opportunities exist in relation to the substation in the form of extensive tree and shrub screen planting and the magnitude of change would reduce to **Medium** resulting in **Moderate Adverse** impacts for the substation in summer 15 years after commissioning as planting matures.

609. The substation mitigation planting would partially screen the overhead line towers from this location, although the magnitude of change would remain **High.** As a result the impacts are assessed as **Moderate – Major Adverse** for the overhead line and towers in summer 15 years after commissioning.

610. Taking the individual assessments of the substation and overhead line into account, the overall impacts in summer 15 years after commissioning would be **Moderate – Major Adverse** for this viewpoint location.

Viewpoint 4: Trewmount Road (B106) near site access road.

Existing View and Sensitivity of Receptors

Grid Reference:	E285645, N358607	It is representative of:
View Direction:	South	• Landscape Character Area - Loughgall Orchard Belt • Sequential routes - B106 • Settlements - Local Farmsteads

611. Views from this location of the substation and overhead line route are viewed predominately by the road user at an oblique transient view. The view looks down the Blackwater valley across the floodplain with lower ground on east and rising ground on the west. The sensitivity therefore is considered to be **Medium** for this viewpoint location.

Predicted Visibility

612. The substation would be located behind the sloping higher ground in the middle distance and would not be visible as a result. The site entrance and access road would sit at the bottom of this sloping higher ground just out of the floodplain. The existing tower, in the centre of the view, would be removed and replaced by two lattice termination towers.

613. 2 overhead line towers would be visible from this location within the context of the existing overhead line, the top of tower 1 would appear in the distance behind the higher ground of the proposed substation site area and tower 3 would be partially screened in south west views by existing mature trees.

614. By Year 15, the proposed woodland would screen the substation access track and the bases of the 2 lattice termination towers from view.

Assessment of Impact

Construction

615. The construction activities for both the substation and the overhead line would be viewed from this location, in particular the construction of the termination towers. The magnitude of change is assessed as **High** for the substation and **High** for the overhead line and towers. As a result, construction impacts are assessed as **Moderate - Major Adverse** for both the substation and the overhead line and towers.

Operational (Year 1)

616. The substation location is screened by intervening topography and once construction activities cease the magnitude of change relating to the substation access track would reduce to **Low.** The resulting impact would be **Minor Adverse** relating to the substation in Year 1 after commissioning.

617. The proposed overhead line towers would be viewed within the context of existing overhead line towers although in the winter year of commissioning would be noticeable new features from this location, in particular the two termination towers. The magnitude of change therefore is assessed as **Medium - High** resulting in **Moderate Adverse** impact for the overhead line and towers in Year 1 after commissioning.

618. Taking the individual assessments of the substation and overhead line into account, the overall impacts in Year 1 after commissioning would be **Moderate Adverse** for this viewpoint location.

Operational (Year 15)

619. Mitigation opportunities relating to the substation, in the form of extensive tree and shrub screen planting, would screen the substation access track from view and the magnitude of change would reduce to **Negligible** resulting in **Negligible** impacts for the substation in summer 15 years after commissioning as planting matures.

620. These same mitigation measures would also partially screen the overhead line towers that sit beyond the horizon in the distance although the two proposed termination towers would still be noticeable features in the foreground landscape and the magnitude of change would therefore remain **Medium - High.** As a result the impacts are assessed as **Moderate Adverse** for the overhead line and towers in summer 15 years after commissioning.

621. Taking the individual assessments of the substation and overhead line into account, the overall impacts in summer 15 years after commissioning would be **Moderate Adverse** for this viewpoint location.

Viewpoint 5: Bonds Bridge over River Blackwater near the Argory

Existing View and Sensitivity of Receptors

Grid Reference:	E287261, N358567	It is representative of:
View Direction:	South - West	• Landscape Character Area - Loughgall Orchard Belt • Sequential routes - Blackwater Canoe Trail • Settlements - Local Farmsteads • Registered Historic Parks and Gardens - The Argory entrance

622. Bonds Bridge is a recognised landmark within the local area close to the entrance of The Argory designed landscape and estate. The Argory is a quality designed landscape and the layout comprises of a variety of tree and shrub species and provides diverse wildlife habitats. This view is directed south and overlooks the River Blackwater and riverside walks that can be found along the boundary of the Argory estate. Existing overhead lines of a similar scale to that proposed are visible from this location.

623. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

624. The substation would be located on higher ground to the west and the intervening woodland along the banks of the River Blackwater channels the view down the river and across the floodplain and blocks all but the southern edge of the substation from view. Overhead line towers 1 & 2 would be visible from this location in the distance and within the context of the existing overhead line.

625. More distant existing vegetation also helps to screen the substation site and by Year 15, the proposed woodland would entirely screen the substation from view.

Assessment of Impact

Construction

626. The construction activities for both the substation and the overhead line would be viewed from this location. The magnitude of change is assessed as **Low** for the substation and **Low - Medium** for the

overhead line and towers. As a result, construction impacts are assessed as **Minor Adverse** for the substation and **Minor – Moderate Adverse** for the overhead line and towers.

Operational (Year 1)

627. The substation location is almost entirely screened by intervening vegetation and once construction activities cease the magnitude of change relating to the substation would reduce to **Low - Negligible.** The resulting impact would be Negligible - **Minor Adverse** for the substation in Year 1 after commissioning.

628. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly, however, the magnitude of change would remain **Low - Medium** resulting in **Minor – Moderate Adverse** impact for the overhead line and towers in Year 1 after commissioning.

629. Taking the individual assessments of the substation and overhead line into account, the overall impacts in Year 1 after commissioning would be **Minor – Moderate Adverse** for this viewpoint location.

Operational (Year 15)

630. Mitigation opportunities relating to the substation, in the form of extensive tree and shrub screen planting, would screen the substation access track from view and the magnitude of change would reduce to **Negligible** resulting in **Negligible** impacts for the substation in summer 15 years after commissioning as planting matures.

631. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Low - Medium** resulting in **Minor – Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

632. Taking the individual assessments of the substation and overhead line into account, the overall impacts in Year 15 after commissioning would be **Minor – Moderate Adverse** for this viewpoint location.

633. For an assessment of the setting of the Argory refer to Chapter 12.

Viewpoint 6: Moy Road (A29) crossing

Existing View and Sensitivity of Receptors

Grid Reference:	E283205, N357868	It is representative of:
View Direction:	South	• Landscape Character Area - Loughgall Orchard Belt • Sequential routes - A29 • Settlements - Local Farmsteads

634. This viewpoint looks south along the A29 close to where the line route crosses the road. The view is generally of a pleasant, undulating landscape with isolated trees in the background. Local farmsteads in the area utilise the rural setting and take advantage of available views of the local landscape.

635. The traffic on the busy road is a distraction and views from this location of the overhead line are transient and viewed predominately by the road user. The sensitivity therefore is considered to be **Medium** for this viewpoint location.

Predicted Visibility

636. Four overhead line towers would be visible from this location. Towers 10 and 11 would appear in views to the south, set back from the road on and behind rising ground. Towers 8 and 9 would appear in views to the north, set back from the road and behind intervening roadside vegetation, which in the summer months would screen these towers from view.

Assessment of Impact

Construction

637. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **Medium - High** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

638. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce to **Medium** resulting in **Moderate Adverse** impact for the overhead line and towers in Year 1 after commissioning.

Operational (Year 15)

639. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 7: Culkeeran Road

Existing View and Sensitivity of Receptors

Grid Reference:	E283081, N357492	It is representative of:
View Direction:	North - East	• Landscape Character Area - Loughgall Orchard Belt • Sequential routes - Culkeeran Road • Settlements - Local Farmsteads

640. This viewpoint looks north - east across open fields from higher ground on Culkeeran Road with the A29 in the middle ground. The view is generally of a pleasant, undulating landscape with isolated trees and hedgerows creating a distinctive field pattern in the landscape. Local farmsteads in the area utilise the rural setting and take advantage of available views of the local landscape. An existing overhead line sits on the horizon; it is a smaller type than that proposed with wooden poles.

641. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

642. Seven overhead line towers would be visible from this location. Tower 10 is located to the north west close to this viewpoint partially screened by mature roadside trees. Towers 8 and 9 would appear in views to the north in the middle distance with towers 6 and 7 appearing more distant behind intervening trees. Towers 11 and 12 would appear in views to the west. The overhead line and associated towers would be visible in the foreground and would be a new feature within the local landscape setting within the context of other existing overhead lines in the area.

Assessment of Impact

Construction

643. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **Medium - High** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

644. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce to **Medium** resulting in **Moderate Adverse** impact for the overhead line and towers in Year 1 after commissioning.

Operational (Year 15)

645. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 8: Gorestown Road

Existing View and Sensitivity of Receptors

Grid Reference:	E282255, N356460	It is representative of:
View Direction:	North - East	• Landscape Character Area - Loughgall Orchard Belt • Sequential routes - Gorestown Road • Settlements - Local Farmsteads

646. This viewpoint looks along Gorestown Road which, is in an enclosed landscape, with drumlins and overgrown hedges limiting views. Existing telecommunication line and wooden poles are medium scale vertical element within the existing view.

647. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

648. The proposed overhead line route would cross the wooded landscape in the middle distance. Tower 14 would sit on a drumlin slope to the north with the top of tower 13 appearing behind and tower 12 more distant as the line travels north. Towers 9, 10 and 11 are theoretically visible but would be obscured by intervening trees and hedgerows. To the south, towers 15 and 16 would appear behind drumlin topography, partially obscured by intervening vegetation. The overhead line and associated towers would be visible in the foreground and would be a relatively new feature within the local landscape setting within the context of other existing overhead lines in the area.

Assessment of Impact

Construction

649. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **Medium - High** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

650. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce to **Medium** resulting in **Moderate Adverse** impact for the overhead line and towers in Year 1 after commissioning.

Operational (Year 15)

651. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 9: Benburb Road

Existing View and Sensitivity of Receptors

Grid Reference:	E282942, N354337	It is representative of:
View Direction:	South	• Landscape Character Area - Loughgall Orchard Belt • Sequential routes - Benburb Road • Settlements - Local Farmsteads

652. This viewpoint looks south along Benburb Road which, is in an open landscape framed by drumlins with roadside hedges and mature trees scattered across the landscape following roadsides and field boundaries. Views north are obscured by drumlin topography. Existing telecommunication line and wooden poles are medium scale vertical element within the existing view.

653. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

654. The proposed overhead line route would cross Benburb Road near the viewpoint location with tower 22 located close to the road. Towers 23 – 30 appear to traverse the landscape travelling south behind tower 22 before the line disappears behind intervening drumlin topography and vegetation. Towers 23

– 30 are only slightly obscured by intervening vegetation and would be viewed as a relatively new feature within the local landscape setting within the context of other existing overhead lines in the area.

Assessment of Impact

Construction

655. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **High** resulting in impacts of **Moderate - Major Adverse** during construction.

Operational (Year 1)

656. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly but the magnitude of change would remain **High** resulting in impacts of **Moderate - Major Adverse** in Year 1 after commissioning.

Operational (Year 15)

657. In Year 15 the magnitude of change relating to the overhead line and towers would remain **High** resulting in **Moderate – Major Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 10: Benburb Road south of Ninewell Bridge

Existing View and Sensitivity of Receptors

Grid Reference:	E282764, N353974	It is representative of:
View Direction:	South - East	• Landscape Character Area - Loughgall Orchard Belt • Sequential routes - Benburb Road • Settlements - Local Farmsteads

658. This viewpoint is located on Benburb Road and the view is largely of open landscape framed by drumlins with scattered hedges and mature trees following roadsides and field boundaries. Existing telecommunication line and wooden poles are medium scale vertical elements within the existing view.

659. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

660. The proposed overhead line route would cross Benburb Road north of this viewpoint (see viewpoint 9). The visible towers span almost 180 degrees from this viewpoint location. Towers 22 – 25 are located in fields adjacent to Benburb Road in the middle distance of this view. Tower 26 is substantially screened by trees. Towers 27 – 29 appear to traverse the landscape travelling south before the line disappears behind intervening drumlin topography and vegetation.

661. Visible towers are slightly obscured by intervening vegetation and would be viewed as a relatively new feature within the local landscape setting within the context of other existing overhead lines in the area.

Assessment of Impact

Construction

662. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **High** resulting in impacts of **Moderate - Major Adverse** during construction.

Operational (Year 1)

663. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly but the magnitude of change would remain **High** resulting in impacts of **Moderate - Major Adverse** in Year 1 after commissioning.

Operational (Year 15)

664. In Year 15 the magnitude of change relating to the overhead line and towers would remain **High** resulting in **Moderate – Major Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 11: Clonfeacle Road (B128) crossing

Existing View and Sensitivity of Receptors

Grid Reference:	E282944, N352445	It is representative of:
View Direction:	South - East	• Landscape Character Area - Loughgall Orchard Belt • Sequential routes - B128 • Settlements - Local Farmsteads

665. This viewpoint looks along the B128 which travels across a relatively open landscape, with gentle drumlins permeating this generally rolling rural and agricultural scene. Views north are obscured by drumlin topography and vegetation associated with the B128 and nearby properties. A series of existing overhead lines are visible within the middle to distant view; it is a smaller type than that proposed with wooden poles. This along with existing telecommunication lines and poles combine to create a network of medium scale vertical elements within the existing view.

666. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

667. Tower 29 would be located north of the B128 close to the roadside hedgerow planting. The overhead line would cross the B128 in the mid-foreground and follows the contours of the gently rolling topography. To the south, tower 30 would appear to sit on the top of a small drumlin with only the top of tower 31 visible before the line route disappears behind intervening drumlin topography. The overhead line and associated towers would be viewed within the context of the existing poles and overhead lines in this scene.

Assessment of Impact

Construction

668. The construction activities for the overhead line would be viewed from this location and the magnitude of change is assessed as **Medium** resulting in impacts of **Moderate** during construction.

Operational (Year 1)

669. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce to **Low - Medium** resulting in impacts of **Minor - Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

670. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Low - Medium** resulting in **Minor - Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 12: Benburb Priory

Existing View and Sensitivity of Receptors

Grid Reference:	E281607, N352127	It is representative of:
View Direction:	East	• Landscape Character Area - Loughgall Orchard Belt • Settlements - Benburb, Local Farmsteads • Registered Historic Parks and Gardens - Benburb Valley Park

671. This viewpoint is located at the edge of the small settlement of Benburb within the Benburb Valley Park close to the Servite Priory. Benburb sits on a ridge and has elevated views to the east across the study

area. The view is from a designed landscape and has long views towards the distinctive drumlin countryside beyond the boundary edges of the Valley Park.

672. The sensitivity is considered to be **High** for this viewpoint location.

Predicted Visibility

673. The proposed overhead line route sits in the distance, across the drumlin countryside that forms the focus of the view. Receptors would view the proposal from an elevated position, tending to look down on the proposal with the landscape behind the immediate distinct drumlin slopes providing a backdrop to the view of the towers and overhead line.

674. Intervening vegetation of the valley park and also within the wider landscape obscures some towers from view and as a result 6 overhead line towers are visible from this viewpoint location. Visible towers are 33, 34, 36, 37, 38 and 39.

675. The visible overhead line and associated towers would be viewed as a new feature within the local landscape setting although the towers would not break the horizon or noticeably disrupt the scale of the existing landscape pattern.

Assessment of Impact

Construction

676. The construction activities for the overhead line would be viewed from this location and the magnitude of change is assessed as **Medium** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

677. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly but the magnitude of change would remain **Medium** resulting in impacts of **Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

678. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

679. For an assessment of the impact to the setting of the Benburb Priory refer to Chapter 12.

Viewpoint 13: Artasooly Road looking towards Blackwater River Crossing

Existing View and Sensitivity of Receptors

Grid Reference:	E283513, N350943	It is representative of:
View Direction:	North - West	• Landscape Character Area - Loughgall Orchard Belt • Settlements - Local Farmsteads

680. Views from this location are of the overhead line route as it crosses the river Blackwater. The local landscape is relatively flat in this area created by the river's floodplain. Landscape features include hedges and mature trees scattered across the landscape following roadsides and field boundaries.

681. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

682. The intervening woodland along the banks of the River Blackwater partially obscures the view of the river and across the floodplain. The overhead line and associated towers would be a new large scale feature within the local landscape setting, particularly tower 32 that sits above the horizon and the intervening trees. The proposed overhead line route would cross this landscape in the mid-distance breaking the horizon and the line sag would tend to appear contrary to the distant gentle roll of the drumlin backdrop. Towers 30 and 33 are partially screened by intervening topography to the north and to the south respectively and as a result only the tops of these towers are visible. Tower 31 is screened by trees from this location.

Assessment of Impact

Construction

683. The construction activities for the overhead line would be viewed from this location and the magnitude of change is assessed as **Medium** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

684. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce to **Low - Medium** resulting in impacts of **Minor - Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

685. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Low - Medium** resulting in **Minor - Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 14: Artasooly Road at Tullymore Bridge

Existing View and Sensitivity of Receptors

Grid Reference:	E283184, N350110	It is representative of:
View Direction:	North - East	• Landscape Character Area - Loughgall Orchard Belt • Sequential routes - Artasooly Road • Settlements - Local Farmsteads

686. This viewpoint looks along Artasooly Road which lies within gentle drumlins that frame medium distance views along drumlin valley landscape. Localised topography, roadside hedgerows and scattered mature trees throughout this landscape also contribute to shortened or framed views from various locations along this winding road. Existing overhead lines and wooden poles are small - medium scale vertical elements within the existing view.

687. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

688. The proposed overhead line route would follow Artasooly Road in the foreground landscape of views north from this location before disappearing over the horizon. Tower 35 would sit close to the road and the viewpoint location appearing as a large new feature within the local landscape setting.

689. North of tower 35, tower 34 is partially screened by roadside trees and towers 30 to 33 appear much smaller in the view and are screened by the roadside hedgerow allowing only filtered views. South of tower 35, towers 36 – 38 follows the drumlin valley before disappearing behind the horizon with tower 38 appearing in line with Artasooly Road before it bends to the west.

Assessment of Impact

Construction

690. The construction activities for the overhead line would be viewed from this location and the magnitude of change is assessed as **Medium** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

691. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly but the magnitude of change would remain **Medium** resulting in impacts of **Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

692. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 15: Artasooly Road and Maydown Road junction at Artasooly

Existing View and Sensitivity of Receptors

Grid Reference:	E282005, N349720	It is representative of:
View Direction:	East	• Landscape Character Area - Armagh Drumlins • Sequential routes - Maydown Road, Artasooly Road • Settlements - Artasooly, Local Farmsteads

693. This viewpoint is located at the edge of the small settlement of Artasooly. The settlement sits on a ridge line and has elevated views to the east across the study area. The view is of a landscape with well defined field patterns and panoramic views across the distinctive drumlin countryside. Hedges and mature trees are pronounced features across the landscape siting on drumlin summits and clearly defining roadsides and field boundaries. This vegetation knits together, giving the illusion of greater tree coverage to the overall view.

694. The sensitivity is considered to be **High** for this viewpoint location.

Predicted Visibility

695. The proposed overhead line route sits in the middle distance. Receptors are largely looking down on the proposal and the landscape behind the immediate and distinct drumlin slopes provide a backdrop to the view of the towers and overhead lines.

696. The proposed overhead line route sits in the middle distance, across the tree covered drumlin landscape that makes up the focus of the view. Receptors would view the proposal from an elevated position, tending to look down on the proposal with the landscape behind the immediate distinct drumlin slopes providing a backdrop to the view.

697. Intervening vegetation within the view obscures some towers from view and as a result 5 overhead line towers are visible from this viewpoint location. Visible towers are 33, 34, 35, 36 and 38. Towers 34 and 36 would be partially screened at the bases of each tower. Towers 33, 35 and 38 are almost entirely screened by intervening vegetation.

698. The visible overhead line and associated towers would be viewed as a new feature within the local landscape setting although the towers would not noticeably disrupt the scale of the existing landscape pattern and only 2 towers would break the horizon.

Assessment of Impact

Construction

699. The construction activities for the overhead line would be viewed from this location and the magnitude of change is assessed as **Low** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

700. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce to **Low - Negligible** resulting in impacts of **Minor - Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

701. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Low - Negligible** resulting in **Minor - Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 16: Battleford Road (B115) Crossing

Existing View and Sensitivity of Receptors

Grid Reference:	E282060, N347406	It is representative of:
View Direction:	South - East	• Landscape Character Area - Armagh Drumlins • Sequential routes - B115, Bracknagh Road • Settlements - Local Farmsteads

702. This viewpoint looks along the B115 which, is in a landscape with overgrown hedges, scattered mature trees and small mixed woodlands within a gentle drumlin landscape. The enclosure that the mature trees and woodland provides gives an intimacy to this particular area. Existing telecommunication line and wooden poles are medium scale vertical element following the road corridor within the existing view.

703. The sensitivity is considered to be **High** for this viewpoint location.

Predicted Visibility

704. Intervening vegetation and drumlins within the view obscure some towers from view and as a result 7 overhead line towers are visible from this viewpoint location.

705. To the east, the proposed overhead line route would cross the B115 in the foreground of this view and Tower 45 would be a large and visually intrusive element within this view.

706. To the south of tower 45, tower 46 would be partially visible above the intervening treeline with filtered views for the majority of the tower and tower 47 would be barely visible through the intervening vegetation.

707. To the north, tower 44 would be partially obscured by intervening roadside vegetation allowing only filtered views and towers 43 – 41 would be partially screened by drumlins and field boundary vegetation.

708. The overhead line and associated towers would be viewed as a new feature within the local landscape setting.

Assessment of Impact

Construction

709. The construction activities for the overhead line would be viewed from this location and the magnitude of change is assessed as **High** resulting in impacts of **Major Adverse** during construction.

Operational (Year 1)

710. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly but the magnitude of change would remain **High** resulting in impacts of **Major Adverse** in Year 1 after commissioning.

Operational (Year 15)

711. In Year 15 the magnitude of change relating to the overhead line and towers would remain **High** resulting in **Major Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 17: Killylea Road (A28) Crossing

Existing View and Sensitivity of Receptors

Grid Reference:	E282334, N344538	It is representative of:
View Direction:	South - West	• Landscape Character Area - Armagh Drumlins • Sequential routes - A28 • Settlements - Local Farmsteads

712. This viewpoint is located on a busy stretch of the A28, on a winding section of roadway which is enclosed by steep sided drumlins, hedgerows and roadside trees, all of which tend to limit views. Existing telecommunication line and wooden poles are a medium scale vertical element following the road corridor within the existing view.

713. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

714. The proposed overhead line route would cross the A28 in the foreground of this view. Views to the north are screened by roadside vegetation and therefore no towers are visible in this direction. To the south Tower 55 is situated close to this viewpoint location and would appear to sit on the horizon created by the nearby field which gently slopes upwards away from the road corridor. Towers 56 and 57 would be visible as the proposed line route travels south before disappearing over the drumlin horizon. The visible towers would be a new feature within the local landscape setting.

Assessment of Impact

Construction

715. The construction activities for the overhead line would be viewed from this location and the magnitude of change is assessed as **Medium** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

716. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce to **Low - Medium** resulting in impacts of **Minor - Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

717. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Low - Medium** resulting in **Minor - Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 18: Killylea Settlement [Fellows Grange Court]

Existing View and Sensitivity of Receptors

Grid Reference:	E279708, N344757	It is representative of:
View Direction:	East	• Recreational routes – Ulster Way • Landscape Character Area - Armagh Drumlins • Settlements - Killylea, Local Farmsteads

718. This viewpoint is located in the village of Killylea. The settlement sits on a ridge line and has elevated views to the east across the study area. The view represents long panoramic views across the distinctive drumlin countryside characterised by the Armagh Drumlins LCA. Hedges and mature trees are common features across this landscape and clearly define roadsides and field boundaries. The mid-foreground drumlins are distinctive in form, some having steep sides. The successive layers of distant drumlin undulations, when viewed in combination however, have a levelling effect and the distant horizon appears relatively flat as a result.

719. The sensitivity is considered to be **High** for this viewpoint location.

Predicted Visibility

720. The proposed overhead line route sits in the distance, across the drumlin countryside that forms the focus of the view. Receptors would view the proposal from an elevated position, tending to look down on the proposal with the landscape behind the immediate distinctive drumlin slopes providing a backdrop to the view of the towers and overhead line.

721. Intervening garden vegetation associated with nearby properties frames the view. Drumlin slopes and vegetation found within the wider landscape also obscures some towers from view. As a result 10 overhead line towers are visible from this viewpoint location. Visible towers are 49, 50, 51, 52, 53, 54, 55, 56, 57 and 59.

722. Tower 51 breaks the horizon and as a result would appear more noticeable than the other visible towers. Towers 50, 52 and 59 would be almost entirely screened by intervening vegetation and would be barely perceptible as a result. Only the top halves of the remaining visible towers would be viewed due to the intervening drumlin landscape.

723. The visible overhead line and associated towers would be viewed as a new feature within the local landscape setting although the majority of the towers would not break the horizon or noticeably disrupt the scale of the existing landscape pattern.

Assessment of Impact

Construction

724. The construction activities for the overhead line would be viewed from this location and the magnitude of change is assessed as **Low - Medium** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

725. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly but the magnitude of change would remain **Low - Medium** resulting in impacts of **Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

726. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Low - Medium** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 19: Navan Fort

Existing View and Sensitivity of Receptors

Grid Reference:	E284706, N345110	It is representative of:
View Direction:	South - West	• Landscape Character Area - Armagh Drumlins • Settlements - Local Farmsteads, Armagh City Former Green Belt • Navan Area of Special Archaeological Interest

727. This viewpoint is located at Navan Fort which is the feature landmark within the Navan Area of Special Archaeological Interest. The view represents long panoramic views across open landscape with gently rolling countryside. The landscape in this view is heavily wooded with mainly deciduous, well managed, small blocks. Hedges and mature trees are common features following roadsides and field boundaries connecting the areas of woodland.

728. The sensitivity is considered to be **High** for this viewpoint location.

Predicted Visibility

729. The proposed overhead line route would be viewed as a distant feature, across the drumlin countryside that forms the focus of the view. Because this viewpoint is elevated a large numbers of proposed overhead line towers are potentially visible, although at over 2km from the overhead line route, visible towers would be barely perceptible from this location.

730. Mature trees that surround Navan Fort provide screening in the direction of the proposals. The fabric of drumlin summits and heavily wooded intervening landscape also obscures some towers from view. With varying degrees of screening 28 towers would be visible from this viewpoint location.

731. Views of the visible overhead line route span from directly west towards proposed tower 50 to the south – west and tower 98. To the west, tower 51 would be visible in the distance appearing to sit on the treeline that creates the horizon and towers 50, 52, 53 and 55 would be almost entirely screened behind intervening trees. Towers 57, 58 and 59 would be appear to be nestled behind intervening woodland and only the very tops of these towers would actually be visible.

732. Further to the south, a group of 6 overhead line towers (towers 62 – 67) would appear amongst existing woodland, although these towers are particularly difficult to discern as they would be smaller elements within the overall view and would be nestled behind intervening woodland with only the tops actually visible. Tower 77 sits in the distance, behind localised drumlin topography and within the context of a group of properties and farmsteads.

733. In southernmost views of visible proposed overhead line route, a group of 13 towers (towers 86 – 98 and tower 81) is clustered together appearing as tiny additions breaking the distant horizon of rolling drumlins.

734. The proposed overhead line route sits on or close to the distant horizon. The overhead line and associated towers would be a new feature within the landscape but from this distance are barely perceptible.

Assessment of Impact

Construction

735. The construction activities for the overhead line would be viewed from this location and the magnitude of change is assessed as **Negligible** resulting in impacts of **Minor Adverse** during construction.

Operational (Year 1)

736. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly but the magnitude of change would remain **Negligible** resulting in impacts of **Minor Adverse** in Year 1 after commissioning.

Operational (Year 15)

737. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Negligible** resulting in **Minor Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

738. For an assessment of the impact to the setting of Navan Fort refer to Chapter 12.

Viewpoint 20: Monaghan Road (A3) east of Norton's Cross Roads

Existing View and Sensitivity of Receptors

Grid Reference:	E280608, N339223	It is representative of:
View Direction:	North - West	• Landscape Character Area - Armagh Drumlins • Sequential routes - A3, Norton's Cross Roads • Settlements - Local Farmsteads

739. This viewpoint looks along the A3 which is an open landscape, slightly elevated with panoramic views across the gently rolling countryside. Hedges and mature trees are common features scattered across the landscape following roadsides and field boundaries. The combination of several distant undulations of drumlin landscape has a levelling effect and the horizon appears relatively flat as a result.

740. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

741. In views to the south – west, the proposed overhead line route would cross the path of the A3 between Towers 73 and 72 in the mid-distance. Tower 71 sits close to the horizon and in this view appears to sit directly behind and above a recently built property. Towers 70 – 67 are partially screened behind intervening vegetation and drumlin topography as the proposed line route travels north before disappearing over the drumlin horizon. The overhead lines would appear to sit on the horizon from this viewpoint location and the line sag would be opposite to the gentle roll of the drumlin landscape. The visible towers would be a new feature within the local landscape setting.

Assessment of Impact

Construction

742. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **High** resulting in impacts of **Moderate - Major Adverse** during construction.

Operational (Year 1)

743. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce to **Medium - High** resulting in impacts of **Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

744. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium - High** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 21: Monaghan Road (A3) crossing

Existing View and Sensitivity of Receptors

Grid Reference:	E280327, N339116	It is representative of:
View Direction:	South - West	• Landscape Character Area - Armagh Drumlins • Sequential routes - A3, Norton's Cross Roads • Settlements - Local Farmsteads

745. This viewpoint looks along the A3 and the view is largely concentrated on the road corridor due to the tall roadside hedging that runs along this section. There are scattered mature trees and scrubland strips following the field boundaries. The enclosure that the mature trees and hedgerows provide gives an intimacy to this particular area.

746. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

747. In views to the south – west, the proposed overhead line route would cross the path of the A3 between Towers 73 and 72 in the foreground. Tower 73 sits in the foreground behind the hedgerow that runs along this section of the A3. The same hedgerow obscures towers 74, 75 and 76 from view at this location. In views west, tower 72 would sit in the mid distance at the bottom of a gentle drumlin slope and most of the tower would appear above the horizon. Tower 71 would be substantially screened by intervening vegetation from this location. Towers 70 - 66 are also screened behind intervening vegetation and drumlin topography as the proposed line route travels north before disappearing over the drumlin horizon. The visible towers would be a new feature within the local landscape setting.

Assessment of Impact

Construction

748. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **High** resulting in impacts of **Moderate - Major Adverse** during construction.

Operational (Year 1)

749. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce to **Medium - High** resulting in impacts of **Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

750. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium - High** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 22: Maddan Road south of Norton's Cross Roads

Existing View and Sensitivity of Receptors

Grid Reference:	E280199, N338710	It is representative of:
View Direction:	North	• Landscape Character Area - Armagh Drumlins • Sequential routes - Maddan Road, Norton's Cross Roads • Settlements - Local Farmsteads

751. This viewpoint looks north along Maddan Road and while the view is largely concentrated on the road corridor, there are views across fields which are more elevated. There are scattered mature trees, bushy hedgerows, cut hedgerows and woodland strips following the field boundaries which enclose views. The enclosure that the trees and hedgerows provide extends towards the horizon and follows the contours of the landscape. Existing telecommunication line and wooden poles are medium scale vertical element following the road corridor within the existing view.

752. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

753. In views to the south – west, tower 74 would be located close to Maddan Road with the overhead line almost following the alignment of the road as it crosses. In views to the north, tower 73 would sit in a nearby field on the lower part of a drumlin slope. Almost all of tower 73 would appear above the horizon. Tower 72 would be partially screened behind intervening drumlin topography so only the top section of that tower would be visible. The closest towers (towers 73 & 74) would be large and visually intrusive elements within the view and the visible towers would be a new feature within the local landscape setting.

Assessment of Impact

Construction

754. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **Medium - High** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

755. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce to **Medium** resulting in impacts of **Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

756. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 23: Cavanagarvan Road and Sheetrim Road Junction

Existing View and Sensitivity of Receptors

Grid Reference:	E279804, N336739	It is representative of:
View Direction:	North - East	• Landscape Character Area - Armagh Drumlins • Sequential routes - Sheetrim Road, Cavanagarvan Road • Settlements - Local Farmsteads

757. This viewpoint is located at the crossroads of Sheetrim Road and Cavanagarvan Road, looking along Cavanagarvan Road. This is in an enclosed landscape with drumlins and overgrown hedges limiting views. The enclosure provided by these landscape elements gives an intimacy to this area. Existing telecommunication line and wooden poles are medium scale vertical element within the existing view.

758. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

759. In views to the north, the line crosses Cavanagarvan Road in the mid distance with towers 78 and 79 partially obscured by intervening roadside vegetation. In views to the east towers 80 and 81 would be

visible above the horizon of intervening trees and vegetation. Tower 80 is the closest tower to this viewpoint location appearing as a medium – large structure with the majority visible above the horizon. Towers 82, 83, 84, 86 and 87 are partially screened behind intervening vegetation, drumlin topography, nearby properties as the proposed line route travels south before disappearing over the drumlin horizon. The visible towers would be a new feature within the local landscape setting.

Assessment of Impact

Construction

760. The construction activities for the overhead line would be viewed from this location and the magnitude of change is assessed as **Medium** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

761. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly but the magnitude of change would remain **Low - Medium** resulting in impacts of **Minor - Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

762. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Low - Medium** resulting in **Minor - Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 24: Drumhillery Road crossing

Existing View and Sensitivity of Receptor

Grid Reference:	E279916, N335173	It is representative of:
View Direction:	North	• Landscape Character Area - Armagh Drumlins • Sequential routes - Drumhillery Road • Settlements - Local Farmsteads

763. This viewpoint looks north along Drumhillery Road which, is predominantly made up of rolling drumlin landscape with hedges and mature trees scattered across the landscape following roadsides and field boundaries. The gentle drumlin landscape frames this generally rolling rural and agricultural scene.

764. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

765. In views to the south – west, tower 86 would be located within the field that lies south of Drumhillery Road at this location. The tower would appear elevated as it appears just behind the drumlin summit, as it is viewed from this location. In views to the north, towers 85, 84 and 83 would be partially screened behind intervening trees and field boundary vegetation so only the top section of towers 85 and 84 would be visible and views of tower 83 would be filtered. As the overhead travels north (to the left of tower 84 from this location) towers 79 – 81 would be almost entirely screened by intervening vegetation. The visible towers would be a new feature within the local landscape setting.

Assessment of Impact

Construction

766. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **Medium - High** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

767. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce to **Medium** resulting in impacts of **Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

768. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 25: Lagan Road west of Keady

Existing View and Sensitivity of Receptors

Grid Reference: E282515, N333286
View Direction: West

It is representative of:
- Landscape Character Area - Armagh Drumlins
- Sequential routes - Lagan Road
- Settlements - Local Farmsteads

769. This viewpoint is located on Lagan Road, a minor elevated road, along a ridgeline. The view is of an open landscape with long panoramic views across the distinctive drumlin countryside. Hedges and mature trees are common features scattered across the landscape following roadsides and field boundaries. The combination of several distant undulations of drumlin landscape has a levelling effect and the horizon appears relatively flat as a result.

770. The sensitivity is considered to be **High** for this viewpoint location.

Predicted Visibility

771. The proposed overhead line route sits in the distance, across the drumlin countryside that forms the focus of the view. Visible towers from this location are 86 – 99. Towers 93 - 99 would break the horizon across this long panoramic view. The distant drumlin landscape that sits behind the line route provides a backdrop to the view and for the majority of towers lessens the amount of tower that appears above the horizon. The visible overhead line and associated towers would be viewed from an elevated position and as a new feature within the local landscape setting.

Assessment of Impact

Construction

772. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **Low** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

773. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce to **Low - Negligible** resulting in impacts of **Minor - Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

774. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Low - Negligible** resulting in **Minor - Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 26: Fergort Road(B3) crossing

Existing View and Sensitivity of Receptors

Grid Reference: E278855, N332466
View Direction: South - East

It is representative of:
- Landscape Character Area - Armagh Drumlins
- Sequential routes - B3, Fergort Road, Listrakelt Road
- Settlements - Local Farmsteads

775. This viewpoint looks along the B3 and the view is largely concentrated on the road corridor due to the tall roadside hedging that runs along this section. There are scattered mature trees and scrubland strips framing the available views. Existing overhead line and wooden poles are medium scale vertical element within the existing view.

776. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

777. In views to the north - east, tower 94 would be viewed as a prominent new feature that would appear to sit at the top of the nearby drumlin. Tower 93 appears in the distance of this view, as the proposed line route travels north before disappearing over the drumlin horizon. In views to the south – east, tower 95 is visible in the mid-distance behind a local farmstead and within the context of an existing telegraph pole and line. The visible towers sit on or near the horizon and would be a new feature within the local landscape setting.

Assessment of Impact

Construction

778. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **Medium - High** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

779. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly but the magnitude of change would remain **Medium - High** resulting in impacts of **Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

780. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium - High** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 27: East of Derrynoose Road

Existing View and Sensitivity of Receptors

Grid Reference:	E280505, N332042	It is representative of:
View Direction:	South - West	• Landscape Character Area - Armagh Drumlins • Sequential routes - Derrynoose Road • Settlements - Derrynoose, Local Farmsteads

781. This viewpoint looks along Derrynoose Road towards Derrynoose which sits in the mid-foreground of this elevated view. Hedges and mature trees are common features scattered across the landscape following roadsides and field boundaries. The settlement of Derrynoose sits within a relatively open landscape, with gentle drumlins permeating this generally rolling rural and agricultural scene.

782. The sensitivity is considered to be **High** for this viewpoint location.

Predicted Visibility

783. Views of the visible overhead line route span across this panorama, from south - west towards proposed tower 98 to the west and tower 93. Towers 94 – 98 sit on or near the horizon, in the distance, behind Derrynoose. The towers would be a new feature within the local landscape setting, other than the individual towers however, the overhead line would be barely visible and the line sag would appear to follow the undulations of the horizon from this viewpoint.

Assessment of Impact

Construction

784. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **High** resulting in impacts of **Major Adverse** during construction.

Operational (Year 1)

785. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce to **Medium - High** resulting in impacts of **Moderate - Major Adverse** in Year 1 after commissioning.

Operational (Year 15)

786. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium - High** resulting in **Moderate – Major Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 28: Derrynoose Road at Curragh Lane looking north

Existing View and Sensitivity of Receptors

Grid Reference:	E278931, N330878	It is representative of:
View Direction:	North	• Landscape Character Area - Armagh Drumlins • Sequential routes - Derrynoose Road • Settlements - Local Farmsteads

787. This viewpoint looks along the Derrynoose Road which travels across a relatively open landscape, with gentle drumlins framing this generally rural and agricultural scene. A series of existing smaller overhead lines are visible within the middle to distant view with wooden poles. These are medium scale vertical elements within the existing view.

788. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

789. The proposed overhead line route sits alongside this section of Derrynoose Road before gradually moving away from the road in a northerly direction. Tower 98 would sit close to the horizon within a field that lies adjacent to the road. This tower would be viewed as a large element within the view due to its close proximity. Tower 97 would be visible as a smaller element within the context of tower 98 although the bottom of the tower would be screened by localised topography. Only the very top of tower 96 would be visible and it would appear directly behind tower 97. The overhead line and associated towers would be a new feature within the local landscape although they would be viewed within the context of the existing poles and overhead lines in this scene.

Assessment of Impact

Construction

790. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **Medium - High** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

791. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly but the magnitude of change would remain **Medium - High** resulting in impacts of **Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

792. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium - High** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 29: Derrynoose Road at Curragh Lane looking south

Existing View and Sensitivity of Receptors

Grid Reference:	E278930, N330882	It is representative of:
View Direction:	South	• Landscape Character Area - Armagh Drumlins • Sequential routes - Derrynoose Road • Settlements - Local Farmsteads

793. This viewpoint looks along the Derrynoose Road which travels across a relatively open landscape, with gentle drumlins framing the generally rural and agricultural scene. This viewpoint differs from the northern view represented by Viewpoint 28, by its increased sense of openness as the topography becomes less pronounced towards the border with the Republic of Ireland.

794. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

795. The proposed overhead line route would cross this section of Derrynoose Road before disappearing over the horizon to the south. Tower 99 would sit just beyond the bend in the road and close to the horizon, appearing to sit directly on the road alignment from this viewpoint. This tower would be viewed as a large element within the view due to its close proximity. The top section of tower 100 would be visible just beyond the horizon which would obscure the remainder of the tower. The overhead line and associated towers would be a new feature within the local landscape setting. Distant towers 101 and 102 are obscured by intervening trees and mature hedgerows.

Assessment of Impact

Construction

796. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **Medium - High** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

797. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly but the magnitude of change would remain **Medium - High** resulting in impacts of **Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

798. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium - High** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 30: View from Crossbane Road

Existing View and Sensitivity of Receptors

Grid Reference:	E279900, N328959	It is representative of:
View Direction:	South - West	• Landscape Character Area - Armagh Drumlins, Mullyash Uplands • Sequential routes - Crossbane Road • Settlements - Local Farmsteads

799. This viewpoint is located on Crossbane Road which, is in a slightly elevated position looking across a drumlin valley landscape. The landscape is enclosed by the drumlins with hedges and mature trees scattered across the landscape following roadsides and field boundaries. This is a quiet and relatively open landscape, with gentle drumlins framing the generally rural and agricultural scene. This view lies within the Armagh Drumlins LCA but is focussed on the Mullyash Uplands LCA which lies across the border within the Republic of Ireland.

800. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

801. The proposed overhead line route would lie in the distance, to the north – west of this viewpoint location. In the direction of the proposed overhead line route, the landscape is predominantly screened by the mid-distant field boundary trees and vegetation. Towers 98, 99 and 100 are almost entirely screened by mid-distant vegetation that intervenes. Towers 101 and 102 are partially screened however much of these towers would still be visible as distant elements in winter months. The overhead line and associated towers would be a new feature within the local landscape setting however the proposals only occupy a small percentage of the view and much of the proposal is screened or partially screened by field boundary trees and vegetation that intervene.

Assessment of Impact

Construction

802. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **Low - Negligible** resulting in impacts of **Negligible – Minor Adverse** during construction.

Operational (Year 1)

803. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly but the magnitude of change would remain **Low - Negligible** resulting in impacts of **Negligible – Minor Adverse** in Year 1 after commissioning.

Operational (Year 15)

804. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Low - Negligible** resulting in **Negligible – Minor Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

Viewpoint 31: Crossaghy Road

Existing View and Sensitivity of Receptors

Grid Reference:	E277469, N329010	It is representative of:
View Direction:	North - East	• Landscape Character Area - Mullyash Uplands, Armagh Drumlins • Sequential routes - Crossaghy Road • Settlements - Local Farmsteads

805. This viewpoint is located on Crossaghy Road which, is in a slightly elevated position looking north across the drumlin landscape.

806. The landscape is relatively open and has excellent views of the drumlin landscape distinctive to this area. Landscape features include hedges and mature trees scattered across the landscape following roadsides and field boundaries. This viewpoint lies within the Mullyash Uplands LCA in the Republic of Ireland. The view looks towards the North - South border and the Armagh Drumlins LCA which lies within Northern Ireland.

807. The sensitivity is considered to be **Medium** for this viewpoint location.

Predicted Visibility

808. Towers 90, 91 and 92 would be located behind the drumlin horizon and only the very tops of these towers would be visible. Towers 93 – 98 would be located on or near the drumlin horizon, appearing to increase in size respectively. As the proposed overhead line route travels south, and closer to this location, tower 99 would break the horizon with half of the tower visible above the horizon. Towers 100 and 101 would not break the horizon and would be partially obscured by intervening vegetation and behind localised drumlin topography. The overhead line would follow the gentle roll of the drumlin landscape although many of the visible towers would break the horizon and would appear as a new feature within the local landscape setting.

Assessment of Impact

Construction

809. The construction activities for the overhead line would be clearly viewed from this location and the magnitude of change is assessed as **Medium - High** resulting in impacts of **Moderate Adverse** during construction.

Operational (Year 1)

810. Once construction activities cease the magnitude of change relating to the overhead line and towers would reduce slightly but the magnitude of change would remain **Medium - High** resulting in impacts of **Moderate Adverse** in Year 1 after commissioning.

Operational (Year 15)

811. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Medium - High** resulting in **Moderate Adverse** impact for the overhead line and towers in summer 15 years after commissioning.

812. This viewpoint lies within the Republic of Ireland and is orientated towards the North - South border and the Armagh Drumlins LCA which lies within Northern Ireland. The impacts assessed from this viewpoint location are therefore considered to be transboundary impacts. See Chapter 20 'Transboundary Impacts' of this ES.

Viewpoint 32: Minor road north-east of Castleshane

Existing View and Sensitivity of Receptors

Grid Reference:	E273697, N333141	It is representative of:
View Direction:	East	• Landscape Character Area - Blackwater Valley and Drumlin Farmland • Sequential routes - Minor road north-east of Castleshane

Selection of Viewpoint

813. Viewpoint SV 10: View from Castleshane Brae (Route N2) was selected as being representative of a scenic view designated in the Monaghan County Development Plan. The mature woodlands that follow the section of road where SV10 is located, seriously limit distant views and so the alternative view from the minor road north-east of Castleshane was selected to represent a clearer view and therefore the worst case view from this area.

Description of viewpoint.

814. Panoramic view of a 180degree angle from eastern edge of settlement towards the proposed overhead line at a distance of 5.3km to the nearest tower in Northern Ireland. The landscape is medium in scale with a strong field pattern defined by hedgerows and small woodland clumps. Views from this location towards the proposed overhead line route are viewed predominately by users of a minor road at an oblique transient view. The sensitivity therefore is considered to be **Low** for this viewpoint location.

Predicted Visibility

815. From this location only three proposed towers are potentially visible, towers 96, 97, & 98. In reality, potentially visible towers 97 & 98 are completely screened behind the intervening trees that sit along the horizon. Tower 96 is substantially screened behind the same vegetation resulting in an extremely filtered view of a very small element within this panorama.

Assessment of Impact

Construction

816. The construction activities for the overhead line would be barely discernible when viewed from this location and the magnitude of change is assessed as **Negligible** resulting in impacts of **Negligible** during construction.

Operational (Year 1)

817. Once construction activities cease the overhead line and towers would be extremely difficult to perceive due to substantial screening. The magnitude of change is therefore assessed as **Negligible** resulting in impacts of **Negligible** in Year 1 after commissioning.

Operational (Year 15)

818. In Year 15 the magnitude of change relating to the overhead line and towers would remain **Negligible** resulting in **Negligible** impact for the overhead line and towers in summer 15 years after commissioning.

819. This viewpoint lies within the Republic of Ireland and is orientated towards the North - South border and the Armagh Drumlins LCA which lies within Northern Ireland. The impacts assessed from this viewpoint

location are therefore considered to be transboundary impacts. See Chapter 20 'Transboundary Impacts' of this ES.

Viewpoint 33: Scenic view from Tullybuck (Clontibret)

Existing View and Sensitivity of Receptors

Grid Reference:	E275064, N330403	It is representative of:
View Direction:	East	• Landscape Character Area - Blackwater Valley and Drumlin Farmland • Settlements- Clontibret, Tullybuck and scattered farm properties

Selection of Viewpoint

820. Scenic viewpoint SV 11: View northwards at Tullybuck (Route N2). Whilst the ZTV shows theoretical visibility in this location, in practice the scenic view north lies in a deep road cutting along the N2, which restricts any views of the proposed overhead line. An alternative view from the settlement edge was selected to represent a possible worst case view from this area.

Description of viewpoint

821. This viewpoint presents a framed view of a 90degree angle from the eastern edges of Tullybuck (Clontibret) towards the proposed overhead line and towers at a distance of 3.7km to the nearest proposed tower in Northern Ireland. The landscape is rural with scattered settlement comprising farmsteads and outbuildings which punctuate the otherwise attractive medium scale landscape. Hedgerows and trees clearly define the horizon. The existing wirescape comprises timber poles supporting overhead lines as well as telegraph poles serving local settlements. Development features strongly in the landscape which has a relatively shallow vertical landscape pattern in this view. The amount of clutter in the landscape results in a less intact landscape pattern than other drumlin landscapes typical of the area.

822. Views from this location of the proposed overhead line route are viewed predominantly by residential receptors and the sensitivity therefore is considered to be **High** for this viewpoint location.

Predicted Visibility

823. No towers are visible from this location.

Assessment of Impact

824. The magnitude of change is considered to be **No Change** for this viewpoint during construction, Year 1 and Year 15. As a result, **No Impact** has been assessed for construction, Year 1 and Year 15.

825. This viewpoint lies within the Republic of Ireland and is orientated towards the North - South border and the Armagh Drumlins LCA which lies within Northern Ireland. The impacts assessed from this viewpoint location are therefore considered to be transboundary impacts. See Chapter 20 'Transboundary Impacts' of this ES.

Viewpoint 34: Mullyash Mountain

Existing View and Sensitivity of Receptors

Grid Reference:	E286455, N326008	It is representative of:
View Direction:	North - West	• Landscape Character Area - Mullyash Uplands • Sequential routes - SV 12 - SV14 Scenic drive and views of open countryside from Mullyash • Settlements- Comaghy and scattered properties

Selection of Viewpoint

826. SV 12 - SV14: Scenic drive and views of open countryside from Mullyash

<u>Description of viewpoint</u>

827. This viewpoint features a panoramic view of a 120 degree angle due west from the minor road at Comaghy, representing views of open countryside from Mullyash and scattered properties that lie along this minor road. This viewpoint lies 8.4km to the nearest Northern Ireland tower with elevated views across the pronounced drumlin landscape of medium scale field pattern defined by hedgerows and patches of deciduous woodland. Drumlins in foreground of view have larger scale field pattern and are more upland in character than the valley drumlins in the distant view. Views from this location towards the proposed overhead line route are viewed directly by residential receptors and road users at an oblique transient view although the focus of the view from this viewpoint and immediately surrounding area is south and west. The sensitivity therefore is considered to be **High** for this viewpoint location.

<u>Predicted Visibility</u>

828. Although the ZTV suggests that the proposed overhead line would be visible from this location, in practice it would be barely perceptible at a distance of 8.4km to the nearest tower in Northern Ireland.

829. The focus of the view is south-west and the NIE towers would only appear within a small amount of this view further to the north and in the distance. Trees, hedgerows and built elements within the intervening landscape, and on ridgelines, would obscure distant views of the proposed towers.

<u>Assessment of Impact</u>

830. The magnitude of change is considered to be **Negligible** for this viewpoint during construction, Year 1 and Year 15. As a result, the visual impacts would be **Minor Adverse** for construction, Year 1 and Year 15.

831. This viewpoint lies within the Republic of Ireland and is orientated towards the North - South border and the Armagh Drumlins LCA which lies within Northern Ireland. The impacts assessed from this viewpoint location are therefore considered to be transboundary impacts. See Chapter 20 ‘Transboundary Impacts’ of this ES.

13.6.2.5 Summary of Residual Visual Impacts

832. This section provides an assessment of the overall likely impact that the development would have on the visual resource during construction and once operational. The assumption is that the impacts are adverse unless otherwise stated.

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Table 13.9: Summary of Visual Impacts

Receptor Type	Sensitivity	CONSTRUCTION		OPERATION (Year 1)		OPERATION (Year 15)		Significance
		Magnitude of Change	Impact	Magnitude of Change	Impact	Magnitude of Change	Impact	
Settlements								
Armagh City	Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
Dungannon	Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
Moy	High	Low-Medium	Moderate	Low-Medium	Moderate	Low-Medium	Moderate	Significant
Blackwatertown	High	Low-Medium	Moderate	Low-Medium	Moderate	Low-Medium	Moderate	Significant
Benburb	High	Medium-High	Moderate – Major	Medium	Moderate	Medium	Moderate	Significant
Killylea	High	Low-Medium	Moderate	Low-Medium	Moderate	Low-Medium	Moderate	Significant
Milford	Medium	Low-Medium	Minor - Moderate	Low-Medium	Minor - Moderate	Low-Medium	Minor - Moderate	Not Significant
Middletown	Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
Keady	Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
Derrynoose	High	High	Major	Medium-High	Moderate - Major	Medium-High	Moderate - Major	Significant
Individual Properties								
Impacts are summarised in Section 13.6.2.2 of this chapter. A more detailed summary of visual impacts from individual properties is presented in Appendix 13A for each property.								

Receptor Type	Sensitivity	CONSTRUCTION		OPERATION (Year 1)		OPERATION (Year 15)		Significance
		Magnitude of Change	Impact	Magnitude of Change	Impact	Magnitude of Change	Impact	
Transport Corridors and Paths								
M1	Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
N2	Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
A28	Low	Low	Negligible	Low	Negligible	Low	Negligible	Not Significant
A3	Low	Medium	Minor	Medium	Minor	Medium	Minor	Not Significant
A29	Low	Low	Negligible	Low	Negligible	Low	Negligible	Not Significant
A45	Low	No Change	No Impact	No Change	No Impact	No Change	No Impact	Not Significant
B115	Medium	Low-Medium	Minor - Moderate	Low-Medium	Minor – Moderate	Low-Medium	Minor – Moderate	Not Significant
B106	Medium	Medium	Moderate Adverse	Medium	Medium	Moderate Adverse	Minor -Moderate	Not Significant
B3/R214	Medium	Low-Medium	Minor - Moderate	Low-Medium	Minor - Moderate	Low-Medium	Minor - Moderate	Not Significant
B34	Medium	No Change	No Impact	No Change	No Impact	No Change	No Impact	Not Significant
B517	Medium	No Change	No Impact	No Change	No Impact	No Change	No Impact	Not Significant
B45	Medium	No Change	No Impact	No Change	No Impact	No Change	No Impact	Not Significant
B128	Medium	Low	Minor Adverse	Low	Minor Adverse	Low	Minor Adverse	Not Significant

Receptor Type		Sensitivity	CONSTRUCTION		OPERATION (Year 1)		OPERATION (Year 15)		Significance
			Magnitude of Change	Impact	Magnitude of Change	Impact	Magnitude of Change	Impact	
B28		Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
B130		Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
B210		Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
B361		Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
B32/R181		Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
R184		Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
National The Ulster Way/Cycle Route 91		Medium	Low-Medium	Minor - Moderate	Low-Medium	Minor - Moderate	Low-Medium	Minor - Moderate	Not Significant
National Cycle Route 95		Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
Regional Cycle Route 11		Low	Medium-Low	Negligible - Minor	Low	Negligible	Low-Negligible	Negligible	Not Significant
River Blackwater Canoe Trail		Medium	Medium	Moderate	Medium-Low	Minor - Moderate	Low	Minor	Not Significant
The Monaghan Way		Medium	Medium-Low	Minor - Moderate	Medium-Low	Minor - Moderate	Medium-Low	Minor - Moderate	Not Significant
The Beetlers Trail		Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
Viewpoints									
01	Clonteevy Bridge over River Rhone on Trewmount Road (B106)	Medium	High	Moderate - Major	High	Moderate - Major	High	Moderate - Major	Significant

Receptor Type		Sensitivity	CONSTRUCTION		OPERATION (Year 1)		OPERATION (Year 15)		Significance
			Magnitude of Change	Impact	Magnitude of Change	Impact	Magnitude of Change	Impact	
02	Derrygally Way to east of Turleenan Substation	Medium	High	Moderate - Major	High	Moderate - Major	High	Moderate - Major	Significant
03	Derrygally Way to south of Turleenan Substation	Medium	High	Moderate - Major	High	Moderate - Major	High	Moderate - Major	Significant
04	Trewmount Road (B106) near site access road.	Medium	High	Moderate - Major	Medium - High	Moderate	Medium - High	Moderate	Significant
05	Bonds Bridge over River Blackwater near the Argory	Medium	Low – Medium	Minor - Moderate	Low - Medium	Minor - Moderate	Low - Medium	Minor - Moderate	Not Significant
06	Moy Road (A29) crossing	Medium	Medium - High	Moderate	Medium	Moderate	Medium	Moderate	Significant
07	Culkeeran Road	Medium	Medium - High	Moderate	Medium	Moderate	Medium	Moderate	Significant
08	Gorestown Road	Medium	Medium - High	Moderate	Medium	Moderate	Medium	Moderate	Significant
09	Benburb Road	Medium	High	Moderate - Major	High	Moderate - Major	High	Moderate - Major	Significant
10	Benburb Road south of Ninewell Bridge	Medium	High	Moderate - Major	High	Moderate - Major	High	Moderate - Major	Significant
11	Clonfeacle Road (B128) crossing	Medium	Medium	Moderate	Low - Medium	Minor - Moderate	Low - Medium	Minor - Moderate	Not Significant
12	Benburb Priory	High	Medium	Moderate	Medium	Moderate	Medium	Moderate	Significant
13	Artasooly Road looking towards Blackwater River Crossing	Medium	Medium	Moderate	Low - Medium	Minor - Moderate	Low - Medium	Minor - Moderate	Not Significant
14	Artasooly Road at Tullymore Bridge	Medium	Medium	Moderate	Medium	Moderate	Medium	Moderate	Significant

Receptor Type		Sensitivity	CONSTRUCTION		OPERATION (Year 1)		OPERATION (Year 15)		Significance
			Magnitude of Change	Impact	Magnitude of Change	Impact	Magnitude of Change	Impact	
15	Artasooly Road and Maydown Road junction at Artasooly	High	Low	Moderate	Low - Negligible	Minor - Moderate	Low - Negligible	Minor - Moderate	Not Significant
16	Battleford Road (B115) crossing	High	High	Major	High	Major	High	Major	Significant
17	Killylea Road (A28) crossing	Medium	Medium	Moderate	Low - Medium	Minor - Moderate	Low - Medium	Minor - Moderate	Not Significant
18	Killylea settlement (Fellows Grange Court)	High	Low - Medium	Moderate	Low - Medium	Moderate	Low - Medium	Moderate	Significant
19	Navan Fort	High	Negligible	Minor	Negligible	Minor	Negligible	Minor	Not Significant
20	Monaghan Road (A3) east of Norton's Cross Roads	Medium	High	Moderate - Major	Medium - High	Moderate	Medium - High	Moderate	Significant
21	Monaghan Road (A3) crossing	Medium	High	Moderate - Major	Medium - High	Moderate	Medium - High	Moderate	Significant
22	Maddan Road south of Norton's Cross Roads	Medium	Medium - High	Moderate	Medium	Moderate	Medium	Moderate	Significant
23	Cavanagarvan Road and Sheetrim Road Junction	Medium	Medium	Moderate	Low - Medium	Minor - Moderate	Low - Medium	Minor - Moderate	Not Significant
24	Drumhillery Road crossing	Medium	Medium - High	Moderate	Medium	Moderate	Medium	Moderate	Significant
25	Lagan Road west of Keady	High	Low	Moderate	Low - Negligible	Minor - Moderate	Low - Negligible	Minor - Moderate	Not Significant
26	Fergort (B3) Road crossing	Medium	Medium - High	Moderate	Medium - High	Moderate	Medium - High	Moderate	Significant
27	East of Derrynoose	High	High	Major	Medium - High	Moderate - Major	Medium - High	Moderate - Major	Significant

Receptor Type		Sensitivity	CONSTRUCTION		OPERATION (Year 1)		OPERATION (Year 15)		Significance
			Magnitude of Change	Impact	Magnitude of Change	Impact	Magnitude of Change	Impact	
28	Derrynoose Road at Curragh Lane looking north	Medium	Medium - High	Moderate	Medium - High	Moderate	Medium - High	Moderate	Significant
29	Derrynoose Road at Curragh Lane looking south	Medium	Medium - High	Moderate	Medium - High	Moderate	Medium - High	Moderate	Significant
30	Crossbane Road (NIE)	Medium	Low - Negligible	Negligible - Minor	Low - Negligible	Negligible - Minor	Low - Negligible	Negligible - Minor	Not Significant
31	Crossaghy Road	Medium	Medium - High	Moderate	Medium - High	Moderate	Medium - High	Moderate	Significant
32	Castleshane Brae	Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Not Significant
33	Tully buck	High	No change	No Impact	No change	No Impact	No change	No Impact	N/A
34	Mullyash Mountain	High	Negligible	Minor	Negligible	Minor	Negligible	Minor	Not Significant

833. During the construction period the majority of receptor groups which directly face the proposed substation and overhead line in close proximity or with immediate views towards it would experience significant and adverse visual effects as a result of the loss of rural visual amenity and the visually intrusive construction activity associated with the construction of an overhead line.

834. Receptors that would experience **Major** to **Moderate** adverse long term impacts have, for the purposes of this assessment, been considered **significant**. This is by virtue of their sensitivity (expectation and importance of the changed landscape to the receptor), the expected magnitude of change, their immediate orientation towards the proposed substation and overhead line and visual proximity to proposed towers and overhead transmission line.

835. Receptors that would experience **Negligible** to **Minor** and adverse long term impacts have, for the purposes of this assessment, been considered **not significant**.

13.7 Conclusions

836. An overhead line of the size and nature of the Proposed Development will inevitably have landscape and visual impacts. However significant efforts have been taken in both the design and routeing process to minimise these impacts as much as possible. Based on the alternative options considered therefore, the Proposed Development would result in the least impacts to the landscape and visual resource of the study area, for an infrastructure project of this nature.

837. The proposed overhead line and substation would be located within an area of Northern Ireland that is primarily agricultural, consisting of low rolling hills, shallow valleys and structured fields, which often have overgrown hedgerows and many mature trees. Orchards are a prominent feature in the north of the study area. The rural hinterland close to the main settlement of Armagh area is populated with many scattered farms, dwellings and small commercial buildings. A few small villages are located along secondary and minor roads and around local educational or commercial centres. There are some valued and higher quality landscapes within the study area including a number of Registered Historic Parks, Gardens and Demesnes. An assessment of the impact to the setting of listed buildings and ancient monuments can be found in Chapter 12 Cultural Heritage.

838. The route of the proposed overhead line was selected based on the results of a number of alternatives studies which examined the environmental, technical and economic constraints present between various route corridors, line route options, and design details. Landscape and visual impacts were two primary environmental constraints that influenced the selection of the preferred route corridor, the line route, and the components of the now Proposed Development.

839. The alternatives studies were therefore the principal means by which the permanent and operational effects of the overhead line and substation have been mitigated. Whilst the Proposed Development would give rise to some adverse impacts it is considered to result in the least damaging impacts when compared to alternatives examined as part of the alternatives studies. For a more detailed description of alternatives refer to Chapter 4 Alternatives.

840. Detailed routeing of the line has sought to achieve the best fit with the landscape using landform and vegetation whilst recognising the technical constraints of the construction and operation of an overhead line.

841. After construction, the towers and overhead lines would remain as significant visual elements in the landscape. Existing lines/poles along with the proposed overhead line route would, nevertheless, combine to reduce the quality of the existing landscape.

842. Over time any vegetation cut back would re-grow and any new replacement planting would become established. Inspection and any repairs would be undertaken, but the level of activity in the landscape would be greatly reduced to a required minimum.

843. Mitigation measures would reduce visual impacts of the proposed substation and would see the embankments, earth bunds and entrance road heavily planted with predominantly native woodland. Over time, as the mitigation landscape matures, views of the substation would be filtered and assimilated back into the local landscape setting.

844. The landscape assessment indicates that there would be significant adverse impacts upon the landscape of some parts of the study 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 it is considered that the landscape and visual resource of the wider study area 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.

13.8 References

Guidelines for Landscape and Visual Impact Assessment (GLVIA) 2nd Edition, Landscape Institute and Institute of Environmental Management and Assessment, 2002;

Landscape Character Assessment, Guidance for Scotland and England, Scottish Natural Heritage & The Countryside Agency, 2002;

Northern Ireland Landscape Character Assessment (DOE, 2001);

The Dungannon and South Tyrone Area plan 2010 (DOE March 2005);

The Armagh Area Plan 2004 (DOE 1995) (and Armagh Area Plan 2018 Issue Paper [DOE March 2004]);

The Monaghan County Development Plan 2007 – 2013 (and Draft Monaghan County Development Plan 2013-2019);

Regional Development Strategy for Northern Ireland 2035, (DRD 2010);

A Planning Strategy for Rural Northern Ireland (DOE 1993);

PPS 6 Planning, Archaeology and the Built Environment (DOE March) 1999;

PPS 21 Sustainable Development in the Countryside (DoE June 2010);

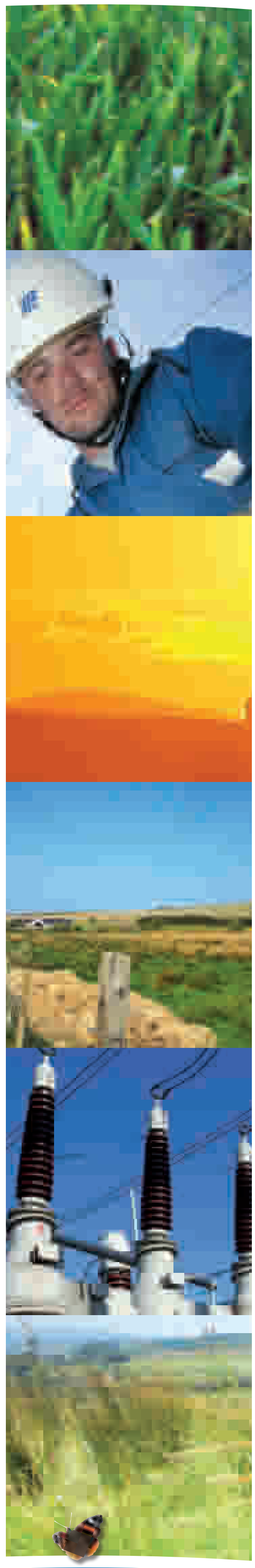
The Register of Parks, Gardens and Demesnes of Special Historic Interest, Northern Ireland. (DOE Jan) 2007

Northern Ireland Biodiversity Strategy (August 2002 and updates).

Tyrone - Cavan Interconnector

Chapter 14

Community Amenity and Land Use



Consolidated Environmental Statement

Volume 2

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Northern Ireland Electricity

14 Community Amenity and Land Use

Chapter Executive Summary

There will overall be an Imperceptible impact to agricultural land as a result of the Proposed Development. There will be an imperceptible or slight adverse impact to 96% of the affected land parcels during construction and operation.

A garden centre will be oversailed in part by the proposed overhead line, which will have a temporary moderate adverse impact during construction. Beyond that there is a day nursery approximately 900m from the Proposed Development and a primary school approximately 700m away. The significant impacts to residential, commercial and community facilities will be limited to the construction phase of the Proposed Development. These impacts arise from temporary disruption to residential properties along some of access tracks which use non-adopted roads. These will be temporary major impacts but will be limited to approximately 29 working days at each tower location.

During construction, there will be some diversion to existing electricity and telephone lines, which may result in temporary interruptions. There will be no significant impact to current planning permissions but three extant planning applications may be impacted during construction if consent is given.

14.1 Introduction

1. This Chapter presents an assessment of the Proposed Development, in relation to existing and proposed land uses and community amenity.

2. The following potential effects have been assessed:

- Impacts to agricultural land;
- Impacts on established residential, commercial or community facilities;
- Disruption to existing services; and,
- Direct impacts to extant planning permissions that would affect or be affected by the Proposed Development.

3. The assessment includes impacts identified in other chapters within this ES, including Chapter 7 EMF; Chapter 11 Noise; Chapter 13 Landscape and Visual, Chapter 15 Socio-Economics and Chapter 18 Traffic.

14.2 Methodology

14.2.1 Agricultural Land

4. The assessment of agricultural land considers agricultural, horticultural and commercial tree plantations within a study area of land parcels. The study area consists of land registry parcels which are identified within 60m of the overhead line and adjoining the substation boundary. An agricultural assessment was

undertaken by a specialist agronomist and is presented as a technical report in Appendix 14A. The results of the technical report are summarised in this chapter.

5. The agricultural assessment has been based on road side survey and examination of aerial mapping information, Ordnance Survey field mapping, Land Registry boundary data, and Department of Agriculture and Rural Development (DARD) Statistics. Consultations were carried out with DARD and with NIE Land Liaison Officers.

6. The agricultural assessment is based on an assessment of the sensitivity (value) of each land parcel, based on the enterprise type, and the magnitude of the impacts. The assessment of both factors provides the significance of the impacts to agricultural land.

7. The matrix in Table 14.1 provides a guide for determining the level of significance of impact and is subject to variation on a case by case basis.

Table 14.1 Agricultural Land Impact Significance[139]

		Magnitude of Impact				
		Very Low	**Low**	**Medium**	**High**	**Very High**
Sensitivity	**Very Low**	Imperceptible	Imperceptible	Imperceptible (possible Slight Adverse)	Slight Adverse (Possible Imperceptible)	Slight Adverse (possible Moderate Adverse)
	Low	Imperceptible	Imperceptible (possible Slight Adverse)	Slight Adverse (possible Imperceptible)	Moderate Adverse (Possible Slight Adverse)	Moderate Adverse (possible Major Adverse)
	Medium	Imperceptible	Slight Adverse (Possible Imperceptible)	Moderate Adverse or Slight Adverse	Major Adverse (Possible Moderate Adverse)	Major Adverse
	High	Imperceptible (possible Slight Adverse)	Moderate Averse (Possible Slight Adverse)	Moderate Adverse (Possible Major Adverse)	Major Adverse	Major Adverse
	Very High	Slight Adverse (possible Imperceptible)	Moderate Adverse (Possible Slight Adverse)	Major Adverse (Possible Moderate Adverse)	Major Adverse	Major Adverse

8. A temporarily limited (generally short duration) impact which occurs during construction will generally be less significant than a permanent or residual impact.

9. This assessment refers to the Agricultural Census of Northern Ireland – Results for June 2012. The Agricultural Census of Northern Ireland categorises land use into ten main agricultural categories (page 11 of the 2012 publication): *Cereals, General Cropping, Horticulture, Specialist Pigs, Specialist Poultry, Dairy, Grazing Livestock (Least Favoured Areas), Grazing Livestock (Lowland), Mixed, Other Types*. For the purpose of this assessment, these ten groups have been adapted into the following five general groups, which are more relevant to this assessment:

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[139] *Table 14.4 is broadly based on Design Manual for Roads and Bridges (DMRB) Vol 2, part 5, table 2.4 "Arriving at the Significance Effect Categories". Site specific factors and case by case assessment by an agronomist may result in assessment of significance which varies from the values in this table.*

- **Grassland** – Cattle and Sheep – includes: *Grazing Livestock (Least Favoured Areas)* and *Grazing Livestock (Lowland)*. These enterprises are grassland based (livestock and non specialist equine) generally medium sensitivity (or low where there is poor land quality);
- **Grassland** Dairy – includes: This enterprise is generally high sensitivity;
- **Cereals and other combinable crops** – Generally medium sensitivity;
- **Mixed** – includes: Enterprises where tillage cropping and grassland occurs. Medium sensitivity;
- **Other** – includes: *Other Types, Horticulture, Specialist Pigs* and *Specialist Poultry.* These enterprises are intensive/specialist equine farms, intensive livestock enterprises (pigs and poultry), horticultural enterprises, mushroom farms and orchards. High to Very High sensitivity;
- **Commercial forestry and tree plantations** – not included in the Agricultural Statistics but commercial forestry and tree plantations are included as a separate group in this assessment. Sensitivity can be Very High but is assessed on a case by case basis in the assessment.

14.2.2 Residential, Commercial and Community Facilities

14.2.2.1 Scope of the Assessment

10. Residential, commercial and community facilities largely form the human and built environment and can be impacted by several types of impacts. This chapter focuses on the impacts resulting from disruption due to construction and during the operational phase. The scope of this aspect of the assessment is based on disruption due to construction or operation in the form of physical land take, impacts due to temporary traffic measures and disruption to access. Other types of impacts to the same receptors are assessed in the relevant chapters of this ES, such as noise, landscape, visual and EMF impacts and the interactive effects of these impacts with disruption impacts from construction and operation are considered. Transboundary and cumulative impacts are summarised in Chapter 19 of this ES.

11. For the purpose of this assessment, “community facilities”[140] have been identified. The community facilities included in this assessment were: schools, playgroups, residential care homes, churches, chapels, hospitals, doctors’ surgeries, health centres, playgrounds, playing fields and other sporting facilities (including GAA pitches, soccer pitches, driving ranges, bowling greens, tennis courts and associated club houses etc.), sports centres, post offices, libraries, way marked walks, cycle routes, and other leisure routes (e.g. canoe trails).

12. Facilities such as gardens centres, public houses, restaurants, etc. can be considered as community facilities as while they are primarily run for profit they can also serve leisure and social purposes. Commercial community facilities have also been considered within the Socio-economics chapter of this ES and have generally been scoped out as there are no likely significant effects.

14.2.2.2 Data Collection

13. All community facilities within 5km from the centre line of the overhead line and the substation boundary were identified as baseline information. It has been determined that beyond 5km, vegetation, local variations in topography, inclement weather and lighting will shield or partially interrupt or obscure views of the Proposed Development. In addition, at distances of 5km or greater, the 25 m to 54 m tall tower structures are unlikely to be prominent features or become focal points within views due to reduced perceptibility. Therefore there are no potential impacts to any community facilities beyond 5km.

[140] Defined as facilities used by local communities for leisure and social purposes.

14. Within that study area, the community facilities within 2km were then identified. The refinement of the study area was undertaken as within 2km there is a slightly greater potential for impacts as a result of the Proposed Development and these were assessed as such.

15. Residential, commercial and community facilities were identified as part of a desktop study, consultation process and site visits.

14.2.2.3 Impact Assessment Methodology

16. Table 14.2 – 14.4 identifies the criteria that are used in the assessment of impacts to residential, commercial and community facilities. The sensitivity of the baseline conditions varies according to the relative importance of existing environmental features on or near to the proposed overhead line (e.g. whether it is of national, regional or local importance) and the sensitivity of receptors which would potentially be affected.

17. Criteria for determination of sensitivity (very high, high, medium, or low) are established based on legislation, statutory designation and/or professional judgement.

Table 14.2: Sensitivity of Residential, Commercial and Community Facilities

Sensitivity	Criteria
Very High Sensitivity	Has little or no ability to absorb change without fundamentally altering its present character; and/or Is of very high environmental value, or of international importance
High Sensitivity	Has low ability to absorb change without fundamentally altering its present character, and/or Is of high environmental value, or of national importance.
Medium Sensitivity	Has moderate capacity to absorb change without significantly altering its present character, and/or Is of some environmental value, or is of national importance
Low Sensitivity	Is tolerant of change without detriment to character, and/or Is of low environmental value or local importance
Negligible Sensitivity	Is resistant to change, and/or Is of little environmental value.

18. It has been determined that all residential, commercial and community facilities are of high sensitivity.

Table 14.3: Magnitude of Impacts to Residential, Commercial and Community Facilities

Magnitude	Criteria
High Magnitude	Total loss or major alteration to key elements or features of the baseline conditions to the extent that post-development character or composition of baseline conditions will be fundamentally changed.
Medium Magnitude	Loss or alteration to one or more key elements or features of the baseline conditions to the extent that post-development character or composition of the baseline conditions will be materially changed.
Low Magnitude	Minor shift away from baseline conditions; Changes arising will be detectable but not material; and The underlying character or composition of the baseline conditions will be similar to the pre-development situation.
Negligible Magnitude	Very little change from baseline conditions; and Change is barely distinguishable, approximating to a ‘no change’ situation.

Table 14.4: Significance of Impacts to Residential, Commercial and Community Facilities

Impact Significance	Criteria
Major Adverse	Large scale impacts on community amenities, and/or where there is an obvious view of the line with potential to cause significant impact on community activity. Major closure of roads during construction requiring significant diversions.
Moderate Adverse	Small scale impacts community amenities, but a large number of people or activities will be affected; or where the line's visibility could have a possible detrimental effect on community activity or other users or where the extent of impacts on community activities or resources is large scale but only a small number of people or activities will be affected. Long term closure of roads during construction requiring small diversions.
Minor Adverse	Small scale impacts on community amenities likely to affect a limited number of people or activities; or where the line would be unlikely to be visible or would be visible at a distance. Temporary closures of roads during construction or minimal diversion.
Negligible	Where no impacts are predicted or where the line would not be visible or not otherwise have an effect.

14.2.3 Disruption to Existing Services

19. As part of the assessment, information on existing services was gathered. This has included gas pipelines, water and sewage pipelines, fibre optic lines, telecommunications equipment, electrical lines and public transport facilities. It has been assessed that there will be no impacts to gas pipelines, water and sewage pipelines, fibre optic lines or public transport facilities and have been accordingly scoped out of the assessment.

20. Existing electrical and telecommunication lines will be directly impacted by the Proposed Development and have been assessed below.

14.2.4 Extant Planning Permissions

21. Planning applications were reviewed, including active applications and those that had been approved by the Department of Environment (DOE). Those applications that have the potential to be impacted by the Proposed Development or result in impacts to the Proposed Development were assessed.

14.2.5 Policy Context

22. Key pieces of policy and guidance relating to community amenity include:

- Regional Development Strategy for Northern Ireland 2035 (DRD, March 2012);
- A Planning Strategy for Rural Northern Ireland (DOE, 1993);
- PPS 1 - General Principles (DOE, March 1998);
- PPS 3 – Access, Movement and Parking (DOE, February 2005);
- PPS 8 – Open Space, Sport and Outdoor Recreation (DOE, 2004);
- PPS 21 – Sustainable Development in the Countryside (DRD, 2010);

- Dungannon and South Tyrone Area Plan 2010 (DOE, 2005);
- Armagh Area Plan 2004 (DOE 1995);
- Armagh Area Plan 2004 Alterations No 1: Armagh Countryside Proposals (DOE 2001); and,
- Armagh Area Plan 2018 Issues Paper (DOE 2004).

23. The key pieces of legislation, policy and guidance relating to agriculture are incorporated into the terms and conditions of schemes and regulations enforced by statutory DARD inspections. These schemes and regulations include Nitrates Regulations, Single Payment Scheme terms and conditions, Cross Compliance Regulations, Countryside Management Scheme terms and conditions, Organic Farming Scheme terms and conditions, and standards of good agricultural and environmental condition (GAECs).

14.2.6 Indication of Any Difficulties Encountered

24. It is acknowledged that community facilities can change in their location and nature. Reasonable attempts have been made to obtain accurate and up to date information but this may change while the planning application for the Proposed Development is determined.

14.3 Baseline Conditions

14.3.1 Agricultural Land

14.3.1.1 Study Area Description

25. The agricultural study area consists of land parcels along the Proposed Development and is shown in Figure 14.10.

26. The average land area per farm in Northern Ireland is 40.6 hectares. In County Tyrone the average land area per farm is also 40 hectares whereas the average land area per farm for County Armagh is 27 hectares. Based on these county averages the farms in the study area have an average land area of 31 hectares.

27. Current biosecurity issues affecting the study area have been documented by DARD. Publically available statistics (December 2012 Animal Stats – DARD website) show that the infectious livestock diseases Tuberculosis (TB) and Brucellosis are present in Co. Armagh and Tyrone and within the study area. The average incidence for TB along the proposed route is similar to the average for Northern Ireland. However, the expected incidence of Brucellosis along the proposed route is higher than the average for Northern Ireland.

28. Potato wart disease is not present in Northern Ireland and there are no current records of potato cyst nematode within the study area. Notifiable soil borne crop diseases are generally not associated with the cereals and maize crops grown in the study area.

29. The dominant soil type within the study area is a good quality clay[141] soil which is well suited to grass but generally not suited to tillage crops due to restricted drainage. There are pockets of free draining acid brown earths (often with tillage crops) which occur less frequently. The land in the southern part of the Proposed Development (between towers 75 – 102) is classified as Less Favoured or

[141] *Sources = Visual Survey carried out by author; "Soils of Northern Ireland and their Environmental Significance", Crawford Jordon (Agrifood and Biosciences Institute) and Barry Rawlins (British Geological Survey); European Soils Database V2 and DARD Agricultural Statistics 2011 (Disadvantaged Areas Map).*

Disadvantaged by DARD and the area has a slightly higher annual rainfall. The land here is often elevated, wet and consisting of rushy grassland.

14.3.1.2 Enterprise Classification

30. The summary of Northern Ireland statistics (DARD 2012) indicates that of the farms in the study area approximately:

- 78% are in the Grassland Beef & Sheep group;
- 9.5% are in the Grassland Dairy group;
- 2% are in the Cereals and other Tillage Crops;
- 2% are in the Mixed Crops & Livestock group; and,
- 8.5% are in the Other group (including pigs & poultry & horticulture).

31. There is a higher proportion of horticultural land in Co. Armagh. Based on the DARD statistics, the tillage cropping in Co. Armagh consists of cereals (3% of total area), horticultural (2% of total area) and potatoes (0.1% of total area). The tillage cropping in Co. Tyrone consists of cereals (1% of total area), horticultural (0.05% of total area) and potatoes (1% of total area). Based on the visual assessment along the Proposed Development, approximately 8% of land parcels have tillage crops. Orchards are present on two land parcels (Land Parcel Ref. Nos 021 & 040 – see Appendix 14A). A horse training track is located on one land parcel (Ref. No 091) and a willow plantation is grown on one land parcel (Ref. No 100) as a bioremediation system for the Linwoods facility.

32. The results of the categorisation of land parcels along the Proposed Development are shown in detail in Appendix 14A. The sensitivity of land parcels are:

- 2% are categorised as having Very High sensitivity – 4 land parcels; There is one orchard (Ref No 040), one equine enterprise (Ref No 091), one bioremedial willow plantation (Ref No 100) and one commercial forestry land parcel (Ref No 1028). These land parcels consist of 49 hectares of land – 3% of the study area;
- 7% are categorised as having High sensitivity – 13 land parcels. There is one orchard (Ref No 021). There are 12 dairy farms. The area of these 13 land parcels is 225 hectares – 13% of the study area; and,
- 91% are categorised as having Medium sensitivity. These are land parcels with grazing livestock and tillage or mixed grassland and tillage. These land parcels consists of 1,493 hectares of land – 84% of the study area;

14.3.2 Baseline Conditions – Residential, Commercial and Community Facilities

33. The main population centres in vicinity of the study area are Armagh and Dungannon, with the villages of Moy, Benburb, Blackwatertown, Killylea, Derrynoose and Keady. Residential and commercial properties were identified through desktop research of online sources, maps, aerial photography and verified through site visits and public consultation.

34. The avoidance of residential properties was a key determining factor for the routeing of the Proposed Development. This was discussed in Chapter 4 of this ES. There will be demolition of one residential property as a result of the proposed substation. This property is owned by NIE and has been scoped out of the assessment.

35. Armagh and Dungannon have sufficiently large populations to include a full spectrum of educational facilities, from nursery/playgroups to post primary education. It is noted that within the study area as the size of the settlement decreases, so does the diversity of community facilities; in the smaller settlements the only community facilities are typically primary schools and churches.

36. Please see Figures 14.1 – 14.8 for location information.

37. Table 14.5 shows an overview of the number of community facilities within the 5km study area as identified by via a desktop study in 2012 and 2013. These are shown on Figures 14.1 – 14.8.

Table 14.5: Overview of Community Facilities within the 5km Study Area

COMMUNITY FACILITY	NUMBER
Primary School	28
Playgroup	23
Church	53
Community Centre	53
Playing Field, Playground, Play Area	74
Residential Care Home	8
Post Office	12
Library	2
Post Primary School	7
Doctors’ Surgery	5
Dental Surgery	1
Beauty Saloon	1
Convenience Store	21
Florists	1
Furniture	1
Garden centre	7
Hairdressers	1
Pet Shop	1
Petrol Station	1
Public house	17
Restaurant	3
Total	**320**

38. Within the 5km study area the largest number of community facilities are playing fields, playgrounds or play areas.

39. Additionally, there are recreational activities in the study area without a designated playing field or other sites, such as walking routes, cycling routes, fishing areas, and road bowling.

40. Table 14.6 gives an overview of all the community facilities within the 2km study area, including facilities which are in the countryside and not associated with any settlement. These are shown on Figures 14.1 – 14.8.

Table 14.6: Overview of Community Facilities within 2km Study Area

COMMUNITY FACILITY	NUMBER
Primary School	9
Playgroup	6
Church	16
Community Centre	8
Playing Field, Playground, Playing Area	10
Residential Care Home	1
Post Office	4
Library	1
Doctors' Surgery	1
Dental Surgery	1
Beauty Saloon	1
Convenience Store	9
Furniture	1
Garden centre	4
Hairdressers	1
Public house	11
Restaurant	1
Total	**85**

41. Within in the 2km study area, Moy Health Centre and a dental practice in Moy are the two medical facilities identified and the library in Moy is the only library identified.

42. In order to gauge the Proposed Development's impact on the existing community facilities within the 2km study area, it is necessary to ascertain the distances between the Proposed Development and the community facilities. Table 14.7 shows the distances calculated from the Proposed Development to community facilities.

Table 14.7: Community facilities within 2km of Proposed Development

COMMUNITY FACILITY	TYPE	APPROXIMATE DISTANCE (KM) TO PROPOSED DEVELOPMENT
Derryhaw Post Office, Monaghan Road, Maddan	Post Office	0.6
Drumhillery Presbyterian Church, Drumhillery Road, Drumhillery	Church	0.7
Drumhillery Primary School, Drumhillery Road, Drumhillery	Primary School	0.7
St Jarlath's RC Church, Clonfeacle Road, Blackwatertown	Church	0.7
Drumhillery Orange Hall, Drumhillery Road, Drumhillery	Community Centre	0.9
Toddler's Rest Day Nursery, Gorestown Road, Moy	Playgroup	0.9
Blackwatertown Methodist Church, Blackwatertown Road, Blackwatertown	Church	1
Church of The Immaculate Conception (RC), Maydown Road, Artisooly	Church	1

COMMUNITY FACILITY	TYPE	APPROXIMATE DISTANCE (KM) TO PROPOSED DEVELOPMENT
Derrynoose Community Centre, Fergort Road, Derrynoose	Community Centre	1
Derrynoose GAC Playing Field, Fergort Road, Derrynoose	Playing Field	1
Grange Friends' Meeting House, Dreemore Road, Grange	Church	1
O'Connell's Tullysaran GAC Playing Field, Milltown Road, Artisooly	Playing Field	1
O'Neill's GFC Playing Field, Quaymount, Blackwatertown	Playing Field	1
St John's Church Hall, Farnaloy Road, Drumhillery	Community Centre	1
Holy Trinity Church Hall, Maydown Road, Drumsallen	Community Centre	1.1
Little Acorns Playgroup, Fergort Road, Derrynoose	Playgroup	1.1
Our Lady's Primary School (Tullysaran), Milltown Road, Artisooly	Primary School	1.1
Playground, Blackwatertown Road, Blackwatertown	Playing Field	1.1
St John's Church of Ireland, Farnaloy Road, Drumhillery	Church	1.1
St Mochua's Primary School, Derrynoose Road, Derrynoose	Primary School	1.1
Holy Trinity Church of Ireland, Maydown Road, Drumsallen	Church	1.2
St Jarlath's Primary School, Charlemont, Blackwatertown	Primary School	1.2
Derrynoose Post Office, Filling Station, Derrynoose Road, Derrynoose	Post Office	1.3
Kute Little Treasures Day Nursery, Main Street, Blackwatertown	Playgroup	1.3
St Mochua's RC Church, Derrynoose Road, Derrynoose	Church	1.3
St Patrick's Church of Ireland, Main Street, Benburb	Church	1.3
Moy Regional Primary School, Dungannon Road, Moy	Primary School	1.4
Playground, Curran's Brae, Moy	Playing Field	1.4
St Patrick's Parish Hall, Main Street, Benburb	Community Centre	1.4
Benburb Community Playgroup, Benburb Priory, Benburb	Playgroup	1.5
Benburb Orange Hall, Main Street, Benburb	Community Centre	1.5
Benburb Playgroup, Drumgoose Road, Benburb	Playgroup	1.5
Benburb Presbyterian Church, Main Street, Benburb	Church	1.5
D. Reaney & Associates Dental Practice, Dungannon Street, Moy	Dental Surgery	1.5
Maddan Raparees GAC Playing Field, Monaghan Road, Armagh	Playing Field	1.5
Moy Resource Centre, Dungannon Street, Moy	Community Centre	1.5
Playground, Drumgoose Road, Benburb	Playing Field	1.5
Playground, The Argory	Playing Field	1.5
Playing Field, Drumgoose Road, Benburb	Playing Field	1.5
Servite Priory Chapel, Main Street, Benburb	Church	1.5
Drumsallen Primary School, Dernasigh Road, Drumsallen	Primary School	1.6
Maddan Community Centre, Riverdale Park, Maddan	Community Centre	1.6

COMMUNITY FACILITY	TYPE	APPROXIMATE DISTANCE (KM) TO PROPOSED DEVELOPMENT
Moy Methodist Church, Dungannon Street, Moy	Church	1.6
Roxborough House Residential Home, Dungannon Street, Moy	Residential Care Home	1.6
St James' Church of Ireland, The Diamond, Moy	Church	1.6
St James' Church of Ireland, The Diamond, Moy	Church	1.6
Benburb Post Office, Main Street, Benburb	Post Office	1.7
Benburb Primary School, Main Street, Benburb	Primary School	1.7
Moy Health Centre, Charlemont Street, Moy	Doctors' Surgery	1.7
Moy Library, The Diamond, Moy	Library	1.7
Moy Presbyterian Church, Benburb Road, Moy	Church	1.7
St John The Baptist's RC Church, Benburb Road, Moy	Church	1.7
Moy Post Office, Texaco Eurospar, Charlemont Street, Moy	Post Office	1.8
St John's Primary School, Benburb Road, Moy	Primary School	1.8
St Joseph's Primary School, Farnaloy Road, Maddan	Primary School	1.8
St Patrick's RC Church, Farnaloy Road, Maddan	Church	1.8
An Maigh GAC Playing Field, Benburb Road, Moy	Playing Field, Playground, Play Area	1.9
Moy Area Playgroup, Benburb Road, Moy	Playgroup	1.9
Playing field, Moy (Adjacent to Ridgeway Avenue)	Playing Field, Playground, Play Area	2.3
Patricia Reilly	Beauty Saloon	1.5
Spar	Convenience Store	1.8
Linwoods SPAR	Convenience Store	0.6
Rose McConnell	Convenience Store	1.9
D Heggarty	Convenience Store	1
Your Store	Convenience Store	<2
The Co Op	Convenience Store	1.6
Benburb Village Stores Spar	Convenience Store	1.5
Priory House Furnishings	Convenience Store	1.5
Texaco Garage & Spar	Convenience Store	1.8
Moy Furniture and Carpet Centre	Furniture	1.8
Blacks Nursery, 19 Dernasigh Road, BT60 4QD	Garden centre	2
O'Neill 44 Drumlee Road, Dungannon BT71 7QD	Garden centre	0.4
Patricia's Village	Garden Centre	Oversailed in part
Int Hairport	Hairdressers	1.5
The Ryandale Inn	Public house	1.7
Bishops	Public house	1.6
The Auction Rooms	Public house	1.7

COMMUNITY FACILITY	TYPE	APPROXIMATE DISTANCE (KM) TO PROPOSED DEVELOPMENT
The Eagle Bar	Public house	2
McCanns	Public house	2
The Bottle of Benburb	Public house	1.5
The Portmore Ltd	Public house	1
Mary Anns	Public house	0.7
Longnancy's Bar	Public house	0.09 (90m)
Digby's	Public house	2
PB's	Public house	1.6
Priory House Restaurant	Restaurant	1.5

Please Note: Distances measured are from Ordnance Survey maps and are taken from the distance of the outer boundary (planning application boundary) for the substation site and from the centre line of the proposed overhead line route.

43. There are 87 community facilities within 2km of the proposed substation. The closest to the proposed substation is a garden centre, which is in part oversailed by the proposed overhead line.

44. There is a day nursery located at Gorestown Road, Moy located 900m from the proposed substation.

45. In total there are nine primary schools and six playgroups within 2km of the Proposed Development (at the closest point). Of those, one is located within 1km of the Proposed Development - Drumhillery Primary School is located approximately 700m from the Proposed Development.

46. Other community facilities within 1km include Derryhaw Post Office, Drumhillery Orange Hall. Grange Friends' Meeting House, the playing fields associated with O'Connell's Tullysaran GAC, Derrynoose Community Centre, the playing fields associated with Derrynoose GAC, and the playing fields associated with O'Neill's GFC in Quaymount Blackwater Town.

47. There are five churches within 1km; St. Jarlath's Church (700m), Church of the Immaculate Conception, Tullysaran (900m), Drumhillery Presbyterian Church (750m) Grange Friends' Meeting House, Dreemore Road, Grange (1km) and Blackwatertown Methodist Church (1km).

48. There are activities within the study area that are a community resource which are not confined to specific designated areas. The main activities of interest are road bowling, angling, cycling, canoeing and walking routes. These are outlined below and illustrated on Figure 14.9:

- Road Bowling – Road bowling is predominantly practised in areas of County Armagh; with Cathedral Road and Battleford Road, Armagh identified as being used for the sport;
- Angling – The Blackwater river catchment encompasses parts of the counties of Tyrone, Armagh and Monaghan. In relation to angling, the area offers both coarse and game fishing and part of the "Blackwater Region";
- Cycling – The cycle routes within the study area include the Ulster Canal Cycle Trail (Regional Cycle Route 11), which traverses through Benburb, Glaslough, and Monaghan Town and onto Clones, and National Cycle Routes 91 and 95;
- Canoeing – The Blackwater Canoe Trail flows from Benburb to Lough Neagh. To the south of the Argory Estate, Co. Tyrone, the canoe trail is within 2km of the line route and substation site;
- Ulster Canal – is a disused canal running through part of County Armagh, County Tyrone and County Fermanagh in Northern Ireland and County Monaghan in the Republic of Ireland. It links

Lough Neagh and the large Shannon/Erne navigation systems. The Proposed Development will cross the Ulster Canal between Atkinson's Bridge and Tullymore Bridge;

- Walking Routes (including Orienteering and Ecotrail Routes) – There are 22 way marked routes advertised by the Blackwater Regional Partnership which promotes the region. The routes offer views and cultural summaries of the villages, woodland and parkland associated with the study area. There is one ecotrail within 2km of the Proposed Development (Benburb Valley Park (1.62km)) and there are two walking trails (The Argory Estate (1.49km) and the Monaghan Way (0.39km). The Ulster Way is a walking route which encompasses Northern Ireland. Part of the route is within the study area along the Navan Fort Road and Tonnagh Road. This section of the Ulster Way is described by NIEA as a “link section” rather than a “quality section” and walkers are advised to make use of the public transport links along the section;
- Killylea Road – often used for road races (cycling and car rallies) and by the Tynan and Armagh Hunt; and,
- Moy Gun Club – practices its sport along Gorestown, Drummond, Broughadoey and Rossenbog.

14.3.3 Baseline Conditions – Disruption to Existing Services

49. The study area contains existing services such as low voltage electricity lines and telephone lines. The locations of these services have been obtained from their operators NIE and BT. It has been determined that the Proposed Development will cross low voltage electricity lines 18 times and 17 crossings of telephone lines that will be undergrounded (see Chapter 5 for further details).

14.3.4 Baseline Conditions – Current Planning Permissions

50. Within the study area, there are a large number of planning applications that are consented but not yet constructed. Information on all applications within the study area has been obtained from DOE. There are four current planning permissions, which could be impacted by the Proposed Development. These applications are:

- M/2008/0143/F – Proposed chicken shed close to Tower 22 – located under the proposed overhead line (consent granted May 2008 and expired in May 2013 without works commencing on the application);
- O/2009/0807/F – Proposed chicken shed close to Tower 66 – located under the proposed overhead line;
- O/2009/0804/F – Proposed chicken shed close to Tower 72 – located under the proposed overhead line; and,
- O/2009/0805/F – Proposed chicken shed close to Tower 72 – located under the proposed overhead line.

14.4 Potential Impacts

14.4.1 Construction Phase – Agricultural Land

Table 14.8 Summary of individual land parcel Construction Phase Impacts

Significance Category	Construction Phase Impacts	
	Number of land parcels	% of total
Imperceptible	108	60
Slight Adverse	65	36
Moderate Adverse	6	3
Major Adverse	2	1

51. One hundred and eighty one (no. 181) land parcels are within the Agronomy Study Area of the Proposed Development. The construction of the substation, two 275kV towers and access road in Turleenan will have a direct impact on two land parcels (Ref. Nos 001 and 1036). A non agricultural dwelling and yard will also be demolished. The substation site will be enclosed within the proposed perimeter fence. The construction of two terminal towers within the substation site will require the existing 275 kV NIE Overhead Line to be diverted temporarily. This will cause an impact on two land parcels adjoining the proposed substation site (Ref Nos 1082 and 1083).

52. There is a major adverse Construction Impact (after mitigation) on two land parcels due to construction of the Proposed Development. 54% of land parcel Ref No 001 will be lost to the substation site in Turleenan. There is also a major adverse construction impact on the land parcel Ref No 100 (willow plantation) due to having to clear 0.1225 hectares of plantation around one tower and due to having to harvest the willow crop on the remainder of the land parcel prematurely to allow for construction of the overhead line.

53. One hundred and seventy eight (no. 178) land parcels (consisting of 1,733 hectares) will be located within the 60m corridor (Ref No 1036, 1082 and 1083 are not within the 60m corridor but are affected by the substation construction). One hundred and two towers will be constructed on 79 land parcels. The remaining 43 land parcels will be affected by other elements of the proposed infrastructure such as temporary access routes, guarding locations, stringing sites, undergrounding trenches and proximity to proposed overhead lines. Land access for construction will be achieved through the way-leaves procedures and in consultation with landowners. During the construction phase, hedgerows and field boundaries will be either permanently or temporarily removed. Preconstruction monitoring will be carried out prior to construction. This will involve site investigation works which may require pit excavation and groundwater monitoring. The construction phase of the entire development is scheduled for a 36 month period. However, the construction phase on any one farm will rarely exceed 6 months and during this time the construction activity on the farm will generally not exceed 4 weeks in total for each tower constructed. Following construction of towers the stringing operation will typically be completed within 14-21 days.

54. The individual land parcel construction phase impacts are presented in Appendix 14A and summarised in Table 14.9. The assessment of agriculture along the Proposed Development indicates that the sensitivity is Medium, the potential magnitude of impact during the construction phase is High (without mitigation) and therefore the pre-mitigation impact significance is Moderate Adverse (without mitigation). The potentially High magnitude of impact is based on:

- Approximately 6.2% of livestock herds in the study area will be restricted due to Tuberculosis (TB) and Brucellosis. Therefore without mitigation there is a low probability of increasing the spread of these notifiable diseases as a result of the construction activities;

- Without mitigation there is a high probability that short - medium term damage (2–15 years) will be caused to soil structure on very small areas of affected land parcels. This will occur on approximately 26.5 hectares of land;
- Without mitigation the impact on field drainage will be restricted to very small areas;
- Without proper on-site management of fuel tankers there may be spills of fuel oil;
- Without mitigation there is a high probability of disturbance to cropping and livestock. Without proper management of access gates and farm boundaries livestock will stray;
- Dust impacts will not be significant; and,
- Noise from construction machinery will cause temporary and transient impacts on livestock which generally are not significant. Where pile driving occurs there is the potential to cause a very high impact if livestock take flight.

After considering the range of potential impacts, their duration, the probability of these impacts and the proposed mitigation measures, the overall significance of construction phase impacts on agriculture along the Proposed Development is Imperceptible. This is due mainly to impacts caused to farm enterprises from disturbance. The impacts on individual farms are provided in Appendix 14A.

14.4.2 Construction Phase – Residential, Commercial and Community Facilities

14.4.2.1 Overview

55. The following likely impacts could occur to residential, commercial and community facilities during the construction stage of the Proposed Development. The scope of this aspect of the assessment is based on disruption due to construction in the form of physical land take, impacts to due temporary traffic measures and disruption to access.

56. The closest community facility to the Proposed Development is a garden centre (Patricia’s Village) which will be in part oversailed by the proposed overhead line. During construction, the stringing operation will require consultation with the owner/operator in order to minimise disruption. There will be a temporary moderate adverse impact to the garden centre during construction.

57. Other community facilities to be noted are a day nursery (Toddler’s Rest Day Nursery) located at Gorestown Road, Moy, approximately 900m away and Drumhillery Primary School - approximately 700m in distance (from the closest point of the Proposed Development). The potential for interacting (cumulative) impacts as a result of noise, landscape and visual and EMF on residential, commercial and community facilities is assessed in the relevant chapter, however, it has been determined that because of the distance of the facilities from the Proposed Development there will be no significant interacting impacts.

58. There is the potential for impacts to roads used for road bowling, racing, and other activities involved by the Tynan and Armagh Hunt and the Moy Gun Club during construction. The potential impacts include events being prevented from occurring due to construction traffic or impacts to the quality of the road surface, which would affect the quality of the event. Where events are directly impacted (high magnitude of impact), there will be a temporary major adverse impact.

59. There may be temporary restricted access (low magnitude) to river banks for angling and canoeing. This is a temporary moderate adverse impact.

60. There may be temporary restricted access (low magnitude) to cycle routes and walking routes. These routes are along roads which may be used by construction traffic (as detailed in Chapter 18 Transport). This is a temporary moderate adverse impact.

61. The potential impacts to residential, commercial and community facilities throughout the study area are:

- Temporary higher traffic volumes;

- Longer journeys times and delays during the construction phase; and
- Temporary disturbance to residents living on access tracks.

14.4.2.2 Journey Times

62. The proposed approach to traffic management is set out in Chapter 18. In summary, it is proposed that the contractor will use temporary traffic measures to minimise disruption to the road network as the preferred access option. These measures will be required at times of delivery of large machinery to the site (e.g. excavators). The temporary traffic measures will include temporary traffic lights resulting in limited lane and road closures during delivery times (medium magnitude of impact). This is estimated to be no more than 15 minutes at any one location in any one occurrence. Because of the rolling nature of the working areas and construction programme (see Chapter 5), the use of temporary traffic measures will be limited in their scale and duration. As outlined in Chapter 5 of this ES the maximum duration of works at any one tower location is approximately 29 working days at each tower location. It is assessed that this will have a temporary moderate adverse impact to road users as road users will be temporarily delayed or be required to seek alternative routes.

63. If it is determined by the Department that temporary traffic measures are not to be used, existing accesses could be temporarily enlarged to accommodate the larger types of construction vehicles. In this case, the low-loaders could enter the proposed sites and make deliveries off the public road network without requiring road or lane closures. Should enlarged access by used, there would be no significant impact to traffic on the public road network.

14.4.2.3 Temporary Disturbance on Access Tracks

64. The access requirements for the construction of the Proposed Development are outlined in Chapter 5 of the ES. Generally construction vehicles will access the working areas using the public road network. It has been determined that there will be no significant impacts to residential, commercial and community facilities from construction traffic making use of the public road network.

65. In order to access the working areas from the public road network, it is proposed to make use of existing accesses as far as possible. This includes non-adopted roads which are currently used for agricultural and residential access. The non-adopted roads are not considered to be part of the public road network and will have low existing traffic volumes. The construction phase will temporarily increase the traffic on the non-adopted roads. The maximum duration of use of any of these accesses is 30 days with a maximum of 25 vehicles in average working day. The magnitude of impacts to the affected residents is assessed high and the significance of the impact is temporary major adverse.

66. Table 14.9 outlines the expected numbers of construction vehicles and duration of construction for each assessed access track. The affected properties are identified by the individual ID numbers used in Chapter 13 (Landscape and Visual). The location of the affected properties can be seen on Figure 5.8 and Figure 13.8.

Table 14.9: Temporary Disturbance on Access Tracks

Tower	Access Track	Affected Property (Landscape ID)	Maximum Daily Traffic Total	Total Work Days
1	AT1	A14	34	19
3, 4, 5, 6	AT 3-4-5-6	A6, A7, A8, A3, A8+	44	57*
9	AT 8-9	B5	36	32
14	AT 14	B18	36	19
15	AT 15	B21	15	15

Tower	Access Track	Affected Property (Landscape ID)	Maximum Daily Traffic Total	Total Work Days
17	AT 16-17	B29	38	32
20	AT 20	C12	20	15
24 and 25	AT 24-25	C30 C31	15	21
23	AT 23SL	C23	20	5
30	AT 30	C66	15	15
31	AT31	D1 D2	15	21
N/A	AT 33SL	D8	20	5
33	AT 33	D10	56	19
34	AT 34	D10	38	19
40	AT40	E6 E5	15	15
42	AT42	E1	30	15
43	AT 43	E13	36	15
46	AT 46	E34 E35 E36 E37 E40	21	19
57 - 58	AT 57	F26 F26+	40	34
58	AT58SL	F29	20	5
61	AT 61	F31 F31+	18	15
62 and 63	AT 62-63	G4 G3	24	15
64	AT 64	G6	15	15
67	AT 67	G9	15	15
68	AT 68A	G17 G28	40	19
70	AT 70	G39 G40	15	15
74	AT74SL1B	H14+	20	5
74	AT 74	H11	21	19
75	AT 75	H15	15	15
78 -79	AT78-79	H24	48	33
80	AT80	H34	18	15
85	AT 85 SL	I12	20	5
85	AT 85	I9	34	19
89	AT 89	I21	44	19
91	AT 91	I27	20	15
96	AT96	J18	15	15
101	AT101	J48	36	15
N/A	ATOS	J36 J37	4	5

* 57 days are required for AT3-4-5-6 as four towers are accessed along this access track. As outlined in Chapter 5 of this ES the maximum duration of works at any one tower location is approximately 29 working days at each tower location.

14.4.3 Construction Phase – Disruption to Existing Services

67. It is proposed that the diversion of existing electricity or telephone lines may result in temporary disruptions to services. Any interruptions will be of short term duration and the affected users and the public will be notified well in advance. There will be no significant impacts.

14.4.4 Construction Phase – Extant Planning Permissions

68. There are four extant planning permissions that would be affected by the construction phase. There will be temporary moderate adverse impacts (Low Magnitude) resulting from construction works at the adjacent towers and through the stringing operation. If the permissions are constructed prior of the Proposed Development construction phase, the construction phase would result in added construction noise and disruption due to the stringing operation (as described in Chapter 5) occurring over the top of the building. If the permissions are constructed during or after the Proposed Development construction phase, consultation would be required between the developer and NIE on the nature of the construction machinery to be used for the permissions to ensure safety clearances are maintained. This could lead to disruption and prolongation of the construction of the development which is the subject of the planning applications.

14.4.5 Operational Phase – Agricultural Land

69. The operational phase impacts on individual land parcels are presented in Appendix 14A. Based on the assessment of the agricultural land along the Proposed Development, the potential magnitude of impact during the operation phase is likely to be in the very low and low range (without mitigation) resulting in a Slight residual impact. The very low to low range Magnitude is based on:

- Total permanent land loss will be 25.8 hectares (22.2 hectares for the substation and 3.6 hectares for the towers for the overhead line). This represents 1.5% of the affected area which is a low impact;
- After the construction period the probability of spreading diseases is negligible;
- Medium term damage will be caused to soil structure during the construction phase on very small areas of affected land parcels. The effects of these will fade in the medium term (7-15 years) and will be negligible in the longer term (>15 years). Also, the area upon which this impact occurs (approximately 26.5 hectares) is taken into account. Therefore the magnitude of impact due to this damage is very low in the operation phase;
- There will be permanent disturbance to cropping and livestock due to the towers being physical obstacles to farm machinery operations. This impact will occur every 340 metres approximately and therefore the magnitude of impact is very low in the operation phase;
- Noise and visual impacts from operation of the Proposed Development will not be significant;
- Health and Safety impacts for farms located within 50m of the proposed overhead lines represent a very low impact.

14.4.6 Operational Phase – Residential, Commercial and Community Facilities

70. The scope of this aspect of the assessment is based on disruption due to construction in the form of physical land take, impacts to due temporary traffic measures and disruption to access. There will be no permanent land take from any residential, commercial and community facilities during the

operational phases. Any traffic resulting from the maintenance requirements (as outlined in Chapter 5) will not be significant because of the low volume of traffic and their infrequent nature. Therefore there will be no significant operational phase impacts. There are thus no corresponding interrelated impacts with noise, landscape and visual and EMF.

71. The Patricia's Village garden centre will be oversailed in part by the overhead line on a permanent basis. There will be no physical impacts to the garden centre below the line and normal operations are unlikely to be affected because of the height of the overhead line above ground level (minimum safety clearance from the line is required as per NIE guidelines). Restringing will be required as a minimum of once every 40 years and will have a similar impact to the facility as was assessed for the construction phase.

14.4.7 Operational Phase – Disruption to Existing Services

72. There will be no operational phase impacts to existing services.

14.4.8 Operational Phase – Extant Planning Permissions

73. There are currently four planning permissions for chicken sheds directly under the proposed overhead line. There would be Imperceptible impacts on two of the planning permissions for the proposed chicken sheds (O/2009/0804/F and O/2009/0804/F) because the overhead line would not overhang the buildings. There would be a major adverse impact on planning permission M/2008/0143/F (if constructed as planning permission expired in May 2013) because tower 22 is located in this site. Assuming there is the required clearance there would be a Moderate Adverse impact on planning permission O/2009/0807/F due to the location of the conductors over the buildings. It is assumed that these houses can be safely built and operated as long as the required safety clearance from the overhead line is provided (as per NIE policy document 6/025). Consultations will be required between NIE and the developer of the chicken shed to determine the full nature of the impact and to determine if compensation is required.

14.5 Mitigation Measures

14.5.1 Agricultural Land Mitigation Measures

74. Legislation[142] provides that those landowners with equipment from the Proposed Development sited on or across their land or property are entitled to compensation. This is the case in instances such as if a tower is located on land or the overhead line oversails land, etc. NIE has consulted with landowners who will be directly affected by the Proposed Development to discuss compensation issues. This consultation will be ongoing.

75. All general construction phase mitigation measures presented in Chapter 5 and the Outline Construction Environmental Management Plan will be implemented and will help to minimise impacts to agricultural land. Measures include:

- The site of the proposed substation will be fenced off prior to construction to ensure that the construction activities within the site have no impact on adjoining farm land.
- An access officer 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;

[142] Schedule 4 of The Electricity (Northern Ireland) Order 1992.

- NIE will ensure that land owners have reasonable access to all parts of their farm during the construction phase to minimise or eliminate temporary farm fragmentation impacts;
- Hedgerows and drains/ditches will be reinstated after completion of works as identified in Chapter 5 of the ES;
- Disease protocols will be adhered to and NIE will comply with any DARD regulation pertaining to animal or plant diseases. Before surveying commences the land owners will be met and a pre-survey interview will be completed. The purpose of this interview will be to ask the land owner to notify NIE of any animal diseases and other risks which may arise from dangerous livestock (e.g. bulls);
- Farmers will be notified at least one week in advance of any works commencing on their farms. The contractor will make all reasonable efforts to accommodate the farmers grazing and cropping programmes and reschedule works if practical to do so.
- NIE will ensure that disinfection facilities are available to all work crews if required;
- Only personnel with clean foot wear and machines with clean wheels will be allowed to enter farms;
- Appropriate fencing will be erected to exclude livestock from sites of construction and to keep livestock within farm boundaries;
- If pilling driving is required, owners of livestock in adjoining fields will be notified in advance. This will allow land owners with sensitive livestock (e.g. blood stock) to take precautions such as moving these animals away from the piling site to a quieter part of the farm or to house them;
- Land drains which may be potentially affected during tower foundation excavations and excavations for undergrounding will be redirected and/or reconnected in a manner that maintains existing land drainage. Before surveying commences the pre-survey interview with land owners will identify location of drains;
- Where top soil is stripped it will be back filled on to the same surface. All disturbed field surfaces will be reinstated. These works may be carried out by the land owner, the contractor or an agreed third party, as agreed with the land owner. All soil disturbance works and remedies will comply with agreements made with land owners;
- Concrete will be mixed off–site and imported to the site. The pouring of concrete for tower bases will take place within a designated area using a geosynthetic material to prevent concrete runoff into the surrounding soil. Any soil contaminated by concrete spillage will be removed to an approved waste facility;
- If water is being pumped from a construction site, a water filtration system will be utilised to minimise impacts on water sources;
- NIE will employ a team to monitor the operation phase of the project and ensure that safety procedures are adhered to;
- Disease protocols will be adhered to during maintenance works; and,
- NIE will provide safety information directly to all affected land owners.

14.5.2 Residential, Commercial and Community Facilities Mitigation Measures

76. All general construction phase mitigation measures presented in Chapter 5 and the Outline Construction Environmental Management Plan will be implemented and will help to minimise impacts to residential, commercial and community facilities.

77. The mitigation proposed in relation to Traffic and Transport (Chapter 18) explains the techniques and timing to be employed during construction, including how access will be retained or managed to residential, commercial and community facilities (including amenity routes, such as cycle route and walking routes). Such measures included notice in advance of any temporary road closures in the local

media and appropriate signage to inform road users of delays and to provide alternative routes. Liaison will be undertaken with community groups as appropriate to ensure mitigation of any disturbance to access. In all cases the roads will be left in such a condition to maintain current community uses.

78. There is the potential for impacts to roads used for road bowling, racing, and other activities involved by the Tynan and Armagh Hunt and the Moy Gun Club during construction. It will be the role of contractors to leave the road in such a condition where events could be held and to liaise with Ból Chumann na hÉireann (Irish Road Bowling Association) in relation to the timing of works around areas where events are to take place during the construction period.

14.5.3 Disruption to Existing Services Mitigation Measures

79. Interruptions to electrical and telephone lines will be kept to a minimum with notice given to the affected users.

14.5.4 Extant Planning Permissions Mitigation Measures

80. All general construction phase mitigation measures presented in Chapter 5 and the Outline Construction Environmental Management Plan will be implemented and will help to minimise impacts to the four affected planning permissions.

14.6 Residual Impacts

14.6.1 Agricultural Land

81. The land area required to construct the substation is 22.2 hectares and the area of land beneath the towers is approximately 3.6 hectares. The total permanent land take is approximately 25.8 hectares, which is a tiny fraction of the area of agricultural land in counties Armagh and Tyrone (326,417 hectares) and is less than two percent of the area of affected land parcels (1,767 hectares). Therefore the significance of impact on a regional or national level will be Imperceptible.

82. Approximately 25.8 hectares of agricultural land will be required for the construction of the Proposed Development. There will be medium term impacts on a further 26.5 hectares around the towers, stringing sites, guarding locations and along access tracks and undergrounding trenches. This combined area is 3.0% of the total agricultural land area in land parcels along the Proposed Development. The significance of residual operational impact, after mitigation, on the agronomy environment along the Proposed Development is assessed to be Imperceptible.

83. The farm impacts in the operational phase are due to land area reductions (tower sites), short-to-medium term damage caused to land during the construction phase, long term inconvenience caused by the presence of the overhead lines and towers and potential restrictions caused to farm yard expansion. The residual impact significance on each land parcel is detailed in Appendix 14A and summarised in Table 14.11.

84. Of the 181 affected land parcels within the study area, one parcel experiences a major residual adverse impact. This is due to the high level of land loss due to construction of the substation. The remaining parcels are affected to an imperceptible, slight adverse or moderate adverse degree – with a high percentage as imperceptible (Table 14.11).

85. Farm 001 experiences a major adverse residual impact. This parcel is affected by the proposed substation and the overhead line suspended on Tower No 2 (Tower No 1 will be located within the site of the substation). NIE has agreed an option to buy the area of the substation from the landowner as

shown in Figure 14.10. The remainder of the parcel will remain in agricultural use. There will be medium term damage to soil structure on the residual land at the construction site around the tower, at two stringing sites, at one guarding location and along temporary access tracks. The residual impact is a result of the following:

- 21 ha is lost as a result of the proposed substation and 0.06 ha is lost under one tower (the land take is 54% of the original land parcel);
- 0.4 ha of medium term damage to soil structure caused during the construction of the overhead line and towers (affecting 2% of the residual land); and,
- Very Low potential impact on farm yard due to location of overhead line 270 metres from yard and 160 metres from the boundary of the substation.

Taking all these factors into account the overall residual impact on farm 001 is major adverse.

Table 14.10 Summary of individual land parcel Residual Impacts

Significance Category	**Operational Phase (Residual) Impacts**	
	Number of land parcels	**% of total**
Imperceptible	140	77.5
Slight Adverse	35	19
Moderate Adverse	5	3
Major Adverse	1	0.5

14.6.2 Residential, Commercial and Community Facilities

86. During the construction phase, with the implementation of the proposed mitigation measures, there will be overall a temporary moderate adverse impact in terms of disruption due to construction on public roads, access tracks, journey times and impacts to the Patricia's Village garden centre. During operation, there will be no significant impact.

14.6.3 Disruption to Existing Services

87. During construction and operation there will be no significant impact.

14.6.4 Extant Planning Permissions

88. There would be Imperceptible impacts on two of the planning permissions for the proposed chicken sheds (O/2009/0804/F and O/2009/0804/F) because the overhead line would not overhang the buildings. There would be a major adverse impact on planning permission M/2008/0143/F (if constructed as planning permission expired in May 2013) because tower 22 is located in this site. Assuming there is the required clearance there would be a Moderate Adverse impact on planning permission O/2009/0807/F due to the location of the conductors over the buildings.

14.7 Conclusions

89. There will be overall an Imperceptible impact to agricultural land as a result of the Proposed Development. There will be an imperceptible or slight adverse impact to 96% of the affected land parcels during construction and operation.

90. A garden centre will be oversailed in part by the proposed overhead line, which will have a temporary moderate adverse impact during construction. Beyond that there is a day nursery approximately 900m from the Proposed Development and a primary school approximately 700m away. The significant impacts to residential, commercial and community facilities will be limited to the construction phase of the Proposed Development. These impacts arise from temporary disruption to residential properties along some of access tracks which use non-adopted roads. These will be temporary major impacts; however they will be limited to approximately 29 working days at each tower location.

91. During construction, there will be some diversion to existing electricity and telephone lines, which may result in temporary interruptions.

92. There are currently four planning permissions for chicken sheds directly under the proposed overhead line. There would be Imperceptible impacts on two of the planning permissions for the proposed chicken sheds (O/2009/0804/F and O/2009/0804/F) because the overhead line would not overhang the buildings. There would be a major adverse impact on planning permission M/2008/0143/F (if constructed if constructed as planning permission expired in May 2013) because tower 22 is located in this site. Assuming there is the required clearance there would be a Moderate Adverse impact on planning permission O/2009/0807/F due to the location of the conductors over the buildings. It is assumed that these houses can be safely built and operated as long as the required safety clearance from the overhead line is provided (as per NIE policy document 6/025).

14.8 References

DOE. (1993). A Planning Strategy for Rural Northern Ireland. http://www.planningni.gov.uk/index/policy/policy_publications/rural_strategy.htm (Accessed October 2012)

DOE. (1995). Armagh Area Plan 2004. http://www.planningni.gov.uk/index/policy/dev_plans/devplans_az/armagh_2004.htm (Accessed October 2012)

DOE. (1998). PPS 1- General Principles. http://www.planningni.gov.uk/index/policy/policy_publications/planning_statements/pps01-general-principles.pdf (Accessed October 2012

DOE. (2001). Armagh Area plan Alternations No. 1: Armagh Countryside Proposals. http://www.planningni.gov.uk/index/policy/dev_plans/devplans_az/armagh2004-area-plan-alt1.pdf (Accessed October 2012)

DOE. (2002) PPS 10- Telecommunications http://www.planningni.gov.uk/index/policy/policy_publications/planning_statements/pps10-telecommunications.pdf (Accessed October 2012)

DOE. (2004). Armagh Area Plan 2018 Issues Paper http://www.planningni.gov.uk/index/policy/dev_plans/devplans_az/armagh2018-issues-paper.pdf (Accessed October 2012)

DOE.(2004) PPS 8 – Open Space, Sport and Outdoor Recreation http://www.planningni.gov.uk/index/policy/policy_publications/planning_statements/pps08-open-space.pdf (Accessed October 2012)

DOE. (2005). Dungannon and South Tyrone Area Plan. http://www.planningni.gov.uk/index/policy/dev_plans/devplans_az/dungannon2010-adopted-plan.pdf (Accessed October 2012)

DOE. (2005). PPS 3 - Access, Movement and Parking. http://www.planningni.gov.uk/index/policy/policy_publications/planning_statements/pps03-access-parking.pdf (Accessed October 2012)

DOE. (2010) PPS 4 – Planning and Economic Development http://www.planningni.gov.uk/index/policy/policy_publications/planning_statements/planning_policy_statement_4-2.pdf (Accessed October 2012)

DOE (2010) PPS 21- Sustainable Development in the Countryside, http://www.planningni.gov.uk/index/policy/policy_publications/planning_statements/planning_policy_statement_21__pps21__sustainable_development_in_the_countryside-3.pdf (Accessed October 2012).

DRD. (2001). Shaping Our Future - Regional Development Strategy for Northern Ireland 2025. http://www.planningni.gov.uk/index/policy/regional_dev.htm (Accessed October 2012)

DRD. (2008). Shaping Our Future – Adjustments to the Regional Development Strategy 2025. http://www.drdni.gov.uk/adjustments_to_the_regional_development_strategy__rds__-2025.pdf (Accessed October 2012)

Irish Road Bowling Association. http://www.irishroadbowling.ie/. (Accessed October 2012)

Northern Ireland 2011 Census. http://www.nisra.gov.uk/Census/2011Census.html . (Accessed October 2012),

Northern Ireland Libraries. http://www.ni-libraries.net/. (Accessed October 2012)

Northern Ireland Statistics and Research Agency http://www.nisra.gov.uk/. (Accessed October 2012)

Southern Education and Library Board (http://www.selb.org/) (Accessed October 2012)

Visit Armagh from www.visitarmagh.com (Accessed October 2012)

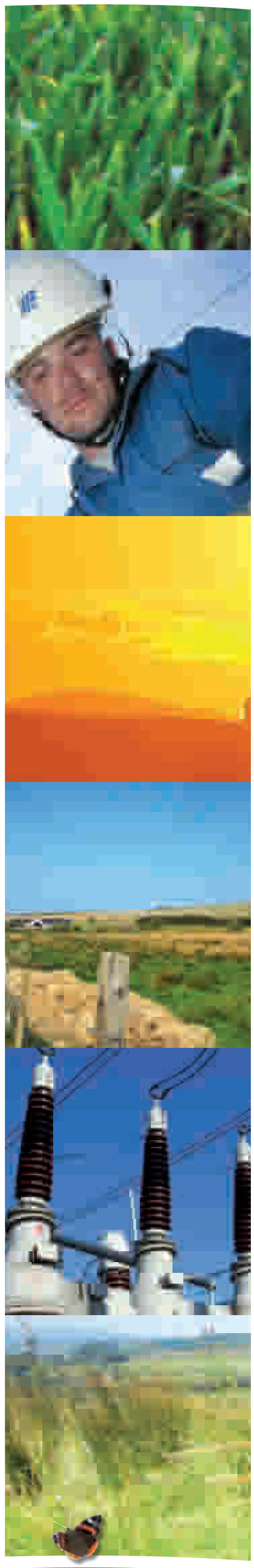
Visit Blackwater Region. Activity and trail guides for the study area. www.visitblackwaterregion.com. (Accessed October 2012)

Visitor attractions and accommodation locations for Armagh www.armagh.gov.uk. (Accessed

October 2012)

Visitor attractions and accommodation locations for Armagh. www.visitarmagh.com (Accessed October 2012.9)

Visitor attractions and trail guides for the study area www.armaghanddown.com (Accessed October 2012)



Chapter 15

Socio-Economics

Consolidated Environmental Statement

Volume 2

Part funded by
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Northern Ireland Electricity

15 Socio-economics

Chapter Executive Summary

There will potentially be a positive impact on employment, including direct employment and indirect employment. There will also be an indirect positive impact on the hospitality industry in the local area at the construction stage of the Proposed Development, as contractors and other workers may stay in the local area during construction.

The impacts of the Proposed Development on visitors and visitor spending, employment and local hospitality businesses in the development area have been assessed and it is considered that there will be no significant negative impacts.

The savings of £7m per year for Northern Irish electricity consumers estimated by DETI are considered to be a significant positive effect to the economy.

Impacts to tourism will not be direct as no tourist sites will be physically impacted by the Proposed Development. The key sites within the study area (the Argory, Navan Centre and Benburb Priory) will have views of the construction and operational phases but it is considered that these impacts will not be significant. Four recreational routes will be oversailed by the Proposed Development and will experience a minor adverse impact during construction.

As there will be a significant negative impact to the running of a bioremediation area used by the Linwoods facility, mitigation and compensation will be required to be agreed with the landowner/operator.

15.1 Introduction

1. This Chapter presents an assessment of the Proposed Development as set out in Chapter 5, in relation to the socio-economic environment.

2. The assessments of impacts to population are also assessed in the following Environmental Statement (ES) chapters*:*

- Chapter 2 Need;
- Chapter 3 Planning and Development Context;
- Chapter 7 EMF;
- Chapter 11 Noise;
- Chapter 12 Cultural Heritage;
- Chapter 13 Landscape and Visual;
- Chapter 14 Community Amenity and Land Use; and,
- Chapter 18 Transport.

15.2 Methodology

15.2.1 Scope of Assessment

3. Based on consultation with the Department of the Environment and other consultees, and a consideration of likely significant impacts arising from the nature of the receiving environment and the nature of the Proposed Development, it was determined that the Socio-Economic Assessment should be focused on the potential impact to tourism in the area. The socio-economic context is also established, and details on the economic impacts of the Proposed Development are also provided.

4. There will be no direct impacts to any employment locations other than agricultural, horticultural and forestry lands. There will be a direct impact to a bioremediation area which is used to treat effluent from the Linwoods facility. Impacts on the agricultural, horticultural and forestry lands have been assessed in Chapter 14 Community Amenity and Land Use. The impact to the bioremediation area has been assessed in this Chapter. It is considered that there are no other likely significant direct impacts to employment locations as a result of the Proposed Development and these have been scoped out of the assessment.

5. Indirect impacts to employment locations may occur during the construction phase arising from traffic disruption due to construction. These impacts have been assessed and mitigation measures have been outlined in the Chapter 18 (Transport) of the ES. Impacts from maintenance traffic during operation will be negligible and further consideration of these impacts with regard to employment locations has been scoped out of this assessment.

15.2.2 Demographic Baseline Data

6. Demographic data for settlements within 2km of the substation site boundary and the centreline of the overhead line was reviewed and is summarised in this chapter. This provides the socio-economic baseline and context.

15.2.3 Tourism Assessment

7. The assessment is based on the scoping and consultation exercise conducted for the project and is undertaken with consideration of published guidelines such as the Scottish Government's research document on the "Economic Impacts of Wind Farms on Scottish Tourism 2008".

8. The following tasks were undertaken to inform the determination of likely impact on tourism:

- Reviewing tourism policies;
- Obtaining tourism data to establish a baseline for tourism in the area;
- Consulting with key organisations involved in the management of tourism in the area;
- Considering the evidence and estimating the likely impacts.

9. Baseline information on the tourist economy in proximity to the Proposed Development was reviewed and compared to other regions within Northern Ireland and Northern Ireland as a whole. Baseline information was collected on the following:

- Tourism data for Northern Ireland - Information on the top 10 visitor attractions and regional tourism estimates;
- Information on visitor attractions within Armagh and Tyrone; and,

- Tourism related industry in proximity to the Proposed Development –Identification of businesses providing visitor accommodation in the study area.

10. This assessment considers a study area of 5km from the substation site boundary and the centreline of the overhead line.

11. The data used to provide the baseline information on tourism within this Chapter uses Northern Ireland Tourist Board (NITB) publications[143].

12. The baseline information was used to establish the location and uses of tourism sites in proximity to the Proposed Development, thereby providing an indication of the tourism value of the study area.

13. The nature of impacts on tourism was considered, and a judgement of significance of this impact was made with consideration to the detailed assessments contained elsewhere in this ES (such as the landscape and visual assessment).

15.2.4 Economic Assessment

14. In assessing the economic impacts of the Proposed Development, information was gathered on the likely employment and capital spend during construction and operation of the Proposed Development from NIE.

15. An assessment of direct impact to a bioremediation area which is use to treat effluent from the Linwoods facility is also provided.

15.2.5 Significance Criteria

16. Table 15.1 identifies the broad criteria that are used to determine significance of an impact.

Table 15.1 Significance Criteria for Assessing Socio – Economic Impacts

Impact Threshold	Criteria
Major Adverse	Large scale impacts on activities or resources, and/or where there is an obvious view of the Proposed Development with potential to cause significant impact on economic activity.
Moderate Adverse	Small scale impacts on activities or resources, but a large number of people or activities will be affected; or where the Proposed Development's visibility could have a possible detrimental effect on activity, resources, employees or other users or where the extent of impacts on activities or resources is large scale but only a small number of people or activities will be affected.
Minor Adverse	Small scale impacts on activities or resources likely to affect a limited number of people or activities; or where the Proposed Development would be unlikely to be visible or would be at a distance.

[143] Due to changes in collection and collation of tourism statistics, there is no post 2007 visitor number data available. For this reason, the 2007 data has been used. All baseline information was the most up to date information available when this assessment was finalised.

Impact Threshold	Criteria
Negligible	Where no impacts are predicted or where the Proposed Development would not be visible or not otherwise have an effect.
Positive	Impacts on activities or resources, and/or where there is an obvious view of the Proposed Development with potential to cause impact on economic activity. (Because of the nature of the Proposed Development, degrees of significance are not required.

15.2.6 Policy Context

17. Key guidance relating to this chapter include:

- Regional Development Strategy for Northern Ireland 2035 (Department for Regional Development [DRD] , March 2012);
- PPS 16 – (Draft) Tourism (Department of the Environment [DOE], 2010);
- Draft Tourism Strategy for Northern Ireland to 2020 (Department for Enterprise, Trade and Investment [DETI], 2010);
- A Planning Strategy for Rural Northern Ireland (DOE, 1993);
- Armagh Area Plan 2004 (DOE 1995);
- Armagh Area Plan 2004 Alterations No 1 :Armagh Countryside Proposals (DOE 2001);
- Armagh Area Plan 2018 Issues Paper (DOE 2004); and,
- Dungannon and South Tyrone Area Plan 2010 (DOE, 2005).

15.2.7 Indication of Any Difficulties Encountered

18. In 2004 a vision for the future of the Northern Ireland (NI) tourism industry was set out in the NITB's Strategic Framework for Action (NITB 2004). This strategy introduced the concept of Signature Projects which aimed to deliver sustainable economic growth for NI. Delivery of the five Signature Projects is a key part of creating the Northern Ireland tourism experience. The five Signature Projects identified were: Saint Patrick and Christian Heritage; the Mournes; Causeway Coast and Glens; the Walled City of Derry; and Titanic. NITB provides a wide range of data and information on these signature projects. However, there is limited data available post 2007 on tourist attractions beyond the five Signature Projects. Therefore difficulties were encountered in collating up to date data for the study area as it does not fall under any of the five signature projects.

19. Data collated from NITB included regional tourism performances estimates for early 2012, regional attractions for 2011, jobs created by tourism in 2012 visitor attractions and expenditure for Tyrone and Armagh 2011. Difficulties were encountered in combining this data into a cohesive dataset due to the varying dates of publications and the varied information available both regionally and locally.

20. Additionally, due to the nature of tourism sites changing with some closing down, reopening etc it was difficult to identify all sites within the study area; however a thorough attempt was made through a desktop survey of the best available information

21. The potential for future tourism developments or facilities has been assessed within this ES. This included committed developments for which planning applications have been submitted. Reasonable efforts have been made to identify future developments without planning applications through public

and statutory consultations. The Proposed Development would not preclude future developments so long as safety clearance issues were taken into account.

22. Assumptions have been made on the Linwoods bioremediation area in the absence of publically available information. The assessment has been made based on the available information following a precautionary approach. Further consultations will be required with the owner and operator of the area to determine the detail of the suggested mitigation measures.

15.3 Baseline Conditions

15.3.1 Demographic Baseline

23. The main settlements in the 2km study area are Moy, Benburb, Blackwatertown, Killylea and Derrynoose. Armagh and Dungannon are the two largest settlements in proximity to the study area; both are approximately 5km from the Proposed Development.

24. The settlements identified within 2km are shown in Table 15.2, where a demographic description is provided.

Table 15.2: Settlements with Study Area

Settlement	Overview
Moy	Moy village is located approximately 8km southeast of Dungannon, Co. Tyrone. It is in the Moy ward, which had a population of 3009 residents and a population density of 1.13 persons per hectare in the 2011 Census.
Benburb	Benburb town is approximately 5km southwest of Moy village and is within the Benburb ward. The Benburb ward had a population of 2860 and a population density of 0.7 persons per hectare in the 2011 Census
Blackwatertown	Blackwatertown village is approximately 4km south of Moy village and is within the Charlemont ward. Charlemont ward had a population of 2774 and a population density of 0.81 persons per hectare in the (2011 Census.
Tullysaran, Artasooly	Tullysaran and Artasooly are within the Ballymartrim ward. This ward had a population of 2725 and a population density of 0.44 persons per hectare in the 2011 Census,
Killylea, Drumsallen, Drumhillery,	The settlements of Killylea, Drumsallen, Drumhillery and Glassdrummond are in the Killylea ward. Killylea village is largely outside of the 2km study area; however it has been included as some of its community facilities are in close proximity to the study area. Killylea ward had a population of 2474 and a population density of 0.39 persons per hectare in the 2011 Census.
Aghavilly	Aghavilly is located within the Milford ward. It is outside the 2km study area but has been included here for consistency. The Milford ward had a population of 2730 and a population density of 0.62 persons per hectare in the 2011 Census
Maddan	Maddan is approximately 9km southwest of Armagh and is located within the Tandragee ward. The Tandragee ward had a population of 2925 and a population density of 1.98 persons per hectare in the 2011 Census.
Derrynoose	Derrynoose settlement is approximately 5km southwest of Keady (which is 6km south of Armagh) and is within the Derrynoose ward. It had a population of 3475 and a population density of 0.5 persons per hectare in the 2011 Census.

(2011 Census dataset QS102)

15.3.2 Tourism Baseline

15.3.2.1 NI Tourism Information

25. The NITB calculates that for January-June 2012 there were a total of 594,000 visits made to NI by overseas visitors, the majority of which were from Great Britain. In addition an estimated 813,000 visits were made by NI residents during January-June 2012. The total revenue earned from tourism in NI for January-June 2012 has been estimated at £157 million.

26. Table 15.3 shows the most popular visitor attractions in NI for 2011. (Note: The Visitor Attraction Survey is voluntary and organisations can choose to not have their data published.)

Table 15.3: Top 10 Participating Visitor Attractions visited in 2011

RANK	ATTRACTION	VISITOR NUMBERS
1	Dundonald Ice Bowl	601,000
2	Giant's Causeway Visitor Centre	533,000
3	Ulster Museum	471,000
4	Peace Bridge	336,000
5	Belfast Zoo	283,000
6	Historic Walls of Derry	278,000
7	W5	251,000
8	Newry Cathedral	250,000
9	Carrick-a-Rede Rope Bridge	243,000
10	Ulster Folk and Transport Museum	201,000

(Excluding Country Parks/Gardens) (NITB 2012)

27. Of the top 10 reporting organisations, the majority (6) are in County Antrim, with one each in Counties, Down and Derry/Londonderry. None of these attractions are within Armagh or Tyrone.

28. Of the top 10 participating country/forest parks and gardens, Dungannon Park, Tyrone is the tenth most visited in 2011, with 125,000 visitors. Of the Argory, Benburb Priory and the Navan Centre, only the Navan Centre has reported its visitor numbers – 45,000 in 2011.

15.3.2.2 Regional Tourism Estimates for NI

Overview

29. Table 15.4 provides the most recent available regional tourism estimates for the number of visits and expenditure (£million) in each of the areas. The estimates show that Belfast accounts for the greatest number of trips (718,900) and overnight stays (2,423,800) and the greatest percentage of spend (25.3%).

30. The estimates show that the Armagh and Down regions accounted for 323,500 trips and £49 million spent. Dungannon accounted for 45,700 trips and £7.4 million spent.

Table 15.4: Regional Tourism Estimates 2009 (NITB 2012)

AREA	TRIPS (Thousands)	TRIPS %	NIGHTS (Thousands)	NIGHTS %	SPEND (£MILLION)	SPEND %
Antrim	129.1	4.1	417.0	3.9	25.6	5.0
Ards	74.7	2.4	285.5	2.7	8.3	1.6
Armagh	58.5	1.9	229.6	2.2	8.8	1.7
Ballymena	87.8	2.8	409.5	3.9	13.4	2.6
Ballymoney	19.3	0.6	79.7	0.8	2.6	0.5
Banbridge	41.6	1.3	159.7	1.5	4.6	0.9
Belfast	718.9	23.0	2,423.8	22.9	128.2	25.3
Carrickfergus	59.5	1.9	189.6	1.8	9.1	1.8
Castlereagh	13.0	0.4	43.5	0.4	1.7	0.3
Coleraine	306.6	9.8	1,017.9	9.9	59.4	11.7
Cookstown	31.3	1.0	107.7	1.0	4.3	0.8
Craigavon	58.3	1.9	275.5	2.6	8.6	1.7
Derry	165.7	5.3	616.5	5.8	28.9	5.7

AREA	TRIPS (Thousands)	TRIPS %	NIGHTS (Thousands)	NIGHTS %	SPEND (£MILLION)	SPEND %
Down	265.0	8.5	742.4	7.0	40.2	7.9
Dungannon	45.7	1.5	213.5	2.0	7.4	1.5
Fermanagh	177.1	5.7	505.2	4.8	32.2	6.3
Larne	102.9	3.3	289.6	2.7	11.6	2.3
Limavady	72.8	2.3	211.8	2.0	9.8	1.9
Lisburn	102.7	3.3	403.9	3.8	13.1	2.6
Magherafelt	28.1	0.9	109.2	1.0	4.1	0.8
Moyle	162.4	5.2	476.3	4.5	27.0	5.3
Newry & Mourne	93.6	3.0	286.5	2.7	12.7	2.5
Newtownabbey	58.8	1.9	270.2	2.6	8.6	1.7
North Down	166.4	5.3	483.5	4.6	19.2	3.8
Omagh	58.7	1.9	208.7	2.0	13.5	2.7
Strabane	31.1	1.0	109.7	1.0	4.2	0.8
TOTAL	3.1 million	100	10.6 million	100	£507 million	100

15.3.2.3 Tourism and Employment in NI

31. Table 15.5 illustrates the numbers employed in the tourism industry across NI as a whole. A total of 54,080 are employed as a direct result of tourism, mainly in the food and beverage service sector (29,480 jobs) (NITB 2012).

Table 15.5: Direct jobs supported by Tourism within NI

SECTOR	NUMBERS EMPLOYED
Accommodation	9,410
Food and beverage service activities (excluding event catering and other food activities)	29,480
Transport agency, tour operator and other reservation services and related activities	1,340
Libraries, archives, museums and other cultural activities	2,460
Gambling and betting activities	2,210
Sports activities and amusements and recreation activities	9,170
Total	54,080

(NITB, 2012)

Visitor Attractions and Attractions in County Tyrone

32. NITB carried out an NI Visitor Attitude Survey for Tyrone and Sperrins in 2011; it highlighted that leisure visitors to this area are most likely to be families or couples on a daytrip who are looking for some where scenic where they can relax. The majority of visitors are from NI with a smaller share from the Republic of Ireland (ROI).

33. Visiting a specific attraction, such as a museum or art gallery, house or other historic monument were the main activities undertaken in the area. Many also visited a visitor/interpretation centre. Travel to Tyrone and Sperrins varies by trip type, with those on a day trip typically from NI or ROI (many are from

Derry or Donegal) using their own car and a larger share of those on holiday or a short break, arriving via sea into ROI with many using a private/tour coach.

34. A third of all leisure visitors to Tyrone also visited the ROI on their trip. Reflecting Tyrone's popularity as a day trip destination, the majority did not visit the areas outside of Tyrone and Sperrins during their single visit. For those on holiday or a short break, hotels and Guest Houses Bed and Breakfasts were most widely used. Cafes were the most popular place to eat out. Table 15.6 lists the average spends per visit to Tyrone and Sperrins.

Table 15.6: Tourist Expenditure in Tyrone and Sperrins

	AVERAGE SPEND PER VISIT, PER PERSON NI AVERAGE	AVERAGE SPEND PER VISIT, PER PERSON WITHIN TYRONE AND SPERRINS
All Visitors	£105	£40
Overnight	£168	£77
Day Visitors	£33	£27

(NITB, Visitor Attitudes Survey 2011)

35. The average spend per person, per visit was £40 across all visitors, ranging from £27 amongst day visitors to £77 amongst visitors who stayed overnight.

Visitor Numbers and Attractions in County Armagh

36. According to NITB's NI Visitor Attitudes Survey (2011) the vast majority (89%) of leisure visitors to Armagh were from the island of Ireland and were on a day trip to the area. Visitors from outside NI mainly used their own car.

37. The main activities undertaken were hiking/walking and visiting a park or garden. One in four also visited places related to St. Patrick and Christian Heritage.

38. Table 15.7 lists the average spends per visit to Armagh.

Table 15.7: Tourist Expenditure in Armagh

	AVERAGE SPEND PER VISIT, PER PERSON NI AVERAGE	AVERAGE SPEND PER VISIT, PER PERSON WITHIN ARMAGH
All Visitors	£105	£33
Overnight	£168	£93
Day Visitors	£33	£26

(NITB, Visitor Attitudes Survey 2011)

39. Reflecting the large share of leisure day trippers to this area, average spend was much lower than for NI as a whole (£33 compared to £105 for NI).The average spend per person, per visit was £33 across all leisure visitors, ranging from £26 amongst day leisure visitors to £93 amongst leisure visitors who stayed overnight. Compared to other destinations, a larger proportion of those staying overnight used self catering accommodation.

15.3.2.4 Visitor Attractions within the Study Area

40. There are a number of organisations promoting tourism within the study area. In addition to the NITB, tourism interests are also promoted by Armagh City and District Council and Dungannon and South Tyrone Borough Council.

41. Tables 15.8 list the number of visitor attractions within the study area, and their location. All of these attractions are over 1km from the Proposed Development.

Table 15.8: Visitor Attractions within the Study Area

VISITOR ATTRACTION	LOCATION
Armagh Ancestry	Armagh City
Armagh County Museum	Armagh City
Armagh Astro Park	Armagh City
Armagh Planetarium	Armagh City
Armagh Public Library	Armagh City
Armagh Palace	Armagh
Armagh Roman Catholic Cathedral	Armagh City
Ardress House	Portadown
Barn Museum	Craigavon
Craigavon Lakes	Craigavon
Dan Winter Ancestral Home	Loughgall
Peatlands Bog Walk	Loughgall
Gosford Forest Park	Markethill
Lough Neagh Discovery Centre	Craigavon
Loughgall Country Park	Loughgall
Our Lady of Benburb Servite Priory	Benburb, Tyrone
Oxford Island National Nature Reserve	Craigavon
Palace Stables Heritage Centre	Armagh City
Royal Irish Fusiliers Museum	Armagh City
Tannaghmore Gardens	Craigavon
Clare Glen	Tandragee
Tayto Ltd	Tandragee
Navan Centre	Armagh (Killylea Road)
Ti Chulainn Cultural Activity Centre	Mullaghbawn
Argory	Moy
Dungannon Heritage Trail	Dungannon
Highway to Health, Armagh	Armagh
St Patricks Cathedral	Armagh City
Ni Eoghain Lodge	Tassagh
Cardinal Tomas O Fiaich Memorial Library and Archive	Armagh City
Irish and Local Studies Library	Armagh City
Milford House Museum	Armagh City
Regional Cycle Route 11	Throughout NI
River Blackwater Canoe Trail	Armagh and Tyrone
Tynan Abbey	Armagh
National Cycle Route 91	Armagh
National Cycle Route 95	Armagh
Keady Heritage Centre	Keady
Ulster Way	Throughout NI

15.3.2.5 Tourism Related Industry within the Study Area

42. Table 15.9 lists Bed & Breakfasts, Guesthouses, Self Catering Accommodation and Hostels that are located with the study area.[144]

Table 15.9: Bed and Breakfasts, Guesthouses, Hostels and Self Catering Accommodation within the Study Area

ACCOMMODATION	ADDRESS	DISTANCE TO DEVELOPMENT (KM)
B &Bs and Guesthouses		
Battleford B&B	122A Battleford Road, Armagh	0.14
Grange Lodge	7 Grange Road, Dungannon	0.77
Seyloran Gate Lodge	Rhone Hill Estate, Dungannon	1.04
The Ryandale Inn	18-18 The Square, Moy	1.68
Charlemont House B&B	4 The Square, Moy	1.70
Beechmont Cottages	83 Moy Road, Dungannon	1.85
Dungorman Gate Lodge	Rhone Hill Estate, Dungannon	1.97
Allistragh House	65 Moy Road, Armagh, BT61 8DW	3.29
Fairylands Country House	25 Navan Fort Road, Armagh	3.56
The Laurels B & B	20 Monaghan Road, Armagh, BT60 4DA	4.21
Meadows B&B	18 Monaghan Road, Armagh	4.23
Desart Guesthouse	Desart Lane, Cathedral Road, Armagh, BT61 8AE	4.49
Ashrene	195 Killylea Road, Tynan, Co. Armagh, BT60 4RF	4.53
Ni Eoghain Lodge	32 Ennislare Road, Armagh, BT60 2AX	4.94
Self Catering Accommodation		
Spice Cottages	142 Moy Road, Dungannon	0.25
Summerhill Courtyard Cottages	87 Killylea Road, Armagh	0.95
Strandwell Cottage	116 Ballycullen Road, Blackwatertown	1.25
Fort View Court	17 Main Street, Charlemont	2.01
College Hall Farmhouse	15 College Hall Lane, Tynan	4.71
Hostel		
Armagh City Hostel	39 Abbey Street, Armagh, BT61 7EB	4.94
Hotel		
Charlemont Arms Hotel*	63-65 Upper English Street, Armagh	5.18
Armagh City Hotel*	Friary Road, Armagh	5.29

*Hotel outside 5km but included for reference

43. Eleven out of the 22 accommodation businesses listed in the above table are over 3km from the Proposed Development. With four of the accommodation businesses less than 1km of the Proposed Development: Battleford Bed & Breakfast, Grange Lodge, Spice Cottages and Summerhill Courtyard Cottages.

[144](Visit Discover Northern Ireland website, accessed 2012)

15.3.2.6 Conclusions on Tourism Baseline Data

44. Visitor numbers to attractions in Armagh and Tyrone are low compared with other regions of NI. Visitors to Armagh in 2011 were mainly from the island of Ireland and participated in the activities of hiking/ walking and visiting a park or garden. St Patrick and Christian Heritage were also popular. Visitors to Tyrone and Sperrins in 2011 were mainly from NI and visited a museum or art gallery, house or historic monument. For both Armagh and Tyrone average spends were much lower than for NI.

45. The 2011 Census (dataset KS605) gives 1098 accommodation and food service employees, or 4.13% of economically active 16-74 year olds, in Armagh Local Government District. In Dungannon the 2011 Census gives 985 accommodation and food service employees or 3.84% of economically active 16-74 year olds. Dungannon has the lowest percent of accommodation and food service employees of all the local government districts in NI; the average is 5.1% and the highest is 8.05% (Coleraine). This would indicate that while tourism is an established part of the local economy, it is not a major economic element.

46. Fourteen bed & breakfasts and guesthouses, five self catering complexes and one hostel were found within 5km of the Proposed Development. Of these, four were less than 1km from the Proposed Development.

47. There are a number of organisations promoting tourism within the study area including Armagh City and District Council and Dungannon and South Tyrone Borough Council. Of the 39 visitor attraction sites within the study area, only three are within 2.5km of the Proposed Development and none are within 1km. The Argory, the Navan Centre and Benburb Priory are the only key visitor attractions identified within 2.5km of the Proposed Development. The Argory is 1.4km from the Proposed Development. Navan Centre is 2.1km from the Proposed Development and Benburb Priory is 1.4m from the Proposed Development.

15.3.3 Economic Baseline

48. With regard to construction and maintenance employment, NIE currently has few employees or contractors working on construction projects or operating in proximity to the Proposed Development.

49. With regard to direct impacts to the Linwoods bioremediation treatment area, the Linwoods facility was established at its current location on the Monaghan Road in 1996 (555m south-east of the Proposed Development). The facility is used for bakery, health foods and dairy production and distribution of the goods. Effluent from the facility is treated through a willow bioremediation area, roughly 1km to the west of the facility and this was established in 2007. It is understood that the bioremediation area was installed to replace the previous treatment regime, were effluent was removed by road tanker and treated in a NI Water wastewater facility in Armagh. The bioremediation area is approximately 13ha[145] and would be directly affected, in part, through the construction of Tower 71 and other associated works (see Sections 15.4 and 15.6 for a description of the potential and residual impacts).

50. The effluent runs from the facility through a pipeline to a 400,000 litre tank (Irish Farmers Journal 14 March 2009). The effluent is then discharged through a series of pipes laid through the rows of the planted willow at 9m intervals. Generally for a system of this type, the effluent would be discharged through the nozzles in the rows of pipe at pressure at roughly 200 litres per day (based on the size of the plantation). The willow plants are harvested as biofuels and are cut back to ground level every two – three years after growing to a height of 4 – 5m.

51. The area is operated under a Consent to Discharge Effluent (No. 344/07) from the Department of the Environment. This Consent controls the volume of discharge per day and per hectare per year. The Consent also specifies weather conditions when there may be no discharge and specifies water quality standards for the waterway downstream of the area.

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[145] Irrigation pipe work has been installed on 7.2ha of willow plantation (ultimately a total of 12.9ha allowing for un-irrigated margins and buffer zones at the edges of the willow plantation).

52. The facility and bioremediation area are both considered to be of high value.

15.4 Potential Impacts

15.4.1 Overview

53. All impacts to tourism will be indirect as no tourist sites will be physically impacted by the Proposed Development. The potential impacts to tourism sites could result from impacts to views from or the setting of the attraction, which could affect the site and visitors' enjoyment of the sites and possibly leading to reduced visitor numbers.

54. The Argory, the Navan Centre and Benburb Priory are the only key visitor attractions identified within 2.5km of the Proposed Development and have been determined to be the only sites with the potential for likely significant impacts. The remaining tourism sites in the study area have been scoped out of the assessment.

55. The Proposed Development crosses over four recreational trails: the Ulster Way, Regional Cycle Route 11, National Cycle Route 91 and River Blackwater Canoe Trail. These routes are assessed below with regard to tourism impacts and are also considered in Chapter 14 Community Amenity and Land Use.

56. The assessment of the potential tourism impacts is detailed below with consideration given to the assessments made in Chapter 13 Landscape and Visual and Chapter 12Cultural Heritage Chapters of this ES. The detail of those assessments is available in the respective chapters.

15.4.2 Construction Phase – Tourism Impacts

15.4.2.1 Argory

57. The construction activities of the Proposed Development will be viewed from this location and the visual impacts will be Minor Adverse during construction of the substation and Minor - Moderate Adverse for the construction of the overhead line and towers. The temporary nature of the proposed works means that the significance of the impacts will be limited.

58. From ground level, there will only be very limited views of the Proposed Development due to the amount of extant tree cover. Even in winter when leaf cover is minimal views will be very limited. While there will be some views from upper storeys of the house these are unlikely to worsen the existing condition as the proposed line will be less dominant than other modern features (e.g. existing power lines, telegraph poles etc) already present.

59. It has been determined that there will be no significant cultural heritage impacts to the setting of the Argory during construction.

60. In terms of tourism, it has been assessed that there will be a minor adverse impact to the Argory during construction. There will be possible but limited views of construction activities but these will be set in the context of existing electrical infrastructure.

15.4.2.2 Navan Fort

61. The construction activities for the overhead line will be viewed from this location however will be barely perceptible due to the distance. The visual impacts will be Minor Adverse during the construction period.

62. It has been determined that there will be no significant cultural heritage impacts to the setting of Navan Fort during construction.

63. In terms of tourism, it has been assessed that there will be a Minor Adverse impact to Navan Fort during construction. There will be distant views of construction activities from the Fort itself. The visitor centre will be unaffected.

15.4.2.3 Benburb Priory

64. The construction activities for the Proposed Development will be visible at a distance from views within the grounds of the Priory. The visual impacts will be Moderate Adverse during the construction period.

65. It has been determined that there will be no significant cultural heritage impacts to the setting of the Priory and Castle during construction.

66. In terms of tourism, there will be some distant views of construction activities from certain parts of the ground of the Priory. However, there will be no change to the normal operation of the facility as Pastoral, Retreat and Conference Centre in terms of uses during construction. The views from the grounds are part of the visitor attraction but not central and so it has been assessed that there will be a negligible impact during construction.

15.4.2.4 Recreational Trails

67. The visual impacts during construction to the Regional Cycle Route 11 have been assessed to be Negligible – Minor adverse. The construction visual impacts to National Cycle Route 91/The Ulster Way have been assessed as Minor – Moderate Adverse. The construction visual impacts to the River Blackwater Canoe Trail have been assessed to be Moderate Adverse.

68. In terms of tourism, the four routes will not be closed during the construction phase and any impacts will be limited to the duration of the works. There will be visual impact to the four routes and increased construction traffic and possible temporary traffic measures on routes. Overall there will be a minor adverse construction impact to the four routes.

15.4.2.5 Impact on Visitor Numbers and Spending

69. In comparison with other sites in Tyrone and Armagh, and in NI as a whole, visitor numbers and spending are low in the area of the Proposed Development as illustrated by the NITB Visitor Attitudes Survey, 2011 and the 2011 Census.

70. The areas main appeal is to those on a leisure daytrip who enjoy the area for its convenience, to visit a specific attraction and its scenery. Consequently, there may be temporary construction impacts arising from visual impacts, noise and traffic. These impacts are short term, and minor in significance.

71. According to NITB, actions which could be taken to further the leisure visitor experience include improving the range of things to do on a Sunday and in the evenings and improving transport availability, service and value for money and providing the opportunity to experience good local food and drink. The construction of Proposed Development is not considered to influence these actions.

72. No significant impacts to visitor numbers or spending are anticipated as a result of the construction stage of Proposed Development.

15.4.3 Construction Phase – Economic Impacts

15.4.3.1 Impact on Economy and Employment

73. The Proposed Development will be a significant capital infrastructure project. This spend will benefit the NI economy through the purchase of construction material and through direct and indirect employment opportunities. There is also a benefit from contractors/construction workers staying in the local area, which is addressed below.

74. In terms of employment in the study area, numbers employed in the hospitality industry within the area are low compared to other regions of NI. Significant job losses should not occur because of temporary construction impacts associated with the Proposed Development. These impacts are short term, and minor in significance.

75. It is thus determined that there would not be significant negative impacts on tourism employment as a result of the construction of Proposed Development. There will be a positive impact during construction relating to construction investment and employment.

76. Chapter 2 (Need) of this ES describes in detail the wider economic impacts of the Proposed Development including the details of positive impact to electricity prices and job creation.

15.4.3.2 Impact on Bed & Breakfasts, Guesthouses and Hotels

77. There are four bed & breakfasts, guesthouses and self catering accommodation under 1km to the Proposed Development and they will not be significantly affected by the Proposed Development. There is the potential for temporary construction impacts arising from noise and traffic, and impacts to views. These impacts will be short terms and minor in significance. As it is expected that the Proposed Development will not have a significant impact on visitor numbers, it is unlikely that these business will be negatively impacted.

78. There may be a positive impact arising from construction workers staying in the wider regional area.

15.4.3.3 Impact to Bioremediation Area

79. The potential impacts to the Linwoods facility are disruption to normal operations due to construction traffic and the impacts to the bioremediation area. Because of the distance from the Proposed Development, there will be no significant direct impacts to the Linwoods facility.

80. Impacts from construction traffic have been assessed in Chapter 18 (Transport) of this ES. The Linwoods facility is located on the A3 Monaghan Road and the facility is the main distribution centre for the Linwoods brand. The Linwoods vehicles will make use of west and east turning movements onto the A3 Monaghan Road and from there throughout the province and beyond.

81. Construction traffic will use the A3 Monaghan Road to access a number of tower locations. There are no towers location accesses directly from the A3 Monaghan Road and therefore there will be no proposed temporary traffic measures (see Chapter 5 for further details). The construction traffic will increase the total numbers of traffic on the public road network. As outlined in Chapter 18, it has been assessed that there is capacity on the road network, particularly on the A3 Monaghan Road, where there will be a less than 10% change in traffic levels and this is not considered to be significant. The magnitude of construction traffic impact to the Linwoods facility is low and so there will be minor adverse impact.

82. There will be a direct impact to the bioremediation area as a result of the construction (and operation) of the Proposed Development. During the construction phase, it is likely that the willow affected by the Proposed Development will need to be harvested to facilitate the proposed works. At this stage is not known what the harvest schedule is and there may be disruption resulting in a lower yield. The proposed works will affect an area of approximately 0.7ha. This will result in the temporary halting of effluent treatment in that area and any adjacent areas depending on the affected pipeline network. The network will be required to be realigned to avoid the permanent aspects of the works. This will be a High magnitude of change, resulting in a Major Adverse impact to the bioremediation area. This is a local impact of short term duration.

15.4.4 Operational Phase – Tourism

15.4.4.1 Argory

83. Visual impacts to the Argory are illustrated in Photomontage Viewpoint 5 (see Chapter 13). The substation location is almost entirely screened by intervening vegetation and once construction activities cease the resulting impact would be Negligible - Minor Adverse for the substation in Year 1 after commissioning. The visual impact for the overhead line and towers in Year 1 after commissioning has been assessed as Minor – Moderate Adverse.

84. As proposed mitigation planting at the substation matures, the impacts of the substation would reduce to Negligible in Year 15 after commissioning. The visual impacts of the overhead line and towers would remain Minor – Moderate Adverse for this viewpoint location in Year 15.

85. The Cultural Heritage assessment concluded that the Argory is considered to be of high value. From ground level there will only be very limited views of the Proposed Development due to the amount of extant tree cover. Even in winter when leaf cover is minimal views will be very limited. While there will be some views from upper storeys of the house these are unlikely to worsen the existing condition as the proposed line will be less dominant than other modern features (e.g. existing power lines, telegraph poles etc) already present. In addition, the distance of the Argory from the development will reduce the impact on the setting of the asset. As a result the magnitude of change is considered to be negligible, resulting in a Slight Adverse significance of impact.

86. In terms of tourism, it has been assessed that there will be a minor adverse impact to the Argory during the operational phase. There will be possible but limited views of the Proposed Development set in the context of existing electrical infrastructure. The grounds and house will be largely unaffected but views will be possible and the significance of the impact will be reduced with time.

15.4.4.2 Navan Fort

87. Visual impacts to the Navan Fort are illustrated in Photomontage Viewpoint 19 (see Chapter 13). The visual impacts to Navan Fort during the operational phase will be Minor Adverse.

88. The Cultural Heritage assessment concluded that the Navan Fort complex is of high value. The asset represents a significant earthwork and was designed to be a dominant feature on the landscape with views over the surrounding area. Although trees provide some screening around the asset, its elevated location, especially from its central area, allow views over the surrounding area. However, views of the proposed overhead line and towers will be limited due to the distance of the asset from the Proposed Development, while the surrounding topography also limits the visual impact. As a result there will be a magnitude of change of no change as the significance of the asset is not affected, and the significance of impact is therefore considered to be neutral.

89. In terms of tourism, it has been assessed that there will be a negligible impact to Navan Fort during operational phase. There will be distant views of the Proposed Development from the Fort itself but the visitor centre will be unaffected. The views from the Fort are mitigated by the drumlin landscape and existing vegetation and are set amongst existing human impacts to the landscape.

15.4.4.3 Benburb Priory

90. Visual impacts to the designed landscape of the Priory are illustrated in Photomontage Viewpoint 12 (see Chapter 13). The Proposed Development will be visible at a distance from views within the grounds of the Priory.

91. Once construction activities cease visual impacts during the operational phase to the Priory will be Moderate Adverse in Year 1 after commissioning and would remain Moderate Adverse for the overhead line and towers in summer 15 years after commissioning.

92. It has been determined that there will be no significant cultural heritage impacts to the setting of the Priory and Castle during the operational phase.

93. In terms of tourism, there will be distant views of the Proposed Development from certain parts of the ground of the Priory. However, there will be no change to the normal operation of the facility in terms of its use during operation. The views from the grounds are part of the visitor attraction but not central and so it has been assessed that there will be a negligible impact.

15.4.4.4 Recreational Trails

94. The visual impacts during the operational phase to the Regional Cycle Route 11 have been assessed as Negligible in winter Year 1 of operation and will remain Negligible in Year 15 after commissioning. Visual impacts to the National Cycle Route 91/The Ulster Way have been assessed to be Minor - Moderate in Year 1 and will remain Minor – Moderate in Year 15. The visual impact to the River Blackwater Canoe Trail has been assessed to be –Minor – Moderate in Year 1, however as mitigation planting matures at the substation, the impact will reduce to Minor Adverse in Year 15.

95. In terms of tourism, the four routes will not be directly affected during the operational phase but there will be limited visual impacts. It has been assessed that there will be a negligible impact as there will be no significant change to the use and enjoyment of the routes.

15.4.4.5 Impact on Visitor Numbers and Spending

96. In comparison with other sites in Tyrone and Armagh, and in NI as a whole, visitor numbers and spending are low in the area of the Proposed Development.

97. Operational impacts on visitor numbers and spending would be indirect and limited to those arising from the impacts to views and to the setting of cultural heritage features

98. No significant impacts to visitor numbers or spending are anticipated as a result of the Proposed Development.

15.4.5 Operational Phase – Economic Impacts

15.4.5.1 Impact on Economy and Employment

99. As outlined in Chapter 2 of this ES, the Proposed Development will result in significant savings in terms of electricity generation costs. The Utility Regulator, in his letter of support to the Planning Appeals Commission dated 6th January 2012, stated that it is forecast that this will reduce the electricity generation costs across the island by £18-25m per year. The DETI Minister has also stated that the Proposed Development is *“is expected to save Northern Ireland electricity consumers £7million per annum”.* In terms of employment, maintenance will be infrequent and will not require NIE to specifically employ additional staff. Numbers employed in the hospitality industry within the area are low compared to other regions of NI. It is not thought that any significant loss of jobs would occur due to the operational impacts.

100. It is thus determined that there would not be significant impacts on tourism employment as a result of the Proposed Development.

15.4.5.2 Impact on Bed & Breakfasts, Guesthouses and Hotels

101. Operational impacts would be related to the visual impacts of the Proposed Development on the surrounding landscape. Visual impacts will vary depending on distance to the Proposed Development as well as intervening topography, vegetation, and landscape character. No significant impacts to visitor numbers or spending are anticipated as a result of the construction stage of Proposed Development and so it is unlikely to be any significant effects as a result.

15.4.5.3 Impact to Bioremediation Area

102. During the operation of the Proposed Development, an area of 0.43ha will be permanently affected, resulting in a reduction in willow yield and effluent treatment area. The normal harvest of the remaining willow crop (either side of the overhead line) will be unaffected by the Proposed Development as the normal growing height before harvest will not interfere with the safety clearance from the overhead line. As outlined in Chapter 5 of this ES, vegetation directly under the conductors will be maintained at a height of 2m. Should this be applied to the bioremediation area, there would a permanent impact to the normal harvest of the crop, which is usually harvested at heights of 4-5m. This will be a High magnitude of change, resulting in a Major Adverse impact to the bioremediation area.

15.5 Mitigation Measures

103. Mitigation measures have been proposed to reduce the impacts arising from the Proposed Development. These are detailed in the various other Chapters of this ES. It is noted that a landscape planting scheme is proposed on the substation site that will reduce visual and landscape impacts at The Argory.

104. Mitigation measures will be required to minimise the impact to the bioremediation area. Further consultations will be required with the owner and operator of the area. It may be possible to accommodate the normal harvesting operation within the construction timetable in order to minimise losses. If this is not possible, compensation will be required for the loss of the value of the crop. In terms of the effluent treatment, consultations with the owner and operator in order to determine the layout of the pipe network and what remedial works will be required during construction and the operation of the Proposed Development. The consultations will also be needed to determine the nature of the effluent material, the rate of production from the facility, rate of discharge and the current condition of the treatment system. It is likely that alterations will be required to the pipe network, which is currently laid above ground along the rows of planted willow. If there is not capacity in the treatment system to accommodate a reduction in the willow area, alternative treatment will have to be agreed with the owner and operator (such as tankering off site as was done for the previous treatment regime) or compensation agreed.

15.6 Residual Impacts

15.6.1 Construction Phase

105. In terms of tourism, it has been assessed that there will be a Minor Adverse impacts to the Argory, Navan Fort and Recreational Trails during construction. There will be a negligible impact during construction to the Benburb Priory.

106. No significant impacts to visitor numbers or spending are anticipated as a result of the construction stage of Proposed Development.

107. There will be a positive impact during construction relating to employment related to the construction of the Proposed Development.

108. As it is expected that the Proposed Development will not have a significant impact on visitor numbers to hospitality businesses, it is unlikely that these business will be impacted.

109. With the implementation of mitigation measures, it is expected that the level of impact to the bioremediation area will be reduced. However at this stage, because of the uncertainty, a precautionary approach must be applied and the residual impact is assessed to be Major Adverse to the bioremediation area.

15.6.2 Operational Phase

110. In terms of tourism, it has been assessed that there will be a Minor Adverse impact to the Argory, which will reduce in significance with the establishment of the proposed substation landscape mitigation planting.

111. There will be a negligible impact during operation to Navan Fort, Benburb Priory and Recreational Trails and no significant negative impacts in terms of visitor numbers or spending, economy, employment or local accommodation businesses.

112. The savings of approximately £7m estimated by DETI are considered significant positive effects to the local economy. The Utility Regulator has estimated savings for the whole of Ireland of approximately £25m per year.

113. With the implementation of mitigation measures, it is expected that the level of impact to the bioremediation area will be reduced. However at this stage, because of the uncertainty, a precautionary approach must be applied and the residual impact is assessed to be major adverse to the bioremediation area.

15.7 Conclusions

114. There will be a positive impact on employment, including direct employment and indirect employment. There will also be an indirect positive impact on the hospitality industry in the local area at the construction stage of the Proposed Development, as contractors and other workers may stay in the wider regional area during construction.

115. The impacts of the Proposed Development on visitors and visitor spending, employment and local hospitality businesses in the development area have been assessed and it is considered that there will be no significant negative impacts.

116. The savings of £7m per year for Northern Irish electricity consumers estimated by DETI are considered to be a significant positive effect to the economy.

117. Impacts to tourism will not be direct as no tourist sites will be physically impacted by the Proposed Development. The key sites within the study area (the Argory, Navan Centre and Benburb Priory) will have views of the construction and operational phases but it is considered that these impacts will not be significant. Four recreational routes will be oversailed by the Proposed Development and will experience a minor adverse impact during construction.

118. As there will be a significant negative impact to the running of a bioremediation area used by the Linwoods facility, mitigation and compensation will be required to be agreed with the landowner/operator.

15.8 References

NITB (2004) Strategic Framework for Action

NITB (2009) Regional Tourism Estimates.http://www.nitb.com/DocumentPage.aspx?path=2e3c2831b6cb-4bcd-a276-e0283e5bd203,b5d4e565-ef7a-4afe-b31e-ffff177e70cb,8c008743-2fee-45e2-bf29-34c3eb116ca3 (Accessed December 2012)

NITB (2012) Visitor Attitude Survey Northern Ireland, 2011 NITB.www.nitb.com. (Accessed December 2012)

2011 Census Results, NISRA, QS102NI, Population density. Available at http://www.ninis2.nisra.gov.uk/public/Theme.aspx. (Accessed April 2013)

2011 Census Results, NISRA, KS605NI, Industry of Employment. Available at http://www.ninis2.nisra.gov.uk/public/Theme.aspx. (Accessed April 2013)

Regional Tourism Estimates. (n.d.). Retrieved 07 2009, from Northern Ireland Tourist Board:http://www.nitb.com/DocumentPage.aspx?path=2e3c2831-b6cb-4bcd-a276-e0283e5bd203,b5d4e565-ef7a-4afe-b31e-ffff177e70cb,8c008743-2fee-45e2-bf29-34c3eb116ca3. (Accessed December 2012)

Visitor attractions and accommodation locations for Armagh www.armagh.gov.uk. (Accessed December 2012)

Visitor attractions and accommodation locations for Armagh.www.visitarmagh.com. (Accessed December 2012)

Visitor attractions and trail guides for the study area www.armaghanddown.com. (Accessed December 2012)

Tourism Ireland Facts & Figures 2011 - Island of Ireland Overseas Visitors'http://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/2_Regional_SurveysReports/Overseas_Visitors_and_Revenue_by_County_2011.pdf?ext=.pdf (Accessed December 2012)

Tourism Ireland. Attractions and Hospitality, interactive map. http://www.discoverireland.com/gb/ (Accessed April 2013)

Economic Impacts of Wind Farms on Scottish Tourism 2008

DRD 2012, Regional Development Strategy for Northern Ireland 2035

DOE 2010 PPS 16 – (Draft) Tourism

DETI 2010 Draft Tourism Strategy for Northern Ireland to 2020

DOE 1993, A Planning Strategy for Rural Northern Ireland

DOE 1995 Armagh Area Plan 2004

DOE 2001 Armagh Area Plan 2004 Alterations No 1 :Armagh Countryside Proposals

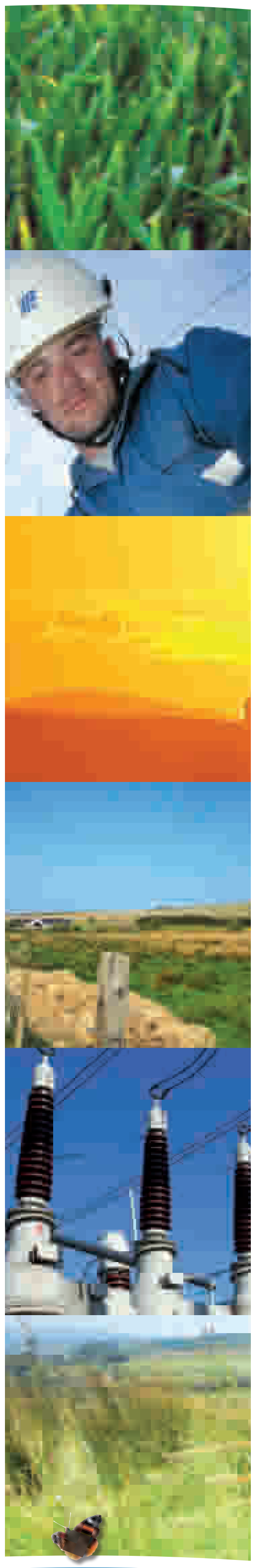
DOE 2004 Armagh Area Plan 2018 Issues Paper

DOE 2005 Dungannon and South Tyrone Area Plan 2010

Tyrone - Cavan Interconnector

Chapter 16

Telecommunications and Aviation Assets



Consolidated Environmental Statement

Volume 2

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16 Telecommunications and Aviation Assets

Chapter Executive Summary

As part of the EIA, extensive consultation took place with the authorities responsible for transmissions associated with radio (domestic and commercial), television, aviation and the emergency services that have telecommunications assets.

No objections or potential impacts were highlighted by the telecommunication or aviation consultees. It is concluded that there will be no significant impacts to telecommunications or aviation assets as a result of the Proposed Development.

The Proposed Development will meet all Electromagnetic Compatibility requirements as set out by legislation.

16.1 Introduction

1. This Chapter presents an assessment of the Proposed Development, as set out in Chapter 5, on radio and television transmissions and on aviation assets.

2. This Chapter summarises the consultation which took place with the authorities responsible for transmissions associated with domestic and commercial radio and television and the emergency services that use radio-based communication systems. Consultations were also undertaken with the bodies responsible for aviation operations.

3. This Chapter does not include any detailed assessment of impacts, such as EMF or noise impacts from the Proposed Development. Interrelated impacts from these topics are considered. . These topics are discussed elsewhere within this ES: noise is covered in Chapter 11 Noise, and EMF is covered in Chapter 7 EMF.

16.2 Methodology

16.2.1 Scope of Assessment

16.2.1.1 Overview

4. An impact could arise from the physical nature of the Proposed Development, especially the towers. Domestic TV reception could be affected by the physical obstruction of the line of sight path from a domestic antenna receiving its signal from a broadcast TV tower, or reflections from a tower into a domestic TV aerial where the unwanted signal may combine with the wanted signal to produce interference such as ‘ghost’ images on the screen.

5. The operation of high voltage overhead lines can generate electromagnetic fields over a wide range of frequencies, from power (50 Hz) to radio frequencies. It is possible for radio receivers in the vicinity to be affected or interfered with by such electromagnetic fields.

6. Very new overhead lines are liable to emit some low-level radio frequency interference. This tends to be higher in amplitude in wet weather. All lines are subject to sporadic bursts of radio frequency interference associated with switching operations elsewhere on the system. In general, however, few if any difficulties with radio and television interference arise from such radio frequency interference.

7. Corona effect gives rise to radio noise which is a potential source of interference on the long wave and medium wave wavebands, but is of little or no significance to the very high frequency radio or television

bands. Receivers located more than a few tens of metres from the proposed overhead line are unlikely to be affected.

8. An impact to aviation assets could be caused by the height of structures as a physical obstruction for aviation purposes. The maximum height of the proposed towers is 54m (a 275kV termination tower at the proposed substation).

16.2.1.2 Methodology

9. Using DCAN 10 (DoE 1999 and 2012), and experience from consultation associated with wind farm developments, which typically involve large vertical structures, a list of consultees was derived to give comment on the effect of the Proposed Development on telecommunications and aviation assets.

10. The following bodies were consulted to obtain background information and comment on the Proposed Development which was pertinent to telecommunication and aviation interference:

- Arqiva
- BBC Reception Services ;
- Belfast Flying Club Ltd;
- Civil Aviation Authority (CAA);
- Crown Estate;
- Health and Safety Executive ;
- Helicopter Training and Hire Ltd;
- Ministry of Defence (MOD);
- Office of Communications (Ofcom);
- Police Service of Northern Ireland (PSNI); and,
- Spectrum Planning (Buildings and Wind farms).

11. The responses were collated to produce background data about the amount and type of telecommunications and aviation assets in proximity to the Proposed Development and how these would be impacted upon by the Proposed Development.

16.2.2 Policy and Legislative Context

16.2.2.1 Planning Policy Statement 10 (PPS 10)

12. Planning Policy Statement 10 (PPS 10) (DoE 2002) sets out the Department's planning policies for telecommunications development. Paragraph C26 of Annex C of PPS10 advises that:

“The construction of new buildings or other structures, such as wind turbines, can interfere with broadcast and other telecommunications services, and the possibility of such interference can be a material planning consideration (see Policy TEL 2).”

13. Policy TEL 2 of PPS 10 states:

“Development and Interference with Television Broadcasting Services. The Department may refuse planning permission for development proposals which would result in undue interference with terrestrial television broadcasting services.”

16.2.2.2 The Air Navigation Order 2009

14. The CAA's responsibility for the safe operation of aviation operations is a requirement of The Air Navigation Order 2009 (SI 2009 No. 3015). The Order also outlines the statutory requirements for the lighting of onshore en–route obstacles (such as the proposed towers) in the UK.

16.2.2.3 The Electromagnetic Compatibility Regulations 2006

15. The Electromagnetic Compatibility Regulations 2006 apply to electrical and electronic equipment liable to cause electromagnetic disturbance or the performance of which is liable to be affected by such disturbance. The purpose of the Regulations is to ensure that the electromagnetic disturbance generated by the proposed electrical or electronic equipment does not exceed a level above which would result in interference to other electronic equipment in the area (e.g. radio and telecommunications). The Regulations require that the manufacturer compile technical documentation which shows that the essential requirements have been met, to put the 'CE' logo on the product and to complete a Declaration of Conformity.

16.3 Potential Impacts

16.3.1 Construction Phase

16. During construction, cranes will be used at the substation site and derrick poles will be used in the construction of the proposed 400kV towers. The location and height of the cranes are similar to the proposed towers but are temporary in nature. It is considered that any potential effect would be the similar as the permanent impact of the towers and was considered as part of operational phase assessment.

16.3.2 Operational Phase

17. Some electronic and radio equipment may be susceptible to the electromagnetic fields and low level radio noise produced by high voltage equipment. NIE has considered the impacts to such equipment (i.e. ensured electromagnetic compatibility) through the selection of the compliant equipment and the selection of the overhead line route and substation.

18. Correspondence with consultees has taken place over a number of years; during each consultation there were differing levels of response. An initial letter was sent to each consultee, and followed up as appropriate with additional letters. A summary of the key responses are provided in Table 16.2 and provided in full in Appendix 6A.

Table 16.2: Telecommunications and Aviations Consultation Summary

Consultee	Response Summary
Arqiva	Based on the information provided, Arqiva's analysis showed that the Proposed Development was unlikely to affect any of the RBLs or point-to-point microwave links and no objection to the Proposed Development was lodged.
NATS Safeguarding Office	The Proposed Development was examined from a technical safeguarding aspect and does not conflict with their safeguarding criteria. Accordingly, NATS (En Route) Limited had no safeguarding objections to the Proposed Development.
Directorate of Airspace Policy (CAA)	The overhead line and supporting structures would not constitute aviation en-route obstructions for civil aviation purposes. The Defence Geographic Agency (DGA) should be informed of the line route so that that updates to aviation documentation can be initiated.
MOD	The MOD had no safeguarding objections to the Proposed Development.
PSNI	No impacts are expected from the Proposed Development.

19. The location of the Proposed Development has been selected to avoid key telecommunication links (and other constraints) in order to avoid any potential impacts. It was confirmed that none of the consultees had any objection to the Proposed Development and did not raise any potential impacts to the services for which they are responsible.

20. Telecommunication impacts to residential properties will be avoided as the proposed overhead line and substation is no closer than 60m to any properties.

21. The equipment of the Proposed Development has been used on other similar projects throughout the UK and Europe and has been rigorously tested for Electromagnetic Compatibility. The requirements of The Electromagnetic Compatibility Regulations 2006 will be fully met by the Proposed Development.

22. There are 17 roadside locations where the proposed overhead line route crosses existing BT lines. The BT lines will be undergrounded by BT under the road. The change to the existing BT equipment that will be crossed by the overhead line route removes any potential for interference and so there is no impact.

23. Surveys by helicopter for maintenance purposes are currently common practice on overhead lines in Northern Ireland. The proposed flights for the Proposed Development will be undertaken in accordance with all aviation and CAA guidance and standards. It is considered that the proposed maintenance as detailed in Chapter 5 will have no likely significant effects on telecommunications and aviation assets.

16.4 Mitigation Measures

16.4.1 Telecommunications

24. In the unlikely event of interference arising, adjustments to the orientation of the aerial of the radio or television or a similar solution should remedy the problem. No mitigation is proposed as part of this EIA.

16.4.2 Aviation Assets

25. Prior to construction, the Defence Geographic Agency (DGA) (the body responsible for maintaining the aviation mapping database for the CAA and MoD) will be provided with detailed mapping of the

Proposed Development (both construction and operation phase details). The Irish Aviation Authority will also be informed.

26. It has been determined that there is no requirement to provide additional visibility measures in line with The Air Navigation Order 2009.

16.5 Residual Impacts

27. Based on the outcome of the consultation exercise the Proposed Development is not expected to cause interference to telecommunication links.

28. It has also been determined that there will be no impacts to aviation assets as a result of the Proposed Development.

16.6 Conclusions

29. As part of the EIA, extensive consultation took place with the authorities responsible for transmissions associated with radio (domestic and commercial), television, aviation and the emergency services that have telecommunications assets.

30. No objections or potential impacts were highlighted by the telecommunication or aviation consultees. It is concluded that there will be no significant impacts to telecommunications or aviation assets as a result of the Proposed Development.

31. The Proposed Development will meet all Electromagnetic Compatibility requirements as set out by legislation.

16.7 References

Department of the Environment. 1999. Development Control Advice Note 10 (Revised): Environmental Impact Assessment.

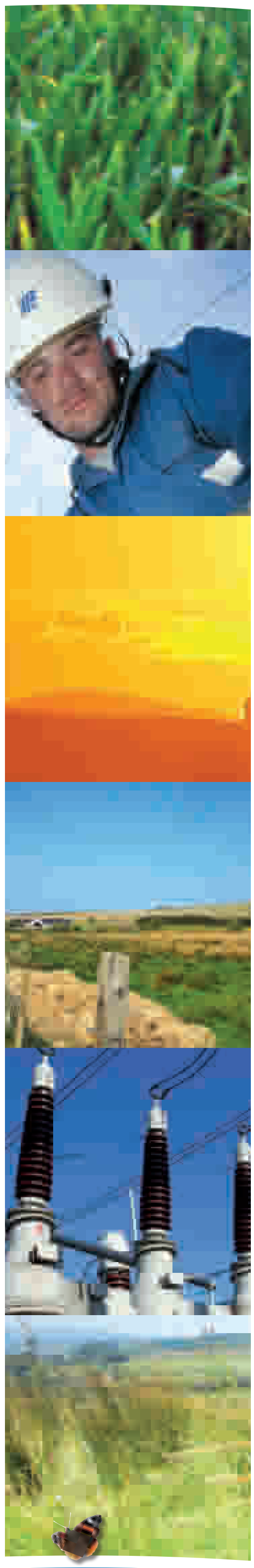
Department of the Environment. 2012. Development Control Advice Note 10 (Revised): Environmental Impact Assessment.

Department of the Environment. 2002. Planning Policy Statement 10 (PPS 10): Telecommunications.

The Air Navigation Order 2009 (SI 2009 No. 3015).

The Electromagnetic Compatibility Regulations 2006.

Tyrone - Cavan Interconnector



Chapter 17

Flood Risk Assessment

Consolidated Environmental Statement

Volume 2

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17 Flood Risk Assessment

Chapter Executive Summary

A Flood Risk Assessment (FRA) has been carried out following the guidance and requirements set out in PPS15 and consultation with the Rivers Agency and the Planning Service. This assessment has considered the route of the Overhead Line and Turleenan Substation.

Although the substation boundary includes land recognised as being in the 1% AEP floodplain, there is no permanent built development at the substation within this area.

The Proposed Development can be considered to be of regional importance and consists of essential infrastructure that has an operational requirement to be at this location.

During the construction period of the substation, the temporary alignment of the access road will encroach onto the floodplain, however, this is not considered to be significant, is temporary in nature and could be offset by providing temporary floodplain storage. However, given the scale of the impact, temporary floodplain storage is not considered to be required and this has been confirmed in consultation with the Rivers Agency.

The Proposed Development has been assessed with source and site controls to develop an outline strategy. The runoff from the future development will be attenuated within the boundary of the substation area and controlled to ensure that it does not exceed the runoff from the existing undeveloped site. The assessment has been carried out for all rainfall events up to and including the 1% AEP event, including an allowance for future climate change of a 20% increase in rainfall intensity in accordance with UKCIP guidelines.

A SWMS has been developed to assess the requirements of SuDS to mitigate the effects of the development on the increased surface water runoff and also to provide adequate treatment.

17.1 Introduction

1. This Chapter presents an assessment of the Proposed Development, as set out in Chapter 5, in relation to flood risk, including the principles of a Surface Water Management Strategy developed for the permanent development area at the substation.

2. The assessment of flood risk considers the Proposed Development with two significant areas of focus. The first is the potential of the Proposed Development to increase flood risk elsewhere and, secondly, the potential flood risk to the Proposed Development.

3. Flood risk assessment requires considering the probability of flooding occurring and the consequence of that flooding. The vulnerability of the receptor is a factor in considering the consequences of the flooding.

17.2 Methodology

17.2.1 Outline

4. This assessment has been carried out in accordance with Construction Industry Research and Information Association (CIRIA) C624 – Development and Flood Risk – guidance for the construction industry and Planning Policy Statement 15 (PPS15) – Planning and Flood Risk.

5. The assessment of the Turleenan Substation has included detailed hydrological and hydraulic modelling to determine flood levels in adjacent watercourses, using an approach based on the vulnerability of the development, or receptors, at each location and potential consequence of flooding, i.e. where the amount of Proposed Development at ground level is small, assessments have comprised of site visits and desktop assessments and where there are substantial proposals, detailed hydrological and hydraulic models of the watercourses and floodplains have been utilised in assessing flooding probability.

6. The assessment of the tower locations and access roads has been carried out through a visual inspection of the Proposed Development and environs and inspection of the Department for Agriculture and Rural Development (DARD) Rivers Agency Strategic Flood Maps, available to view online, to determine if the Proposed Development is potentially in areas identified as floodplain. The identification of potential receptors has been carried out through site visits and mapping to determine proximity to watercourses where development is proposed.

7. Consultation with the Rivers Agency has been carried out during the site selection and design for the substation. The Rivers Agency has provided guidance and information on appropriate design flood levels and also made hydraulic modelling data of the River Rhone available to assist in carrying out this Flood Risk Assessment (FRA). Details of the consultations are provided in Chapter 6 of this ES.

8. At the locations of Proposed Development within or in close proximity to floodplains, consideration has been given to the design of the Proposed Development and the function of the floodplain, in terms of conveyance or storage, to assess whether the development will have an effect on floodwater, in terms of restricting conveyance or displacing flood water and the relative significance of that effect on potential receptors.

17.2.2 Scope of Assessment

9. The assessment considers the development process through construction to the permanent development proposals.

10. The main areas of consideration for the permanent development proposals are associated with the terrestrial interface of the development; therefore, the assessment considers the Turleenan Substation and tower locations. In addition, for the construction phase, the assessment considers proposed access routes and associated temporary construction requirements.

11. It should be noted that flood risk is a significant consideration within the design of the Turleenan Substation and reference should be made to Appendix 17A, the Turleenan Substation Flood Risk and Surface Water Management Strategy (AECOM 2008), which contains the detailed assessment of the development proposals within the substation boundary. This ES chapter contains a summary of that assessment and, additionally assessment of the tower locations and associated temporary construction requirements.

12. The design information for the Proposed Development is in Chapter 5 of this ES. The main elements of development associated with flood risk are associated with the Turleenan Substation, construction and permanent development, including access, working areas, earthworks and proposed drainage, which have all been considered within the detailed Flood Risk Assessment, Surface Water Management Strategy, prepared as part of the original assessment and appended, and subsequent design.

13. In addition, there are aspects of the towers that have a bearing on flood risk considerations, due to the proposed tower locations, base construction, working areas and access tracks.

17.2.3 Legislative and Policy Context

14. The European Directive on the Assessment and Management of Flood Risks (2007/60/EC), known as the Floods Directive came into operation on 26 November 2007. This Directive has been transposed into local legislation in Northern Ireland through The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009. The most significant changes resulting from the Directive (and local legislation) are the specification of flood risk needing to be considered in terms of being the combination of probability and consequence of flooding and also that flood risk should be considered in terms of the risk to social, environmental, cultural heritage and economic impacts.

15. Planning Policy Statement 15 (PPS15) sets out the national planning considerations in relation to development and flood risk. Planning Policy FLD1 states that development will not be permitted in the floodplain unless it is of 'overriding regional importance' or meets one of a range of exceptions.

17.2.4 Indication of Any Difficulties Encountered

16. There have been no issues arising through this assessment.

17.3 Baseline Conditions

17.3.1 Overhead line

17. The overall assessment of the overhead line route has been carried put utilising the Strategic Flood Maps (NI), as produced by the Rivers Agency and available to view online, to consider the elements of Proposed Development, incorporating tower locations and working areas, access tracks and associated working areas, i.e. stringing locations. The assessment has been carried out with cognisance of relevant guidelines and scoped using professional judgement and consideration of each location and potential effect.

17.3.2 Substation

17.3.2.1 Overview

18. More detailed assessment techniques have been used within the Turleenan Substation Flood Risk Assessment and Surface Water Management Strategy and are detailed in Appendix 17A.

19. The Rivers Agency has recommended that the appropriate level of risk for future development is the Q100 event that with a 100 year return period. This is more appropriately referred to as the 1% Annual Exceedence Probability (AEP) event, i.e. there is a 1% probability that this level will be exceeded in any given year. An additional 'freeboard' allowance of 600mm, to accommodate climate change and uncertainties, should be added for design purposes.

20. The substation will require the construction of a large relatively flat compound, with a total area of approximately 5ha, to accommodate a range of substation electrical equipment. This platform will be achieved by undertaking a significant excavation into the hillside, to provide a finished level for the platform of 17.75m AOD. No land raising will be carried out in the floodplain and no compensation storage will therefore be required.

21. As part of the temporary works required to construct the substation and facilitate connections to the existing overhead line, two temporary structures are required to be constructed adjacent to the substation site. One of these structures will be located within the Q100 floodplain of the Blackwater River. The duration of the temporary structures being in position will be 2-3 months and the construction of the structures has limited activity at ground level, with small foundations and stayed supports. The function of the floodplain where the structures is to be located is considered to be for storage only, with no conveyance function. Therefore, the effect of the temporary structures construction will be temporary, minor and limited only to minor loss of floodplain storage.

22. A permanent access road from the north of the compound will follow the contour of the hill to meet the B106 road to the north of the site. The permanent access road will be constructed at a level above the 1% AEP flood level to ensure that access to the site is maintained during flood conditions. A temporary access from the new access road to the B106 will be formed during the construction phase of the compound, which will be located to the east of the permanent access and located within a small area of the 1% AEP floodplain.

23. A plan of the proposed substation and access route is shown in Appendix 17A (Appendix Figure 3.2).

24. Rivers Agency Flood mapping for the area indicates that part of site within the application boundary includes land identified as the 1% AEP floodplain. Early correspondence with the Rivers Agency confirmed that the appropriate 1% AEP flood level for the substation is 16.01m AOD. However, subsequent evaluation of the available model data, including a hydrological review of the modelled flows, has concluded that the flood levels for the site are higher than those previously stated.

25. The extent of existing flooding from the 1% AEP event is shown in Appendix 17A (Appendix Figure 4.1).

26. The proposed level for the main compound of the development will be constructed at 17.75m AOD. Therefore, allowing a freeboard of 600mm added to the design flood levels, the site is considered to be at a sufficient level where the risk of flooding from the River Rhone will be substantially less than 1% AEP.

17.3.2.2 Flooding from Groundwater

27. The geotechnical investigation for the substation site reports that excavation is not anticipated to be below groundwater levels. Although local perched groundwater (Isolated pockets of groundwater, usually at a shallow depth, above the level of the main groundwater table) is present, the report concludes that '...*under present conditions, groundwater would not be encountered at the foundation depths suggested'*. Should any groundwater be encountered it is not considered to pose any significant flood risk.

17.3.2.3 Flooding from Land

28. The site of the substation compound lies downhill from a small area of land, which could generate surface water run-on to the site in the event of extreme rainfall. It is considered that the rate of runoff will not be significant due to the small area upslope and that appropriate perimeter drainage will convey runoff around the compound.

29. This drainage will also be required to manage any groundwater resulting from the excavation into the hill side. A Surface Water Management Strategy (SWMS) is included in Appendix 17A, with details of the conceptual drainage design shown in Appendix 17A (Appendix Figure 4.2).

17.4 Potential Impacts

17.4.1 Overview

30. This assessment considers the potential impacts of flooding on the Proposed Development as well as the potential for the development and associated construction activities to create a potential impact elsewhere, through reducing floodplain storage volumes, impeding the conveyance of floodwaters or increasing runoff from land.

17.4.2 Construction Phase

17.4.2.1 Substation

31. During the construction period of the substation the temporary alignment of the access road will encroach onto the floodplain. There will be a temporary loss of floodplain storage as a result of the construction of the temporary access from the B106. This volume is considered to be not significant in respect to the effect that it will have upon the floodplain of the River Rhone or River Blackwater and has been confirmed by the Rivers Agency as acceptable (see Appendix 6A).

32. The flood risks associated with external influences on the site are not expected to be significantly increased. However, due to the changes in land use from the development there may be increased flood risk within and also downstream of the site as a result of the increased surface water runoff. Uncontrolled drainage from the development could increase the rates and volumes of runoff and has potential to increase flood risk. To prevent an unacceptable increase in flood risk a SWMS has been developed to determine the requirements of the surface water drainage design to provide treatment and attenuation to the runoff in accordance with CIRIA – C697 – The SuDS Manual. Subsequently this strategy has been further developed into a detailed design of proposals for the drainage associated with the substation.

33. Through the implementation of Sustainable Drainage Systems (SuDS), as part of the Surface Water Management Strategy, the rate of runoff will be controlled to ensure that runoff is not increased. SuDS will also provide additional environmental benefits to the development through water quality and habitat improvements.

34. Further details of the SWMS are included in Appendix 17A, with details of the conceptual drainage design shown in Appendix 17A (Appendix Figure 4.2).

35. The planning and design of the substation recognises that the probability of flooding on the surrounding public roads is higher than that for the substation and associated private access road.

17.4.2.2 Overhead Line and Towers

36. The construction activities included in this assessment relate to the provision of temporary access roads which are required to access the locations of towers and stringing areas.

37. The areas where towers and access tracks are being proposed which are identified within, or in close proximity to, floodplain are associated with the following locations:

- Towers 36-39;
- Towers 56 – 58;
- Tower 62-63;
- Access track AT37-38-39;
- Access track AT56;

- Access track AT62SL;
- Access track AT62-63; and,
- Access track AT76.

38. Seven of the nine tower locations identified within the Q100 floodplain are proposed to be temporarily stoned, comprising of an area averaging 35m x 35m, with a 0.01m geotextile matt and 0.1m of stone. The construction of these areas will lead to a temporary loss of floodplain. The temporary loss of floodplain in these locations is not considered significant. The locations of these towers are:

- Tower 36;
- Tower 37;
- Tower 39;
- Tower 57;
- Tower 58;
- Tower 62; and
- Tower 63.

39. The proposals for the access roads, using existing tracks as far as practicable and where required, being of a temporary stone or modular aluminium roadway are not considered to create any significant impact.

40. Three of the five access tracks located in the Q100 floodplain will comprise of a temporary stone construction, with a geotextile mat being placed and a 3m wide track formed with 0.1m of stone material. The construction of these tracks will result in a temporary loss of floodplain storage. The volume of floodplain temporarily lost is considered not significant. The tracks, located in the floodplain, that will be stoned are:

- Access track AT37-38-39;
- Access track AT62-63; and,
- Access track AT76.

17.4.3 Operational Phase

41. Once construction is completed, the effects of the development on flooding will be limited to the locations of towers, in areas identified as being floodplain, and emergency access and egress requirements to the substation. At the substation increased runoff will be managed through the drainage system meeting the principles of the Surface Water Management Strategy set out in the Flood Risk Assessment

42. Each of the tower locations has been assessed to determine if the floodplain functions through the provision of storage of floodwater or providing conveyance capacity. The assessment considers that the primary floodplain function at each location is for the storage of floodwater, however, should the location provide conveyance, the effect will be localised and considering each location and there being no vulnerable receptor in close proximity, no further detailed assessment is considered warranted.

43. The proposed towers, by their nature are not at risk of flooding. Temporary flooding at the bases of the towers will not have a detrimental effect on the operation of the Proposed Development and therefore no consequence.

44. The construction of the towers in the floodplain is proposed to be in areas where flow velocities are considered to be low, being located in floodplains of smaller watercourses or more remotely from the watercourses, where the function of the floodplain will predominantly be only for storage.

45. There will be no likely significant effects as a result of the proposed maintenance activities as outlined in Chapter 5 of this ES as the effects of maintenance activities with respect to flood risk will be limited to risk upon those activities and not other receptors and activities can be planned to avoid extreme flooding events.

17.5 Mitigation Measures

46. A Flood Risk Assessment (FRA) has been carried out following the guidance and requirements set out in PPS15 and consultation with the Rivers Agency and the Department of the Environment.

47. Although the substation boundary includes land recognised as being in the 1% AEP floodplain, there is no permanent built development at the substation within this area.

48. The development can be considered to be of regional importance and consists of essential infrastructure that has an operational requirement to be at this location.

49. The proposed construction methods have been considered within this assessment.

50. The construction of the substation will incorporate the elements of the Surface Water Management Strategy to attenuate flows. This strategy also includes appropriate levels of treatment in accordance with the SuDS Manual to provide treatment to the runoff. The development has been assessed with source and site controls to develop an outline strategy. The runoff from the future development will be controlled and limited to ensure that it does not exceed the runoff from the existing undeveloped site. The assessment has been carried out for all rainfall events up to and including the 1% AEP event, including an allowance for future climate change of a 20% increase in rainfall intensity in accordance with UKCIP (UK Climate Impacts Programme) guidance.

51. The design of the tower bases has been developed to ensure that there is limited requirement for foundations to extend above ground level, to ensure that there is no loss of floodplain storage.

52. During the construction period of the substation, the temporary alignment of the access road will encroach onto the floodplain.

53. A SWMS has been developed to assess the requirements of SuDS to mitigate the effects of the development on the increased surface water runoff and also to provide adequate treatment.

17.6 Residual Impacts

54. There are no likely significant residual flood risk effects as a result of the construction or operation of the Proposed Development. The loss of flood plain during the temporary access at the substation and towers and access tracks is not considered significant and will not result in significant impacts to or from the Proposed Development.

17.7 Conclusions

55. A Flood Risk Assessment (FRA) has been carried out following the guidance and requirements set out in PPS15 and consultation with the Rivers Agency and the Northern Ireland Planning Service.

56. Although the substation boundary includes land recognised as being in the 1% AEP floodplain, there is no permanent built development at the substation within this area.

57. The Proposed Development can be considered to be of regional importance and consists of essential infrastructure that has an operational requirement to be at this location.

58. During the construction period of the substation, the temporary alignment of the access road will encroach onto the floodplain; however, this is not considered to be significant, is temporary in nature and could be offset by providing temporary floodplain storage. However, given the scale of the impact, this is not considered to be required and has been confirmed in consultation with the Rivers Agency.

59. The Proposed Development has been assessed with source and site controls to develop a strategy. The runoff from the future development will be attenuated within the boundary of the substation area and controlled to ensure that it does not exceed the runoff from the existing undeveloped site. The assessment has been carried out for all rainfall events up to and including the 1% AEP event, including an allowance for future climate change of a 20% increase in rainfall intensity in accordance with UKCIP guidelines. The principles of the strategy have been developed into a detailed design of proposals for the drainage associated with the substation.

60. A SWMS has been developed to assess the requirements of SuDS to mitigate the effects of the development on the increased surface water runoff and also to provide adequate treatment.

17.8 References

Department of the Environment. Planning Policy 15 (PPS15) – Planning and Flood Risk

Rivers Agency (2012). Strategic Flood Mapping. Online:

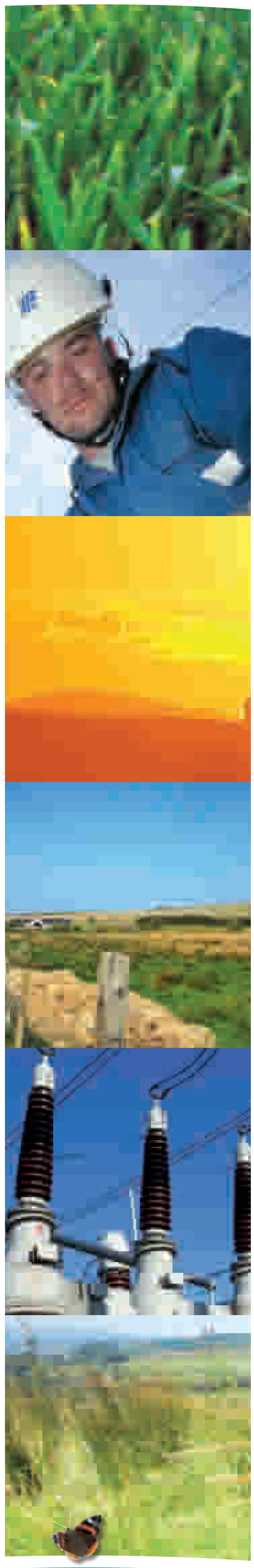
http://www.dardni.gov.uk/riversagency/index/strategic-flood-maps.htm

CIRIA C697 – The SuDS Manual

Tyrone - Cavan Interconnector

Chapter 18

Transport



Consolidated Environmental Statement

Volume 2

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18 Transport

Chapter Executive Summary

This assessment concludes that the construction of the Proposed Development would result in a temporary increase in traffic levels on a number of roads within the study area. In accordance with the significance criteria detailed in Table 18.3 these increases are considered to be minor or negligible and as such not significant.

Haul routes for construction have been identified as far as possible at this stage of the design process, i.e. before a contractor has been appointed. A number of potential suppliers have been identified however it would be a decision of the contractor as to which supplier would be used. Therefore haul routes have been identified for all construction sites from the nearest A or B class road.

Overall effects on the public highway by the construction of the overhead line and towers will be reduced by taking access from existing field gateways and laneways. Each access has been individually assessed and requirements for mitigation/enhancement have been identified and suitable measures proposed.

Traffic generated during the operation and maintenance of the Proposed Development would be minimal and would not result in any significant effects.

With the implementation of mitigation measures such as an appropriate traffic management plan and suitable liaison with Roads Service, the residual traffic and transport effects are temporary and have been assessed as having an impact of negligible significance.

18.1 Introduction

1. This chapter provides a Traffic Assessment, which identifies the potential effects of increased road traffic as a result of the construction, operation and maintenance of the Proposed Development. The chapter assesses the significance of these effects against recognised guidelines and, where required, appropriate mitigation measures are considered.

2. The Proposed Development consists of three elements:

- The construction of 102No. towers and tower bases;
- The installation of approximately 34km of 400kV overhead line; and
- Associated substation at Turleenan (including 2 additional 275kV towers).

18.2 Methodology

18.2.1 Scope of Assessment

18.2.1.1 Overview

3. The scope of the assessment has been determined using the Institute of Environmental Management and Assessment (IEMA) Guidelines and the potential traffic effect of the development has been assessed by the following approach:

- Consultations were undertaken with Roads Service to establish their requirements for the traffic assessment;

- Review of appropriate guidance and policy was undertaken;
- The delivery / haul routes for construction vehicles were reviewed in order to assess the nature of the road network and determine the effect on road layout, improvements and the overall suitability in accommodating the expected vehicles;
- The traffic study area was defined along the access routes to the towers to ensure the assessments were robustly undertaken;
- Traffic flow data was acquired and reviewed to assess the traffic conditions and composition along the access routes;
- An outline construction programme and activity schedule was developed to predict the traffic that would be generated during the construction of the development;
- Recognised national assessment guidelines were used as a base for the analysis of the data and effect significance;
- An appropriate mitigation strategy was prepared to ensure that any potential traffic effects are kept to a minimum; and
- The operational/maintenance traffic effects were then reviewed to establish the residual effect on the local road network.

4. The study area for this assessment relates to the routes used for the transportation of construction and maintenance traffic to/from the tower and substation sites.

5. The methodology used in this assessment adheres to that set out in the IEMA guidelines, and therefore focuses on:

- Potential effects on local roads and users of those roads; and
- Potential effects on land-uses and the environmental resources fronting those roads, including the relevant occupiers and users.

6. The following rules, taken from the IEMA guidelines, have been used as a scoping process to define the scale and extent of the assessment:

- Rule 1 – Include highway link where traffic flows are predicted to increase by more than 30% (or where the number of heavy goods vehicles is predicted to increase by more than 30%); and
- Rule 2 – Include any other specifically sensitive areas where traffic flows are predicted to rise by 10% or more.

7. Sensitivity of a road can be defined by the user groups such as school children and the elderly. Examples of ‘sensitive’ areas may be adjacent to a school, nursing home, located where residential properties front the road or where pedestrian activity is high.

8. It should be noted that increases below 10% are generally considered to be insignificant given that daily variations in traffic flow may fluctuate by this amount. Changes in traffic flows below this level are therefore assumed to result in no discernible or significant environmental effects.

18.2.1.2 Data Collection and Collation

9. A desktop study using Ordnance Survey plans, aerial photographs and site visits on several occasions during 2012 and 2013, have been carried out to establish an understanding of the highway network.

10. An assessment of tower accesses and access/haul routes, including a visual inspection, was undertaken to assess existing road layout and traffic conditions along the delivery and access routes to

the towers and substation. This assessment enabled construction traffic access routes and the associated study area to be defined.

11. Baseline traffic flows and personal injury accident information along the routes within the study area were obtained and reviewed in order to consider the effect of construction vehicles on road capacity and road safety.

18.2.1.3 Consultations with Roads Service

12. A meeting was held with Roads Service and Planning Service on 10 January 2013. At the meeting Roads Service requested that a Transport Assessment (TA) report be produced. The TA is included as a separate Appendix to this ES, Appendix 18A.

13. This chapter provides the salient sections of the TA and also provides an assessment of the likely significant environmental effects from a transport perspective.

18.2.1.4 Effects Requiring Further Consideration

14. The IEMA guidelines identify that the following environmental effects should be considered when assessing the traffic related to the development:

- Accidents and Safety;
- Air Pollution;
- Driver Delay;
- Dust and Dirt;
- Ecological Effects;
- Fear and Intimidation;
- Hazardous Loads;
- Heritage and Conservation;
- Noise;
- Pedestrian Amenity;
- Pedestrian Delay;
- Severance;
- Vibration; and
- Visual Effects.

15. Of the above effects, the following would be within the remit of assessments reported within other chapters of this ES:

- Air Pollution – Chapter 6;
- Ecological Effects – Chapter 10;
- Heritage and Conservation – Chapter 12;
- Noise – Chapter 11;
- Vibration – Chapter 11; and
- Visual Effects – Chapter 13.

16. Furthermore, there will be no hazardous loads during the construction or operational periods of the development and therefore this has been scoped out of this assessment.

18.2.1.5 Assessment of Significance

17. As already described, the IEMA Guidelines state that two broad rules of thumb can be used as a scoping process to delimit the scale and extent of the assessment.

18. The IEMA guidelines indentify general thresholds for traffic flow increases of 10% and 30%. Where the predicted increase in traffic flows is lower than the thresholds, the guidelines suggest the significance of effects can be stated to be low or insignificant and further details are not warranted. However, to ensure a relative assessment of the increase in road traffic in environmental terms the following criteria outlines in Table 18.1 and Table 18.2 are used to determine the magnitude of impact and receptor sensitivity respectively.

19.

Table 18.1 – Magnitude of Impact Criteria

Change In Traffic Flow	Magnitude of Impact
Change in total traffic or HGV flows over 90%	Major
Change in total traffic or HGV flows of 60 – 90%	Moderate
Change in total traffic or HGV flows of 30 – 60%	Minor
Change in total traffic or HGV flows of less than 30%	Negligible

Table 18.2 – Receptor Sensitivity

Receptor Sensitivity	Receptor Type
Major	Receptors of greatest sensitivity to traffic flow: schools, colleges, playgrounds, accident blackspots, retirement homes, urban/residential roads without footways that are used by pedestrians. (Paragraph 2.5 IEMA Guidelines, 1993)
Moderate	Traffic flow sensitive receptors including: congested junctions, doctors' surgeries, hospitals, shopping areas with roadside frontage, road with narrow footways, un-segregated cycle-ways, community centres, parks, recreation facilities.
Minor	Receptors with some sensitivity to traffic flow: places of worship, public open space, nature conservation areas, listed buildings, tourist attractions and residential areas with adequate footway provision.
Negligible	Receptors with low sensitivity to traffic flows and those sufficiently distant from affected roads and junctions.

20. The magnitude of change and the sensitivity of the receptor are then compared to determine the overall significance, as detailed in Table 18.3.

Table 18.3 – Determination of Significance of Effects

Sensitivity of Receptor	Magnitude Of Impact			
	Major	**Moderate**	**Minor**	**Negligible**
Major	Major	Major	Moderate	Minor
Moderate	Major	Moderate	Minor	Negligible
Minor	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

Sensitivity of Receptor' classification taken from 18.2 and 'Magnitude of Impact' classification taken from Table 18.1

21. Potential effects are therefore concluded to be major, moderate, minor or negligible significance.

18.2.2 Policy and Guidance Context

18.2.2.1 Overview

22. The traffic and transport issues described in the following planning policy, guidance and advice documents have been taken into account in this assessment:

- Guidelines for the Environmental Assessment of Road Traffic, Institute of Environmental Assessment (IEMA), 1993
- Planning Policy Statement 3 (PPS 3) : Access, Movement and Parking, Department of the Environment Planning Service, February 2005 and Clarification of Policy AMP3: Access to Protected Routes, October 2006
- Planning Policy Statement 13 (PPS 13) : Transportation and Landuse, Department of Regional Development, 2005
- Development Control Advice Note 15 (DCAN 15) : Vehicular Access Standards, Department of the Environment Planning Service & Roads Service Development Control, August 1999
- Transport Assessment Guidelines for Development Proposals in Northern Ireland, Department of Regional Development & Department of the Environment, 9 November 2006
- The Design Manual for Roads and Bridges (DMRB) TD42/95 Geometric Design of Major/Minor Priority Junctions
- DMRB TD 41/95 Vehicular Access to All-Purpose Trunk Roads
- Traffic Signs Manual Chapter 8 Traffic Safety Measures and Signs for Road Works and Temporary Situations

18.2.2.2 Guidelines for the Environmental Assessment of Road Traffic

23. The 'Guidelines for the Environmental Assessment of Road Traffic' produced by the Institute of Environmental Management and Assessment (the IEMA Guidelines 1993), are referred to throughout this assessment of the potential traffic and transport issues. The IEMA Guidelines suggest two broad rules can be used as a screening process to identify the appropriate extent of the assessment area. These are:

- Rule 1: Include road links where traffic flows would increase by more than 30% (or the number of HGVs would increase by more than 30%); and

- Rule 2: Include any other specifically sensitive areas where traffic flows would increase by 10% or more.

24. These guidelines are intended for the assessment of the environmental effect of road traffic associated with major new developments. It should be noted that these relate to permanent developments. In traffic terms the only permanent components with ongoing traffic impacts are the substation and maintenance associated with the overhead line and towers. The other traffic impacts i.e. associated with the construction traffic are considered temporary with negligible post construction traffic impacts.

18.2.2.3 Planning Policy Statement 3: Access, Movement and Parking

25. Planning Policy Statements (PPS) set out the policies of the Department of the Environment (DoE) on particular aspects of land-use planning and apply to the whole of Northern Ireland. Their contents will be taken into account in preparing development plans and are also material to decisions on individual planning applications and appeals.

26. PPS 3 sets out the Departments planning policies for vehicular and pedestrian access, transport assessment, the protection of transport routes and parking. It forms an important element in the integration of land use planning. It embodies the Government’s commitments to the provision of a modern, safe and sustainable transport system, the improvement of mobility for those who are socially excluded or whose mobility is impaired, the promotion of healthier living and improved road safety.

18.2.2.4 Planning Policy Statement 13 : Transportation and Landuse

27. The Department for Regional Development (DRD) formulated the Regional Development Strategy for Northern Ireland 2035 (RDS). Planning Policy Statement 13 has been prepared to assist in the implementation of the RDS. It will guide the integration of transportation and land use, particularly through the preparation of development plans and transport plans. PPS 13 replaces Strategic Policy 11 and Policy PSU 6 of “A Planning strategy for Rural Northern Ireland”. PPS13 flows directly from the vision, spatial strategy and strategic planning guidelines contained in the RDS.

18.2.2.5 Development Control Advice Note 15 : Vehicular Access Standards

28. Development Control Advice Note 15 (DCAN 15) sets out the advice relating to vehicular accesses. The advice set out in DCAN 15 applies to new private accesses and new development access roads joining the public road.

18.2.2.6 Transport Assessment Guidelines for Development Proposals in Northern Ireland

29. These guidelines assist in the preparation of Transport Assessments for development proposals in Northern Ireland, the policy context for which is set out in Planning Policy Statement 13: Transportation and Land Use and Planning Policy Statement 3: Access, Movement and Parking.

30. The purpose of Transport Assessment is to provide enough information for DoE and DRD to understand how the Proposed Development is likely to function in transport terms. Assessing the transport impacts in a systematic manner contributes towards understanding how more sustainable travel patterns might be achieved through changing travel behaviour. Transport Assessment also subsumes the former process of Traffic Impact Assessment.

31. Section 3.5 of the guidelines provide a guide as to which proposals require the completion of a detailed Transport Assessment in terms of the following parameters:

- **Size:** The size threshold for ‘Industry’ is 5,000m^2 Gross Floor Area (GFA);
- **Location**: These sites are likely to be only easily accessible by car, generally located on the edges of urban areas, in green belts, out of town, near motorway junction;
- **Activity**: 100 or more vehicle movements in the peak hour; and,

- **Other considerations:** Where Planning Service and Roads Service consider the proposals raise significant transport implications.

32. Following a meeting with Planning Service and Roads Service on 10 January 2013 it was confirmed that a Transport Assessment would be required.

18.2.2.7 DMRB TD42/95 Geometric Design of Major/Minor Priority Junctions

33. This document advises on the design of major/minor priority junctions, including the siting of junctions. Recommendations are given on the geometric design of the important elements of the major/minor priority junction, and the way in which the individual components can be brought together to produce good overall design.

18.2.2.8 DMRB TD41/95 Vehicular Access to All-Purpose Trunk Roads

34. This document sets out standards for the geometric layout of connections for direct vehicular access to all-purpose trunk roads where the numbers using the connection are below 500 AADT. The Standard describes the effects of vehicular access to Trunk Roads and outlines the results of recent research on the safety implication.

18.2.2.9 Traffic Signs Manual Chapter 8 Traffic Safety Measures and Signs for Road Works and Temporary Situations

35. Chapter 8 of the Manual sets out the effects of road works or temporary closures on all kinds of road users and recommends steps that should be taken to minimise these effects.

18.2.3 Indication of Any Difficulties Encountered

36. A difficulty encountered in regard to the Transport Assessment of the Proposed Development is that suppliers and contractors cannot be specified at this stage. On this basis, haul routes to/from quarries, concrete supplier and landfills can only be assessed as the route from the nearest A or B class road to/from the development sites (see Section 18.3.7.1, Section 18.4.1.2 paragraphs 92-94 and Section 18.4.1.3 paragraphs 120-121).

37. In addition, the exact details of locations where route traffic management (see Section 18.5) is required cannot be concluded until discussions have taken place with Roads Service. Therefore an outline Construction Traffic Management Plan (see Appendix 18A) has been produced at this stage, and will be refined (by the appointed contractor) prior to construction. It should be noted that the final version will be within the parameters set by the outline plan.

18.3 Baseline Description

18.3.1 Study Area

18.3.1.1 Overview

38. Figure 1 of Appendix 18A shows the overall study area.

39. The location of the substation is permanent and will have a permanent access however temporary access is required at over 100 locations in order to facilitate the construction of towers that will carry the overhead line. For the purpose of the Transport Assessment the study area relates to the roads where

the permanent and temporary accesses are to be located and also the haul routes used for the transportation of construction and maintenance traffic.

40. The study area covers approximately 34km of road network between the Tyrone and Cavan county border and consists of a mixture of A, B and C class roads and rural unclassified roads.

18.3.1.2 A Class Roads

41. The A Class roads in the study area are:

- A26 Killylea Road – runs between Armagh and Caledon;
- A29 Moy Road – runs between Dungannon, Moy, Armagh and Newtownhamilton; and
- A3 Monaghan Road – runs between Armagh and the border near Monaghan.

42. The above roads have central delineating white lines, high speeds and relatively high traffic flows.

18.3.1.3 B Class Roads

43. The B Class roads in the locality are:

- B3 Fergort Road – runs from Keady to the border;
- B115 Battleford Road – runs between Eglish and Armagh;
- B106 Trew Mount Road / Benburb Road – runs between Benburb, Moy and the M1;
- B103 Clonfeacle Road – runs between Benburb and Armagh Road A29; and
- B132 Maddan Road – runs from Keady to the A3 at Armagh.

44. The above roads have central delineating white lines, relatively high speeds and traffic flows.

18.3.1.4 C Class Roads

45. The C Class roads in the locality are:

- Derrynoose Road – connects the B3 Fergort Road with the L3530 across the border.

46. The above road has central delineating white lines and is approximately 6 metres wide.

18.3.1.5 Unclassified Roads

47. The following unclassified roads in the locality are more than 4 metres in width:

- Drumhillery Road;
- Hanslough Road;
- Brootally Road;
- Cormeen Road;
- Doohat Road;
- Artasooly Road;
- Tullysaran Road;

- Tullyneagh Road;
- Gorestown Road; and
- Culkeeran Road

48. The above roads do not have central delineating white lines however they have sufficient width for two cars to pass.

49. The following unclassified roads in the locality are between 3 and 4 metres in width:

- Bracknagh Road;
- Crossbane Road;
- Dernalea Road;
- Derrygally Way;
- Drumlee Road;
- Glassdrummond Road;
- Navan Fort Road;
- Rhone Road;
- Tullydowey Road;
- Tullyneagh Road;
- Gorestown Road;
- Culkeeran Road;
- Unclassified road off Killylea Road serving AT57, AT58, AT59 and AT60;
- Unclassified road off Tullcallidy Road serving AT62SL and AT63; and
- Unclassified road named Monaghan Road off Brootally Road.

50. The above roads do not have central delineating white lines. Two cars can generally pass each other, and wider vehicles use informal passing opportunities along the roads to pass each other when this occurs.

51. The following unclassified roads in the locality are less than 3 metres in width:

- Ballyhoy Road;
- Cavanagarvan Road;
- Culverog Road;
- Listrakelt Road;
- Major Lane;
- Sheetrim Road; and
- Tivenacree Road.

52. The above roads do not have central delineating white lines and are too narrow to allow two cars to pass each other. Informal passing opportunities along the road exist and are utilised by all traffic i.e. all vehicle types. The existing vehicle types are comparable to those used in the Proposed Development.

18.3.2 Site Access

18.3.2.1 Overview

53. The development proposals to be assessed in this ES, relate to two aspects. Firstly, the construction of a substation at Turleenan (which includes the removal of one existing 275kV tower and replacement with two new 275kV towers). This is a permanent development with a permanent access. Secondly the construction of the overhead line and towers. Whilst the towers and overhead line are permanent features their access requirements for the purposes of construction are temporary.

18.3.2.2 Turleenan Substation

54. The proposed substation will consist of two buildings (a control building and a Gas Insulated Switchgear (GIS) building) and an open air 400kV switchyard (AIS). The positioning of the proposed substation compound has been aligned with NIE's existing 275kV overhead line and will allow connection to the proposed 400kV overhead line. The development will require one existing 275kV intermediate suspension tower in the vicinity of the substation to be removed and two new 275kV towers to be constructed to provide connection to the proposed substation.

55. The proposed substation is located in the Turleenan townland, near Moy, County Tyrone with access via Trew Mount Road (B106), as shown in Figure 1 of Appendix 18A.

56. Construction of the substation is estimated to take a period of three years, with a start date of 2015 and completion in 2017. Once completed it will be maintained throughout its life and will become permanent as part of NIE's major infrastructure. The development includes a total of six car parking spaces to facilitate staff parking when maintenance is required.

57. There is an existing dwelling (No. 152 Trew Mount Road) located within the confines of the development site. The development proposals involve initially allowing the dwelling to remain during the construction phase (to be used as a site office), with a temporary access located to the northern edge of the site, see Figure 2 of Appendix 18A. It should be noted that this access is located within the flood plain and therefore it is intended, once the majority of the construction work is completed, to demolish the dwelling and locate the permanent access to the site in this location, which is not in the flood plain. Figure 3 of Appendix 18A shows the proposed permanent access location.

18.3.2.3 Overhead Line and Towers

58. The overhead line and towers will include a total of 102 towers. Chapter 5 provides detail on the tower types and construction methodology. The tower type impacts the amount of material required for construction, for example a 30 degree tower requires more concrete for the foundations than an intermediate tower. Therefore tower type impacts the amount of traffic generated.

59. A total of 104 temporary accesses are to be used to construct the 102 proposed towers. The vast majority of these temporary accesses will use either existing field gates or laneways.

60. Annex 1 of Appendix 18A details the proposed access arrangements to each of the towers and also separate stringing locations, including photos of the proposed access locations and maps showing the access points on the local highway network.

18.3.3 Baseline Traffic

18.3.3.1 Traffic Flows

<u>Traffic Census Data</u>

61. The Roads Service Traffic and Travel Information 2006 – 2010 Annual Traffic Census has been consulted for relevant data. Traffic census data is currently not available for 2011.2013 as it has not yet been published. Historical traffic flow data for sites on the A and B-class roads in the vicinity have been

examined as shown in Table 18.4 below. The approximate locations of the counters are show in Figure 5 of Appendix 18A.

Table 18.4 - Traffic Census Data 2006-2010

Ref No.	Location	2006		2007		2008		2009		2010	
		AADT	% HGV	AADT	% HGV	AADT	% HGV	AADT	% HGV	AADT	% HGV
417	A29 Keady Road	6,260	9.0	5,790	9.15	5,760	8.3	5,710	7.1	5,750	7.2
424	A3 Monaghan Road	6,660	11.0	6,880	11.06	6,580	10.6	6,490	10.1	6,260	9.9
428	B3 Derrynoose Road	5,520	7.0	5,290	6.62	5,290	6.0	5,210	5.9	5,040	4.7
440*	A29 Moy Road	-	-	5,010	11.8	4,580	10.7	4,340	9.7	10,310	10.0
442*	A3 Monaghan Road	-	-	10,580	13.41	10,500	13.2	10,510	13.2	4,230	13.7
606	A29 Armagh Road	10,750	9.0	10,860	9.12	10,550	8.8	10,600	8.1	10,250	7.9

* It should be noted that permanent Roads Service counters were not in places for either 440 or 442 in 2006

62. Tables 18.4 shows that annual traffic levels are decreasing annually and therefore are currently undergoing negative growth.

<u>Surveyed Traffic Count Data</u>

63. Base traffic flow data was obtained from a series of Automated Traffic Counters (ATCs) installed within the study area in May 2012 and January 2013. The surveys took place at 42 locations within the area. Figure 6 of Appendix 18A details the locations of the ATC surveys and the results are shown in Table 18.5.

Table 18.5 - ATC Survey Results

Site Ref.	Road Name	Road Classification	Weekday Daily Traffic	% HGV
Site 1	Trew Mount Road	B106	3,672	4%
Site 2	Moy Road	A29	8,522	8%
Site 3	Culverog Road	Unclassified	65	2%
Site 4	Benburb Road	B106	813	3%
Site 5	Clonfeacle Road	B103	1,846	5%
Site 6	Artasooly Road	Unclassified	490	5%
Site 7	Battleford Road	B115	2,432	5%
Site 8	Killylea Road	A28	4,721	7%
Site 9	Brootally Road	Unclassified	180	9%
Site 10	Dernalea Road	Unclassified	210	5%
Site 11	Drumhillery Road	Unclassified	423	6%
Site 12	Fergort Road	B3	642	6%
Site 13	Listrakelt Road	Unclassified	177	5%
Site 14	Monaghan Road	A3	6,180	8%
Site 15	Maddan Road	B132	1,145	6%
Site 16	Carn Industrial Estate	B2	663	7%

Site Ref.	Road Name	Road Classification	Weekday Daily Traffic	% HGV
Site 17	Derrygally Road	Unclassified	133	14%
Site 18	Major Lane	Unclassified	33	21%
Site 19	Culkeeran Road	Unclassified	149	17%
Site 20	Rhone Road	Unclassified	39	13%
Site 21	Gorestown Road	Unclassified	668	13%
Site 22	Drumlee Road	Unclassified	230	20%
Site 23	Tullydowey Road	Unclassified	51	18%
Site 24	Tullysaran Road	Unclassified	213	16%
Site 25	Tullyneagh Road	Unclassified	282	15%
Site 26	Battleford Road	B115	1926	14%
Site 27	Bracknagh Road	Unclassified	45	20%
Site 28	Navan Fort Road	Unclassified	56	25%
Site 29	Cormeen Road	Unclassified	289	22%
Site 30	Unclassified	Unclassified	71	4%
Site 31	Tullcallidy Road	Unclassified	41	22%
Site 32	Ballyhoy Road	Unclassified	25	24%
Site 33	Unclassified	Unclassified	90	3%
Site 34	Dernalea Road	Unclassified	26	4%
Site 35	Hanslough Road	Unclassified	490	10%
Site 36	Cavanagarvan Road	Unclassified	66	6%
Site 37	Sheetrim Road	Unclassified	27	4%
Site 38	Glassdrummond Road	Unclassified	90	17%
Site 39	Unclassified	Unclassified	34	3%
Site 40	Derrynoose Road	C Road	678	19%
Site 41	Unclassified	Unclassified	12	8%
Site 42	Crossbane Road	Unclassified	54	4%

64. The total number of vehicles in any given hour for each of the ATC surveyed sites were used to determine overall peak hours for the study assessment period and the AM peak hour was found to be 08:00-09:00 and the PM peak hour 17:00-18:00. The peak hour calculations are shown in Annex 2 of Appendix 18A.

65. Saturday flows are generally lower than the daily weekday flows and therefore the weekday is considered to be the worst case and a Saturday assessment is not required. Work will not occur on Sundays, so a Sunday assessment is also not required,

18.3.4 Personal Injury Accident Review

66. In the first instance the traffic accident history of the study area has been obtained. Table 18.6 details the accident data between 2008 and 2010 (the latest available at the time of writing). The information within the table includes the accident severity and proximity to nearest access point.

Table 18.6 - Accident Data 2008-2010

Year	Ref.	Location	Proximity To Nearest Access Point	Severity Of Collision	Severity Of Casualty		
					Slight	Serious	Fatal
2008	1	Moy Road	160m	SLIGHT	1	0	0
	2	Drumgrannon Road	750m	SLIGHT	1	0	0
	3	Drumgrannon Road	825m	SLIGHT	1	0	0
	4	Tullyneagh Road	10m	SLIGHT	1	0	0
	5	Dernalea Road	10m	SLIGHT	2	0	0
2009	6	Drumgrannon Road	825m	SLIGHT	1	0	0
	7	Clonfeacle Road	350m	SLIGHT	2	0	0
	8	Clonfeacle Road	700m	SLIGHT	1	0	0
	9	Monaghan Road	400m	SERIOUS	0	1	0
	10	Monaghan Road	200m	SLIGHT	1	0	0
2010	11	Gorestown Road	1000m	SLIGHT	2	0	0
	12	Benburb Road	200m	SLIGHT	1	0	0
	13	Clonfeacle Road	10m	SERIOUS	0	1	0
	14	Battleford Road	430m	SLIGHT	1	0	0
	15	Cormeen Road	310m	SLIGHT	1	0	0
	16	Monaghan Road	500m	SERIOUS	2	1	0
	17	Not Known	600m	SLIGHT	3	0	0

67. Table 18.6 shows there are three locations where collisions occurred within 10 metres of a proposed access, accident reference numbers 4, 5 and 13, and this warranted further investigation. The following provides further information regarding these accidents:

<u>Tullyneagh Road (Accident Ref 4)</u>

- Vehicles involved: - Collision involving one motorcycle;
- Weather/ road conditions: - Raining and wet road; and,
- Collision details: - Going ahead around right hand bend, object in carriageway.

<u>Dernalea Road (Accident Ref 5)</u>

- Vehicles involved: - Collision involving two cars;
- Weather/ road conditions: - Bright and dry road; and,
- Collision details: - Car going around right hand bend skidding with car behind colliding into it.

Clonfeacle Road (Accident Ref 13)

- Vehicles involved: - Collision involving car and HGV>7.5t;
- Weather/ road conditions: - Raining and wet road; and,
- Collision details: - Car going around left hand bend skidded into oncoming HGV.

68. The accidents detailed above were either caused by wet road conditions or driver error and the accident history data shows that there have not been three or more accidents at the same location on the network. This is a 'normal' indication that no remedial work is required.

18.3.5 Sensitive Receptors

18.3.5.1 Definition

69. From the IEMA guidelines, it is recommended to identify particular groups or locations which may be sensitive to changes in traffic conditions, deemed as Sensitive Receptors. The IEMA guidelines include a list of potential Sensitive Receptors. The two applicable to this study are:

- Existing accident black-spots; and,
- Locations with statutory restrictions i.e. roads with weight and load restrictions in place.

18.3.5.2 Accident Black-spots

70. An accident black-spot is defined as location with three or more accidents as per paragraph 2.5 IEMA Guidelines 1993. Analysis of the accident data within the study area between 2008 and 2010 identified three areas with three or more accidents which are detailed below;

- Drumgrannon Road;
- Clonfeacle Road; and
- Monaghan Road.

71. However detailed analysis of accident locations showed that only one location had three accidents on the same stretch of road i.e. Drumgrannon Road whereas both Clonfeacle Road and Monaghan Road detailed three accidents over a considerable distance of road.

72. Illustration 18.1 shows the accident black-spot on Drumgrannon Road and identifies the location (see arrow) outside a residential property. The speed of the road is National Speed Limit and there is no street lighting.

Illustration 18.1 - Drumgrannon Road

73. Reasons stated for the three accidents recorded at this location all indicate that vehicles skidded due to weather conditions and poor lighting.

18.3.5.3 Weight Restrictions

74. The sign shown in Illustration 18.2 was erected in 2008 by Roads Service Traffic Management Section to advise road users that Tullydowey Road was not suitable for heavy goods vehicles. There are no weak structures on this road and the sign is advisory, not mandatory.

75. The sign shown in Illustration 18.3 on the Culverog Road was not erected by Roads Service Traffic Management Section. This was confirmed by Roads Service and also confirmed that the sign "*should be ignored*"[146]. However there is a two storey house at a corner on Culverog Road which high sided vehicles have difficulty getting around. The sign may have been erected by members of the public to alert road users to this constraint.

[146] Email to AECOM from Roads Service Dungannon section dated 23/05/2013.

Illustration 18.2 - Weight Restriction Advisory Sign (Tullydowey Road)

Illustration 18.3 - Weight Restriction Advisory Sign (Culverog Road)

18.3.6 Committed Developments

76. Planning Service does not provide planning consultants with an indication of planning histories. Therefore, a search of planning applications was conducted within a 5km radius of the site through the third party search website Planning online (http://www.planningonline.co.uk/pol/about.jsp).

77. The search identified two applications in the area which have been granted permission and could be of significance in terms of impact due to site development and potential accesses.

- M/2010/0870/F - Proposed Housing Development consisting of 47No. Dwellings (3No. Detached, 34No. Semi-Detached and 10No. Townhouses) and associated site works, located at Clonfeacle Road.
- O/2012/0460/F - Housing development and associated site works consisting of 2No. Detached Dwellings and 3No. Townhouses, located at Maydown Road.

78. As these have been granted permission they have been considered as committed within the Transport Assessment.

79. In order to take account of the traffic implications of the aforementioned committed developments within the traffic impact analysis, the volumes of traffic generated have been calculated based on the interrogation of the latest TRICKS database – version 2012 (b). In order to provide a robust assessment, 85th percentile trip rates have been used to estimate the traffic flows. Table 18.7 below, shows the anticipated traffic generation.

80. The trip rates are per dwelling for mixed private housing. In the AM peak the two developments generate 6 arrivals and 19 departures. In the PM peak 34 arrivals and 22 departures are generated.

Table 18.7 Committed Developments Traffic Generations

SITE REF.	LOCATION	PEAK HOUR	85TH PERCENTILE TRIP RATES			TRAFFIC GENERATION		
			ARR	DEP	TOTAL	ARR	DEP	TOTAL
M/2010/0870/F	Clonfeacle Road	08:00-09:00	0.110	0.335	0.445	5	16	21
		17:00-18:00	0.562	0.363	0.925	28	18	46
O/2012/0460/F	Maydown Road	08:00-09:00	0.110	0.335	0.445	1	3	4
		17:00-18:00	0.562	0.363	0.925	6	4	10

18.3.7 Summary of Assumptions

18.3.7.1 Depot and Supplier Details

81. NIE's existing depot at Carn Industrial Estate, Craigavon, will be used as the depot for the construction of the overhead line and towers. The depot will be used to store construction vehicles and equipment. Materials for all of the construction phase (overhead line and towers) will be stored at the Carn depot. Carn is NIE's main regional depot in the southern half of Northern Ireland. It is adjacent to the M12 Carn roundabout and 15 miles (24km) from the proposed Turleenan Substation which will link the proposed new 400kV Line to the existing Network. The location of the depot is shown in Figure 4 of Appendix 18A.

82. With regard to stone and concrete, which unlike other construction equipment stored at Carn will go directly from the source to the constructions sites, will be sourced from suppliers through the contractor. Licensed landfill sites will be used to dispose of waste spoil from the construction. There are a number of landfill sites in the area that can be used to dispose of the waste and spoil material. These include,

for example, Tullyvar Landfill Site near Aughnacloy, the Aughnagun Landfill Site near Mayobridge and the Lisbane Landfill Site near Tandragee.

83. These can all be immediately accessed via A and B routes. The Tullyvar site is to the north of the study area and can be accessed via the A29 and then onto the A4 and A5 routes. The Aughnagun Landfill Site is to the south of the study area and can be accessed via the A29 as far as Armagh and then the A28 to Newry and then on to the B6 and B7 on the eastern side of Newry. The Lisbane Landfill Site near Tandragee is to the east of the study area and is accessed via the A29 and A51.

84. These routes are suitable for the types and volumes of traffic generated by the Proposed Development.

18.3.7.2 Staff Travel to/from Construction Sites

85. The appointed contractor will be required to transport all staff to and from the construction sites in staff mini-bus/work van vehicles

18.4 Potential Impacts

18.4.1 Construction Phase

18.4.1.1 Overview

86. As described previously, the nature of the Proposed Development means that almost all the travel generated by the Proposed Development will be during the construction period. Therefore the majority of trips will be vehicular and there will be little or no travel by walk, cycle or public transport. The following sub-sections detail the traffic generated by the sub-station and overhead line and towers respectively.

18.4.1.2 Turleenan Substation Traffic Generation

87. The construction traffic associated with the substation traffic would access the development site through the proposed temporary access. As stated previously the construction phase is anticipated to start in 2015 for a period of 3 years until completion in 2017, and can be considered in the following seven segments:

1) Site Entrance
2) Access Road
3) Site Clearance, Landscaping and Preparation of Bund Construction
4) Install Drainage and Ducting
5) Construction of Roads and Bases Within Site
6) Installation of Equipment and Construction of Buildings
7) Completion of Access Road and Entrance, Including Final Surfacing

88. The substation is anticipated to be completed and operational in 2017.

<u>Working Hours</u>

89. During construction the site working hours will be restricted to 07:00 – 19:00 or hours of daylight Monday to Friday. Saturday working hours will be restricted to 07:00-13:00 or hours of daylight. No Sunday or night working except for emergency works (pumping of excavations, not construction).

Parking

90. Parking of construction vehicles on footways/verges and double parking will be prevented on the B106 in the vicinity of the proposed substation. Signs will be erected at the road verges and the construction site manager will ensure this is adhered to. Construction vehicles will park within the confines of the construction site.

91. To further minimise staff vehicles, all staff will travel to the construction sites in mini-buses/work van vehicles originating from Carn Industrial Estate.

92. It is proposed that part of the temporary hard-standing area at the construction site will be set aside for access and parking of emergency vehicles

93. In summary there will be no parking impacts caused by the Proposed Development on the surrounding road network.

Proposed Distribution of Construction Related Traffic (Haul Routes)

94. The proposed substation site enjoys good access routes and all construction traffic can access the site using A and B class roads including the B106 itself, the B28 from Craigavon and the A29 from Armagh to the south and Dungannon to the north, as well as the M1 Motorway providing excellent access to Belfast and its port to the east as well as the west.

95. As described previously a difficulty encountered in regard to the identification of haul routes for the Proposed Development is that suppliers cannot be specified at this stage. On this basis haul routes to/from quarries, concrete supplier and landfills can only be assessed so far as the route from the nearest A or B class road to the development site.

Traffic Generation

96. Construction traffic volumes have been based on a maximum daily flow of 200 vehicles (calculated on the basis to allow for construction to be completed within 3 years).

97. The traffic figures are based on a reasonable worst case i.e. the day on which the maximum daily traffic will be generated during construction and based on a 12hour working day. A 12 hour working day represents the majority of the working year and therefore using this scenario is considered to provide a robust assessment.

Traffic Impacts

98. Section 4.7.2 of Appendix 18A details the calculation of forecast background traffic flows. In summary NRTF low growth factors have been used to calculate forecast background traffic flows.

99. With regard to traffic generated by committed developments within the study area, previously detailed in Section 18.3.3, given the volumes generated, this is considered to be already included in the forecast background traffic.

100. Table 18.8 identifies the peak traffic impacts during the construction phase of the proposed substation i.e. the peak construction traffic in the first year of construction, 2015.

Table 18.8 - Turleenan Substation Traffic Impacts and Significance of Effect – Construction Phase

Time Period	Trew Mount Road 2015 Background Traffic (Vehs)	Peak Construction Development Traffic (Vehs)	Peak Impact (%)	Significance of Effect
Daily Traffic	3,782	200	5.3%	Negligible

101. On the basis that the peak impact is less than the threshold value of 30%, the significance of the effect, as defined in Table 18.1, of traffic generated during the construction phase is considered to be **negligible.**

Access Assessment

102. As stated previously, there is an existing dwelling (No. 152 Trew Mount Road) located within the confines of the development site. The development proposals involve initially allowing the dwelling to remain during the construction phase (to be used as a site office), with a temporary access located to the northern edge of the site.

103. The proposed temporary access provides 15 metres radii and 4.5 x 168.3metres sightlines, which are compliant with the advice set out in DCAN15. This coupled with the low predicted traffic flows (see Table 18.8) means the proposed access arrangement is considered to be adequate for the Proposed Development and no mitigation measures are required.

18.4.1.3 Overhead Line and Towers

Construction Phasing

104. The following details the construction methodology from which the traffic generations have been derived. Five stages of work have been identified, as follows:

- Stage 1: Access Work – Initial site clearance, installation of temporary tracks and delivery of plant and equipment;
- Stage 2: Tower Foundations – Excavation of foundations, concrete infilling, backfilling of excavated materials;
- Stage 3: Steel Work – Delivery and construction of steel towers;
- Stage 4: Conductor/Insulator Installation – Installation of conductor and insulator through tensioners and pullers; and
- Stage 5: Reinstatement of Land - Once all works are complete, the access route and the construction areas around the tower are restored to their original condition.

Stage 1: Access Work

105. Stage 1 entails the preparation of the site for tower construction. Temporary tracks will be required to accommodate the heavier vehicles associated with the later phases. A total of 53 access tracks will require stone. Generally, temporary tracks are constructed using stone, whereby geotextile material is laid on the ground and 100mm of stone is placed on top and compacted. Other site preparation works include such things as removal of hedges and fences and erection of temporary fencing.

Stage 2: Tower Foundations

106. Key activities for Stage 2 are the excavation of the foundations for the tower legs and the subsequent infilling of concrete. The volume of concrete required for the foundations depends on the tower type i.e. whether intermediate, 30 degree, 60 degree or 90 degree and also the ground conditions. Although some of the excavated soil will be backfilled and compressed, there will be a volume of waste spoil which will have to be removed from site. The need for temporary stoned working areas to construct the tower bases has been assessed and identified in Chapter 5.

Stage 3: Steel Work

107. Within Stage 3 the steel for the tower is delivered and constructed on site. Only steel to be used that day would be delivered to the site in the morning, to avoid excess materials being located on site overnight. A Derrick Pole would be used to assemble the tower.

Stage 4: Conductor / Insulator Installation

108. Stage 4 involves the stringing of the overhead conductor / insulator lines between towers, usually in sections of 10 consecutive towers. Overhead lines originate from tensioners on one side of the tower section and are fed through via pullers on the other side of the section. A pilot wire is pulled across the section via a heavy towing tractor to connect the tensioners.

Stage 5: Reinstatement of Land

109. Once all works are complete, the access route and the construction areas around the tower will be restored to their original condition. This reinstatement work will have the same levels of staff and vehicles as Stage 1.

Summary

110. Table 18.9 overleaf summarises the construction phases and the associated vehicle types, staff requirements and number of days. It should be noted that Stages 1-5 described above relate to the physical construction of the towers through the designated access tracks. Further access is also required to complete the stringing of the overhead line, through further ‘Stringing Location’ accesses and ‘Guarding location’ accesses (see paragraphs 124 and 125 respectively).

Table 18.9 - Summary of Construction Methodology for Overhead Line and Towers

Stage	Description	Activities	Vehicle Types Requiring Access	No. of Staff	Typical Work Days	
					Tower Type	Days
1	Access Work	Delivery of plant and equipment Site clearance Installation of temporary tracks (if required)	Fastrac/tractor + low loader trailer carrying dumper / fencing equipment / excavator / rock breaker (if required) Tipper Lorry (22 tonnes) – only when stone required Transit type van	3	Inter	1
					30	1
					60	1
					90	1
2	Tower Foundations	Delivery of plant and equipment Removal of surplus material Concrete filling of foundations	Tractor and trailer Concrete lorry (8 cubic metres) Transit type van	6	Inter	3
					30	4
					60	6
					90	6
3	Steel Work	Delivery of plant and equipment Delivery of steel Construction of tower	Flatbed lorry (26 tonnes) Tractor and trailer Fastrac/tractor + low loader trailer carrying Derrick Pole / Telescopic Loader Transit type van	8	Inter	3
					30	4
					60	4
					90	4
4	Conductor/ Insulator Installation	Delivery of plant and equipment Stringing of line Removal of spent drums	Fastrac/tractor + low loader trailer carrying puller tensioners / conductor drums / stringing wheels / compressor and heads / quad bikes Tractor and trailer Transit type van	15	Inter	7
					30	7
					60	7
					90	7
5	Reinstatement of Land	Delivery of plant and equipment Site clearance Removal of temporary tracks (if required)	Fastrac/tractor + low loader trailer carrying dumper / fencing equipment / mini-digger Tractor and trailer Transit type van	3	Inter	1
					30	1
					60	1
					90	1

Construction Schedule / Period

111. It is estimated that the construction period in any particular location along the overhead line route will be in the order of 4 – 6 months. This is because all of the Stages of the construction can not follow immediately on from one another, an example being that once Stage 2 is completed i.e. the concrete poured for the base, the steel cannot be erected until the concrete has set adequately, which is estimated to take at least 4 weeks. Furthermore once the steel work is completed in Stage 3, Stage 4 cannot follow directly after unless enough of the towers have been constructed to allow the stringing of the conductor to take place. In summary, the traffic generated by each of the access points will occur for short periods of time with breaks between all Stages except Stages 1 and 2.

112. NIE intends to instruct the contractor to provide two construction teams, at this point estimated to complete towers 1-51 and 52-102 respectively.

Working Hours

113. During construction the site working hours will be restricted to 07:00 – 19:00 or hours of daylight Monday to Friday. Saturday working hours will be restricted to 07:00-13:00 or hours of daylight. No Sunday or night working except for emergency works (pumping of excavations, not construction).

Construction Management

114. As described above, two separate construction teams will construct the overhead line and towers. As the Proposed Development crosses 34km of land, this means that the two teams will be travelling to and working within separate areas. For example, the route taken by each team from Carn Industrial Estate would be via different approaches e.g. via the M1 or B28 for the northern end of the development and via the A3 for the southern end of the development. Therefore no interaction between the two teams is anticipated, as the first team approaches tower 51 for construction, the second team will be approaching tower 102 for construction. This working methodology means that the cumulative effects of the two teams working in the same area (accessing the same roads) will not occur.

Parking

115. It is proposed that part of the temporary working area at the construction site will be set aside for access and parking of emergency vehicles.

116. To further minimise staff vehicles, all staff will travel to/from the construction sites in mini-buses/work van type vehicles and will park in the temporary working area.

117. If construction vehicles need to use the roadside this will be managed using traffic management measures, see Section 18.5.2.1.

118. In summary there will be no parking impacts caused by staff vehicles associated with the Proposed Development on the surrounding road network. On occasions when construction vehicles park on the roadside, this will be managed by traffic management measures, see Section 18.5.2.1.

Proposed Distribution of Construction Related Traffic (Haul Routes)

119. Again, as previously described a difficulty encountered in regard to the identification of haul routes for the Proposed Development is that suppliers cannot be specified at this stage. On this basis haul routes to/from quarries, concrete supplier and landfills can only be assessed so far as the route from the nearest A or B class road to the development site.

120. Haul routes as described have been identified for the overhead line and towers within Annex 8 of Appendix 18A.

Traffic Generation

Tower Accesses

121. NIE, with their consultants, have carried out a study of the prevailing ground conditions in the proposed tower locations to all best estimates of the requirements for stone, spoil disposal and concrete. Annex 3 of Appendix 18A includes details of each of the access points, the tower types and the estimates of stone, spoil disposal and concrete. This has allowed the daily traffic generations to be calculated.

122. As identified earlier, the peak hours for background traffic are 08:00-09:00 and 17:00-18:00. Development traffic generations for these periods have been calculated based on the peak daily traffic for the particular access with flows apart from staff arrivals and departures (assumed to arrive before

and depart after the designated peak hour times) split uniformly over a 12 hour working day. The traffic figures are based on a reasonable worst case i.e. the day on which the maximum daily traffic will be generated during construction and based on a 12hour working day. A 12 hour working day represents the majority of the working year and therefore using this scenario is considered to provide a robust assessment. Although the working day hours can decrease in winter periods, as the traffic generations are based on the peak daily flow it is considered to represent a robust assessment of likely traffic flows.

123. The peak daily traffic generated by the proposed temporary accesses varies between 15 and 58 vehicles per day. Average daily traffic flows range between 6 and 26 vehicles per day. The total days used by the majority of accesses would be 15 construction days. However, the access track providing access to Towers 3, 4, 5 and 6 would be used for a period of 57 construction days.

Stringing Location Accesses

124. Stringing locations will be used for a maximum of 5 days and will have a maximum daily traffic flow of 20 vehicles per day.

Guarding Locations

125. Guarding locations will require access by 1 or 2 vehicles daily over a period of 5 days.

Traffic Impacts

126. The same forecasting approach described above has been undertaken with regard to the calculation of background traffic flows for this aspect of the development. Construction of the scheme is expected to commence in 2015 with the year of opening detailed as 2017. The forecast year has been taken as 2015 to provide a reasonable assessment, as the traffic impacts are likely to be most significant when the background traffic flows are the lowest.

127. Appendix 4 of Annex 1 shows traffic impacts for the overhead line and towers in forecast year 2015 for peak hours and daily flows. Table 18.10 overleaf shows the locations where traffic impacts in excess of the threshold value of 30% are exceeded. In total there are 13 roads serving 31 accesses where the traffic impacts are over the threshold value of 30%.

128. In accordance with the significance of effect criteria (Table 18.3) the levels of impact are also included in Table 18.10

Table 18.10 - Overhead Line and Towers Traffic Impacts and Significance of Effect

Road	Access Track	Background Daily Traffic (Vehs)	Peak Construction Development Daily Traffic (Vehs)	Peak Impact (%)	Significance of Effect
Major Lane	AT7	34	15	44.4%	Negligible
Rhone Road	AT13	40	54	135.3%	Moderate
	AT14	40	36	90.2%	Moderate
Culverog Road	AT16-17	67	38	56.7%	Moderate
	AT18	67	40	59.7%	Moderate
	AT19	67	54	80.6%	Moderate
Bracknagh Road	AT47	46	34	73.9%	Minor
	AT48A	46	15	32.6%	Negligible
	AT48B	46	15	32.6%	Negligible
	AT49	46	42	91.2%	Moderate
	AT49SL	46	20	43.4%	Negligible
	AT50	46	15	32.6%	Negligible
Navan Fort Road	AT52	57	34	59.3%	Negligible
	AT52SL	57	20	34.9%	Negligible
Unclassified road	AT57-58	73	40	55.1%	Negligible
Ballyhoy Road	AT61	26	18	70.4%	Minor
Monaghan Road (spur)	AT62	92	36	39.1%	Negligible
Cavanagarvan Road	AT78-79	68	48	71.7%	Minor
Sheetrim Road	AT80	28	18	65.2%	Minor
	AT81	28	26	94.1%	Moderate
	AT82	28	36	130.3%	Moderate
	AT83A	28	32	115.9%	Moderate
	AT83B	28	32	115.9%	Moderate
	AT84	28	15	54.3%	Negligible
	AT85	28	34	123.1%	Moderate
Tivenacree Road	AT88	35	15	43.1%	Negligible
	AT89	35	44	126.5%	Moderate
	AT90	35	15	43.1%	Negligible
Glassdrummond Road	AT92	92	30	32.6%	Negligible
Unclassified road	AT102A	12	30	244.4%	Moderate
	AT102B	12	30	244.4%	Moderate

129. In total 18 out of a total of 104 accesses points for the construction of the overhead line and towers have impacts ranging between minor and major, and these are further considered in the preceding sections.

130. The Transport Assessment guidelines state in Section 4.111 "*The significance of a traffic impact depends not only on the percentage increase of traffic but the available capacity. A 10% increase on a lightly trafficked road may not be significant, whereas a 1% increase on a congested road will be".*

131. Taking this into account methods to assess the capacity of the affected roads have been identified, including:

- Calculation of Congestion Reference Flows (CRF) - The CRF of a link is an estimate of the Annual Average Daily Traffic (AADT) flow at which the carriageway is likely to be congested in the peak periods on an average day (DMRB Volume 5 Section 1 TA 46/97 'Traffic Flow Ranges for use in the Assessment of New Rural Roads); and
- Traffic flow implications from first principles i.e. deriving a 12 hour flow profile for a typical day and adding the hourly generated traffic flows to get an indication of impacts in each hour.

132. Within the Transport Assessment (Appendix 18A, Section 4.8), the results of the two assessments above are included in detail. In summary, overall the traffic volumes required to be accommodated by the roads under consideration are low and have a temporary nature i.e. only for a limited number of days. The analysis has indicated both the background traffic and the development traffic flows are low and within the estimated link capacity. In addition it should be noted if two vehicles meet on roads that are too narrow for two vehicles to pass each other there are currently numerous informal passing opportunities that allow these manoeuvres to take place.

133. It should be noted above that whilst the percentage increases in traffic flow have minor and moderate effects, the actual volumes of traffic are low hence the percentages are relatively high. The highest background traffic flow considered is 92 and the lowest is 12. Clearly any increases on such low numbers will show a disproportionate increase.

134. Daily generated development traffic flows range between 15 and 54 vehicles. It should be emphasised that these are daily flows and that these volumes of traffic spread over the day are considered negligible. A point further emphasised by the fact that the flows are temporary in nature taking place on average for only 15-19 days per tower, depending on tower type.

Access Assessment

135. The locations of the temporary accesses used in the development proposals were identified in extensive on-site survey work undertaken by NIE. Where possible existing field gates and laneways have been used on the premise that they are being used currently by large farm machinery and therefore similar to the vehicles proposed to construct the towers. Vehicles will therefore be able to pull off the public road and undertake their operations without impacting on local traffic. As part of the transport assessment process the accesses have been assessed with regard to their use during the construction of the towers and overhead line. These access points are identified in Annex 1 of Appendix 18A.

136. A series of AutoTrack assessments were undertaken at the proposed entrance points. These have been undertaken on topographic survey bases to increase accuracy. These were tracked for a worst case scenario, which includes:

- Fastrac vehicle with 8 metre trailer;
- 8 cubic metre concrete lorry; and
- Where applicable tipper trucks for stone delivery.

137. Out of the total 104 temporary accesses associated with the construction of the overhead line and towers, a total of 59 accesses cannot facilitate the required manoeuvres associated without enhancement/mitigation measures either at the access or en route from the nearest feeder road.

138. Annex 9 of Appendix 18A includes a table showing the assessment of the access tracks and identifies which type of mitigation/enhancement measures are required i.e. access improvements or en route improvements. Annex 9 also includes the AutoTrack assessments of the accesses where the required manoeuvres can be accommodated i.e. locations where no mitigation measures are required (see Section 4.8.4 of Appendix 18A for full list of accesses).

18.4.1.4 Potential Effects

139. The traffic generated by the proposed substation at Turleenan has been shown to be below the 30% threshold value, according to IEMA guidelines, therefore no mitigation measures are required. The temporary access for construction is compliant with DCAN 15 and through the geometry provided will facilitate all required vehicles without infringing upon pass-by traffic on Trew Mount Road. The significance of the effect of traffic associated with the substation is considered to be **negligible**.

140. With regard to the construction of the overhead line and towers, there have been 18 locations where the threshold value of 30% has been exceeded and the significance of the impact is classed as either minor or moderate. These locations will be considered in more detail in the 'Mitigation Measures' section (Section 18.5).

141. Furthermore the proposed temporary accesses for the overhead line and towers have been analysed using AutoTrack and 59 accesses have been identified where further mitigation/enhancement measures may be required to facilitate the development and reduce the impact of the development.

142. The increases in HGV traffic have the potential to result in the following environmental effects:

- **Traffic noise and vibration –** the potential traffic noise impact on residential receptors in the vicinity of the site would be temporary in nature and very small scale. This issue is considered further in Chapter 11 Noise;
- **Disruption and driver delay** – the effects of delay to other road users would mainly be apparent during the movement of HGVs, as a result of their low speed rather than their numbers. It is very unlikely that more than one HGV would be on the same stretch of road at the same time, due to the implementation of a construction traffic management plan, reducing overall disruption;
- **Increased risk of accidents –** A road safety audit is not a check with compliance of design standards. The primary purpose of road safety audits is to identify potential road safety hazards within a scheme. As all the sites are accessed via existing access point (or adjacent to), their location and use by similarly sized vehicles is already known to those who use them and pass by them. This will lessen the risk of collisions and insecurity;
- **Severance, intimidation and pedestrian delay** – an increase in vehicle numbers particularly HGVs through towns and villages, could result in additional driver delays to pedestrians wishing to cross the road i.e. severance. HGV traffic can reduce the amenity of pedestrian routes in towns and villages to the extent that pedestrians feel intimidated by the traffic. There is a potential for these effects to be felt in towns and villages during the construction phase, however haul routes have been identified to minimise the effects on such locations;
- **Dust and dirt** – HGVs have the potential to distribute dust and dirt from the construction site onto the local road network. These effects would be most pronounced in the immediate vicinity of the site entrances. The potential for road soiling would be controlled by appropriate measures such as wheel cleaning and road sweeping; and
- **Visual effects** – The movements of high sided vehicles could be considered visually intrusive. This effect would be short-term during the construction period and furthermore temporary and intermittent.

18.4.2 Operational Phase

18.4.2.1 Turleenan Substation

143. The proposed substation at Turleenan will become operational in 2017, using a permanent access off Trew Mount Road, see Figure 3 of Appendix 18A.

Working Hours

144. Post construction working hours during the week, except for emergencies, are likely to be during 08:00-18:00 hours.

Parking

145. Once operational the proposed substation will have a total of 6 no. parking spaces. The maximum generated traffic at the substation is never likely to require parking in excess of this number of spaces.

Traffic Generations

146. Operational traffic would use the permanent access to the site from year 2017 and include the following:

- Operational traffic associated with the control building would be a maximum of 2 vehicles per day;
- Maintenance of the facility would be undertaken over a period of a 7 day period per calendar year and include 3 or 4 vehicles per day entering and exiting the site per day;
- An oil tanker would service the site every 6 months; and
- Estimated that once a year an excavator would need to access the site to undertake maintenance work on the SuDS pond.

Traffic Impacts

147. Operational traffic flows are on the basis of the maximum daily traffic within the year i.e. when operational and maintenance traffic occurs at the same time, and includes 1 operational vehicle arriving and departing within the peak hours. For the daily traffic generation it has been assumed that 4 maintenance vehicles would enter and exit the site in addition to the one operational vehicle entering and exiting the site.

148. Table 18.11 shows the traffic impacts for the substation once operational in 2017 i.e. year of opening and also in design year 2027, 10 years after opening. All percentage impacts are below the threshold value of 10% therefore no further detailed traffic assessment is required.

Table 18.11 - Turleenan Substation Traffic Impacts and Significance of Effect – Operational Phase

Year	Trew Mount Road Background Traffic (Vehs)	Peak Development Traffic (Vehs)	Peak Impact (%)	Significance of Effect
2017 Opening Year	3,881	10	0.3%	Negligible
2027 Design Year	4,296	10	0.2%	Negligible

149. On the basis that the peak impact is less than the threshold value of 30%, the significance of the effect of traffic generated during the operational phase is considered to be negligible.

Access Assessment

150. The proposed permanent access provides 15 metres radii and 4.5 x 168.3metres sightlines, which are compliant with DCAN15. This coupled with the low predicted traffic flows (see Table 18.8) means the

proposed access arrangement is considered to be adequate for the Proposed Development and no mitigation measures are required.

18.4.2.2 Overhead Line and Towers

151. Once construction of the overhead line and towers is complete the traffic generations are negligible, as any future maintenance of the towers will require only minimal access (no less than once every two years), either on foot or by 4x4 vehicle via existing field gates or laneways. Other access would only be required if there was an incident on the line e.g. storm damage for example. However access in this respect would be by the same method i.e. 4x4 vehicles via existing field gates or laneways.

18.4.2.3 Potential Effects

152. It is predicted during the operational phase for the substation there would be a maximum increase in traffic of 10 vehicle movements per day (over a single 7 day period during the calendar year). In the majority of cases, the increase would be only 4 movements per day (all light vehicles). For the maximum value of 10 vehicles per day, 4 of these would be light vehicles and the remainder would be HGVs. This constitutes a negligible increase in traffic movements on the assessed routes. These movements would fall substantially below the IEMA Guidelines for significance, i.e. a 10% increase in sensitive areas and a 30% increase for other locations are considered significant. Hence, traffic movements associated with the operational phase of the proposed substation are considered to be of **negligible significance.**

153. Traffic associated with the maintenance of the overhead line and towers are predicted to constitute a single 4x4 vehicle (or on foot), gaining access through existing field gates or laneways every two years. Other access outside of this would only be required if there was an incident on the line, for example storm damage, but again access would use the same existing field gates or laneways. Hence, traffic movements associated with the operational phase of the proposed overhead line and towers are considered to be of **negligible significance**.

18.5 Mitigation Measures

18.5.1 Overview

154. This section considers the likely mitigation measures that would be implemented in order to minimise the traffic and transport impacts of construction and operation of the Proposed Development.

18.5.2 Construction Mitigation Measures

18.5.2.1 Site Access Mitigation Measures

155. Annex 9 of Appendix 18A tabulates the assessment of the requirement for mitigation/enhancement measures for each of the 59 accesses indentified in Section 18.4. Further detail on this process is included in Section 4.9.2 of Appendix 18A.

156. In summary the mitigation/enhancement measures proposed include:

- **Mitigation Measure 1 - Traffic Management at the Site Access** – 17No.accesses have restricted movements at the site access, and include:
  - o Benburb Road – AT20
  - o Drumlee Road – AT24-25
  - o Clonfeacle Road – AT29
  - o Tullyneagh Road – AT43

- Bracknagh Road – AT48A, AT49
- Navan Fort Road – AT51
- Killylea Road – AT54
- Brootally Road – AT65, AT67
- Dernalea Road – AT71SL2, AT72
- Maddan Road – AT74SL2
- Sheetrim Road – AT80
- Tivenacree Road – AT89, AT90
- Unclassified Road – AT93-94

And 10 No. require ‘shuttle running’ i.e. traffic management with traffic control either temporary signals or stop/go boards and includes:

- Culkeeran Road – AT10
- Benburb Road – AT26
- Artasooly Road – AT33, AT35
- Battleford Road – AT45
- Bracknagh Road – AT47
- Hanslough Road – AT76
- Drumhillery Road – AT86
- Doohat Road – AT99
- Derrynoose Road – AT100

- **Mitigation Measure 2 - Access Widening** – 20No. accesses require widening to accommodate the required construction vehicles including:
    - Rhone Road – AT13
    - Culverog Road – AT18 and AT19
    - Artasooly Road – AT34
    - Tullysaran Road – AT41A, AT41B-42
    - Bracknagh Road – AT50
    - Navan Fort Road – AT52, AT52SL
    - Maddan Road – AT74SL1A
    - Cavanagarvan Road – AT77-78A, AT77-78B, AT79
    - Sheetrim Road – AT81, AT82, AT83A, AT83B, AT84,
    - Glassdrummond Road – AT91

- **Mitigation Measure 3 - Traffic Management En Route from Feeder Road** – 5No. accesses including:
    - Derrygally Way – AT2
    - Rhone Road – AT14

- Tullydowey Road – AT31-32A, AT32B
- Maddan Road – AT74SL1B

- **Mitigation Measure 4 - Traffic Management Measures required at Access and En Route from Feeder Road –** 2No. accesses including:
  - Unclassified Road – AT75 (restricted traffic movements at access)
  - Listrakelt Road – AT97

- **Mitigation Measure 5 - Access Widening and Traffic Management En Route from Feeder Road** - 5No. accesses including:
  - Major Lane – AT7
  - Tullydowey Road – AT30
  - Unclassified Road – AT74
  - Unclassified Road – AT102A (restricted movements at access), AT102B (restricted movements at access)

157. Annex 10 of Appendix 18A includes drawings showing the mitigation measures proposed for the accesses requiring widening and also a typical layout showing the 'shuttle running' traffic management measures proposed.

158. For the junctions requiring widening the drawings include sight lines, radii, and swept path analysis showing a JCB Fastrac vehicle with a trailer (the most onerous turning movement expected) and designed in accordance with standards in Development Control Advice Note 15 (DCAN 15) Vehicular Access Standards.

159. With regard to the accesses requiring traffic management measures to be deployed en route, the detail of the traffic management would be agreed as part of the Construction Traffic Management Plan (see Annex 11 of Appendix 18A) but options include one way systems or use of traffic control over stretches of the road, e.g. use of stop/go boards. These details would be agreed with Roads Service prior to construction.

160. It should be noted that if it is determined by the Department that temporary traffic measures are not to be used, existing accesses could be temporarily enlarged to accommodate the larger types of construction vehicles. In this case, all construction vehicles could enter the proposed sites and make deliveries off the public road network without requiring traffic management at the site access. The area required for the temporarily enlarging of the existing accesses has been identified and included within the planning application boundary. On the basis of the Department's determination, where the accesses are to be widened, vegetation will be cleared (where applicable) and any affected services and drainage will be amended to ensure normal operation during the construction phase and, replacement vegetation will be planted after the construction phase along with stock proof fencing, where required.

18.5.2.2 Construction Traffic Management Plan

161. Prior to construction, a Construction Traffic Management Plan would be prepared and submitted to Roads Service following consultation with other stakeholders such as the Police Service of Northern Ireland. An outline plan has been drawn up at this stage; see Annex 11 of Appendix 18A. However, the appointed contractor would finalise this traffic management plan (within the parameters set by the outline plan) with Roads Service and adhere to its detail during the construction of Proposed Development. This plan would include the following:

- If required, appropriate Police or contractor escort to accompany movement of components to be agreed with the Roads Service and Police where appropriate;
- Advanced notification to the general public warning of transport movements;
- Informative road signage warning other users of forthcoming construction traffic movements;
- Arrangement for regular road maintenance and cleaning, e.g. road sweeping in the vicinity of the site access point as necessary;
- In order to reduce traffic and parking impacts, construction personnel would be required to travel to the construction sites in mini-buses / staff work van type vehicles.
- Wheel cleaning/dirt control arrangements at key stages of constructions; and
- Provision of temporary signs and traffic control where necessary.

18.5.3 Operational Mitigation Measures

162. No mitigation measures are anticipated to be required during operation of the Proposed Development, due to the low numbers of operational vehicle movements.

18.6 Residual Impacts

18.6.1 Construction Phase

163. The mitigation measures described above, and short-term nature of the increase in traffic, would result in minimal residual environmental effects in terms of traffic and transport. This conclusion is justified by:

- Use of a construction traffic management plan and routeing agreements to minimise any impacts during construction; and
- Specific traffic management arrangements for specific sections of road i.e. tailored for existing conditions.

18.6.2 Operational Phase

164. The mitigation measures described above, and short-term nature of the increase in traffic, would result in minimal residual environmental effects in terms of traffic and transport. This conclusion is justified by:

- The effects associated with traffic in the operational phase being insignificant.

18.7 Conclusions

165. This assessment concludes that the construction of the Proposed Development would result in a temporary increase in traffic levels on a number of roads within the study area. In accordance with the significance criteria detailed in Table 18.3 these increases are considered to be minor or negligible and as such not significant.

166. Haul routes for construction have been identified as far as possible at this stage of the design process, i.e. before a contractor has been appointed. A number of potential suppliers have been identified however it would be a decision of the contractor as to which supplier would be used. Therefore haul routes have been identified for all construction sites from the nearest A or B class road.

167. Overall effects on the public highway by the construction of the overhead line and towers will be reduced by taking access from existing field gateways and laneways. Each access has been individually assessed and requirements for mitigation/enhancement have been identified and suitable measures proposed.

168. Traffic generated during the operation and maintenance of the Proposed Development would be minimal and would not result in any significant effects.

169. This Transport chapter has assessed the likely significance of the traffic associated with the Proposed Development during construction and operation. With the implementation of mitigation measures such as an appropriate traffic management plan and suitable liaison with Roads Service, the residual traffic and transport effects are temporary and have been assessed as having an impact of **negligible significance**.

18.8 References

Institute of Environmental Management and Assessment (1993) Guidelines for the Environmental Assessment of Road Traffic

Department of the Environment Planning Service (1993 revised 2005) Planning Policy Statement 3 (PPS 3): Access, Movement and Parking

Department of the Environment Planning Service (1993 revised 2005) Planning Policy Statement 3 (PPS 3): Access, Movement and Parking. Clarification of Policy AMP3: Access to protected Routes, October 2006

DRD NI Department of Regional Development, Northern Ireland (2005) Planning Policy Statement 13 (PPS 13): Transportation and Landuse

Department of the Environment Planning Service and Roads Service Development Control (1999) Development Control Advice Note 15 (DCAN 15): Vehicular Access Standards

Department of Regional Development & Department of the Environment (2006) Transport Assessment Guidelines for Development Proposals in Northern Ireland

DMRB The Design Manual for Roads and Bridges (1995), Vol. 6 Road Geometry, Section 2 Junctions, Part 6 - TD42/95 Geometric Design of Major/Minor Priority Junctions

DMRB The Design Manual for Roads and Bridges (1995), Vol. 6 Road Geometry, Section 2 Junctions, Part 6 - TD 41/95 Vehicular Access to All-Purpose Trunk Roads

DfT Department for Transport (2009), ISBN 978-0-11.553051-7, Traffic Signs Manual, 2nd Edition, Chapter 8 - Traffic Safety measures and Signs for Road Works and Temporary Situation, Part 1 Design HMSO.

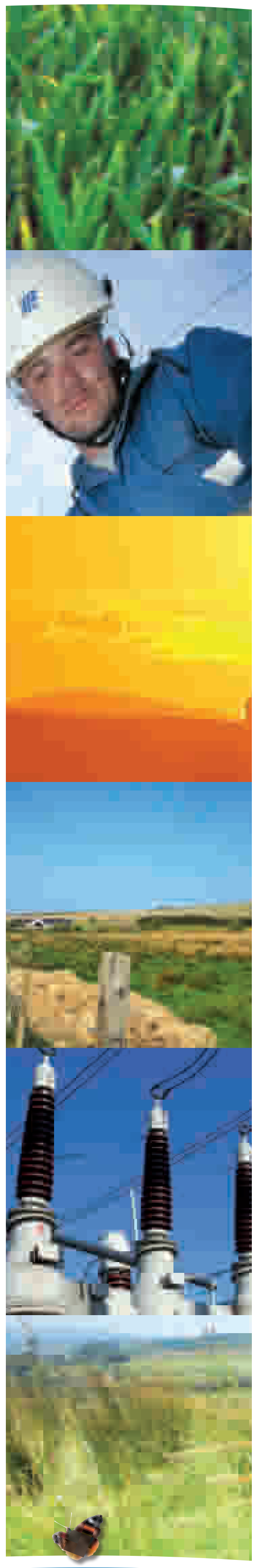
DfT Department for Transport (2009), ISBN 978-0-11.553051-7, Traffic Signs Manual, 2nd Edition, Chapter 8 - Traffic Safety measures and Signs for Road Works and Temporary Situation, Part 2 Operations HMSO.

DfT Department for Transport (1997), NRTF National Road Traffic Forecast (Great Britain)

Tyrone - Cavan Interconnector

Chapter 19

Cumulative Impacts



Consolidated Environmental Statement

Volume 2

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19 Cumulative and Interactions of Impacts

19.1 Introduction

1. This chapter assesses the likely significant cumulative effects of the Proposed Development with other developments and provides a summary of interacting effects of the Proposed Development between assessment topic areas.

2. Cumulative effects result from multiple impacts on receptors and resources. They can occur over time and can be interactive, additive, and/or synergistic in nature. Cumulative effects can also be considered as impacts resulting from "*incremental changes caused by other past, present or reasonably foreseeable actions together with the project."* (European Commission 1999: 7).

3. Cumulative effects are considered in the following ways:

- Multiple effects from the development, and from different developments, upon the same resource;
- Incremental effects arising from a number of small actions; and,
- Consideration of direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the Proposed Development.

4. This chapter is structured as follows:

- **Methodology** – how the cumulative effects have been assessed;
- **Assessment of Cumulative Environmental Effects** – an assessment of likely significant cumulative effects; and,
- **Conclusions** – a summary section.

19.2 Methodology

19.2.1 Overview

5. The assessment of cumulative effects has been undertaken with regard to "Development Control Advice Note (DCAN 10) Environmental Impact Assessment" (Department of the Environment [DOE] 2012), "Environmental Impact Assessment: Guide to Procedures" (Office of the Deputy Prime Minister 2000) and the European Commission (1999) "Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions".

6. In the absence of specific guidelines for the assessment of cumulative effects of electricity interconnector developments, guidelines for other linear infrastructure developments have also been consulted. This has included the Design Manual for Roads and Bridges (DMRB) (2008).

7. There are two types of cumulative effects in Environmental Impact Assessment (EIA). These are:

- Cumulative impacts from a single development (i.e. interaction of impacts); and
- Cumulative impacts from other developments (in combination with the Proposed Development being assessed).

19.2.2 Cumulative Effects from a Single Development

8. These effects are typically interactive. The interaction of impacts arises from the *"combined action of a number of different environmental topic-specific impacts upon a single receptor/resource"* (DMRB 2008: 1/8). For example, the removal of trees can have landscape, visual and ecological effects, or an individual residential receptor can be affected by noise and visual impacts. Cumulative effects can also arise from different types of impact within a single topic on a receptor, such as the cumulative visual impact of vegetation removal and erection of an electricity tower on a single receptor.

9. The technical assessments in this Environmental Statement (ES) (Chapters 7 – 18) contain assessments of the likely significant cumulative effects arising from the Proposed Development singularly. During the assessment process, coordination took place between assessment specialists to ensure that interacting impacts arising from the Proposed Development singularly were identified, assessed and, where appropriate, mitigated. These impacts are reported in the individual chapters and are not repeated here. Table 19.1 outlines the likely interacting impacts and chapters where they are assessed.

Table 19.1: Interaction of Impacts on the Proposed Interconnector

	EMF	Water Environment	Soils, Geology and Groundwater	Ecology	Noise	Cultural Heritage	Landscape and Visual	Community Amenity and Land Use	Socio-economics	Telecomms and Aviation	Flood Risk Assessment	Transport
EMF				✓				✓		✓		
Water Environment			✓	✓				✓			✓	
Soils, Geology and Groundwater		✓		✓		✓		✓			✓	
Ecology	✓	✓	✓		✓		✓					✓
Noise				✓				✓	✓			✓
Cultural Heritage			✓				✓		✓			
Landscape and Visual				✓		✓		✓				
Community Amenity and Land Use	✓	✓	✓		✓		✓		✓			✓
Socio-economics					✓	✓		✓				
Telecomms and Aviation	✓											
Flood Risk Assessment		✓	✓									
Transport				✓	✓			✓				

10. Key interactive effects are:

- Ecology and the Water Environment – interactive impacts could potentially occur to the surface water environment. They could include potential impacts on aquatic species, requiring mitigation measures;
- Ecology and Landscape & Visual – interactive impacts could potentially occur as a result of loss of habitats (hedgerows, trees, grassland, etc);
- Cultural Heritage and Landscape & Visual – interactive impacts could potentially occur in relation to the landscape character and setting of cultural heritage assets;
- Cultural Heritage and Geology & Soils – interactive impacts arising from dewatering could potentially impact on cultural heritage sites, such as historical wells; and,
- Community Amenity & Land Use, Socio-economics and other topics – interactions in the human environment are typically complex within an ES as there is the potential for receptors to be impacted in a number of ways.

11. The likely significance of these combined and interrelated impacts has been assessed within the individual assessment chapters. For instance the Landscape & Visual chapter includes an assessment of the relevant interactive ecological impacts. The converse is found in the Ecology chapter.

19.2.3 Cumulative Effects from Other Developments

19.2.3.1 Overview

12. Cumulative effects may arise from the “combined effects of a number of other developments, in combination with the development being assessed, on a single receptor/resource” (DMRB 2008). This can include multiple impacts of the same or similar type from a number of developments upon the same receptor/resource.

13. For the purposes of the Proposed Development, the categories of other developments included in the cumulative effect assessment has been taken to include:

- All overhead line developments currently in the planning process (at the time of assessment – April 2013) within 30 km of the Proposed Development [147]; and,
- Any approved and still implementable planning applications with the potential for significant cumulative effects with the Proposed Development.

19.2.3.2 Overhead Line Developments

14. The following proposed overhead lines have been considered within the cumulative assessment (please see Figure 19.1 for location):

- Tamnamore to Omagh 110 kV network reinforcement project (planning permission approved). This is a 50 km 110 kV overhead electricity line and substation between existing NIE substations at Tamnamore (Dungannon) and Omagh. Tamnamore substation is located approximately 4.7 km to the north west of the proposed Interconnector at its closest point. The Tamnamore to Omagh line is located approximately 1.6 km from the proposed Interconnector at its closest point.

15. No planning application has been formulated or submitted by EirGrid for the portion of the Tyrone-Cavan Interconnector within the Republic of Ireland and the form of their proposals is as yet

[147] Chapter 20 (Transboundary Impacts) assesses the impact of the Proposed Development (i.e. the project within Northern Ireland) on receptors within the Republic of Ireland, as required by the EIA Regulations. Please see Chapter 20 for further details.

undetermined. In circumstances in which EirGrid has yet to conclude its public consultation exercise and EirGrid's proposed development has yet to crystallise sufficiently for NIE to conduct such a cumulative impact assessment, NIE is unable to conduct a cumulative impact assessment as part of this ES. However, once EirGrid's proposal has crystallised sufficiently, this will be done. The current status of the EirGrid project (as of April 2013) can be viewed on the EirGrid website (www.eirgrid.com) in the documents "North South 400kV Interconnection Development: Preliminary Re-evaluation Report (May 2011) and "Final Re-evaluation Report" (April 2013).

19.2.3.3 Confirmed Planning Applications

16. Information on planning applications was obtained from the DOE and Monaghan County Council. A review of all planning applications within 30 km of the Proposed Development was undertaken.

17. Projects to be included within the cumulative assessment were selected based on the following scoping criteria:

- Nature of the project – developments with large vertical structures as part of their development were selected because of the potential for cumulative effects with the proposed towers. In addition, other developments with significant impacts in their own right or required an EIA were considered;
- Distance – developments further from the Proposed Development were scoped out because of distance and the diminishing potential for significant cumulative effects; and,
- Scale – developments which are large scale were considered because of the potential for cumulative effects during the construction or operational phases.

18. Based on the scoping selection process, the following confirmed planning applications have been considered within the cumulative assessment (please see Figure 19.1 for location):

- M/2011/0652/F Erection of 1 no. 50 kW wind turbine with a hub height of 36.5 m to supply farm business;
- M/2008/0797/F Erection of 1 no. wind turbine;
- M/2010/0412/F Proposed installation of a GAIA (11kW) wind turbine on a 18 m high lattice tower type mast;
- M/2010/0589/F 24.8 m height 11kW white wind turbine with galvanised steel lattice tower for domestic use;
- M/2011/0465/F Erection of wind turbine (32.3 m hub height 30 m blades);
- M/2010/0913/F Erection of a Wind Turbine (50 kW Max) With a Tower height of 30 m;
- M/2009/0940/F Proposed wind turbine 1 Gaia Wind 11 kW turbine (18.3 m lattice tower construction);
- M/2008/0464/F Proposed 24 m High (10kW) domestic wind turbine;
- O/2011/0364/F Proposed erection of wind turbine with 30 m hub height and 30 m rotor diameter with a maximum output not exceeding 250 kW;
- O/2006/1142/F Erection of 33 m high wind turbine;
- O/2010/0406/F Installation of 50 kW wind turbine on 36.6 m high free standing steel mast;
- O/2010/0646/F Proposed new 20kW wind turbine on 18 m mast;
- O/2011/0195/F Erection of a single 250 kW wind turbine of 40 m tower height (55 m to tip) and control room;
- O/2007/0796/F Erection of 1 No. wind turbine 33 m high with associated site works;
- O/2010/0212/F 600 mm diameter radio transmission dish mounted on steel pole fixed to existing facade of building;

- O/2007/0374/F 15 m high 6 kW proven wind turbine for domestic use at 90 Clay Road, Keady;
- O/2007/0449/F Erection of a 15 m High 6 kW wind turbine for domestic and agricultural use at 44 Tievenamara Road;
- O/2011/0401/F Proposed 2 No. free range poultry sheds with 4 No. feed bins;
- O/2011/0539/F Replacement poultry shed with 2 No. feed bins to contain 35,000 egg laying hens in enriched cages;
- O/2011/0412/F Proposed free range poultry shed generator store and feed bin (amended scheme to include 6 passing bays);
- M/2012/0340/F Proposed 2 No. select farm poultry sheds 4 No. feed bins and an ancillary building with biomass boiler, standby generator, office and changing facilities (each poultry shed will contain 25,850 chickens);
- O/2012/0234/F Erection of 1 no. chicken house (22,600 birds - high welfare broilers);
- O/2003/0276/A4 Proposed new chicken house;
- O/2010/0490/F Proposed free range poultry shed generator store and feed bin;
- M/2010/0717/F Proposed 2 No. poultry houses (each containing 23,000 chickens) 4 No. feed bins and a office, changing & generator building;
- M/2008/0143/F Proposed chicken house (planning permission expired May 2013);
- O/2009/0807/F Erection of 1 No. free range organic chicken house;
- O/2009/0805/F Erection of 1 No. free range organic chicken house;
- O/2009/0804/F Erection of hen house;
- M/2010/0487/F Proposed additional free range poultry shed and feed bin (to contain 6,000 free range egg laying hens);
- 10416 (Monaghan County Council Planning Reference) Four wind turbines of hub height 85 m and associated development (This planning application redesigns the permitted wind farm granted on site under Reg. ref 04/1207/ABP ref PL18.218484);
- 10480 (Monaghan County Council Planning Reference) 1) demolish existing farm buildings; (2) erect a poultry unit, manure store and egg store; (3) insert a holding tank and two number meal bins; and,
- 11358 (Monaghan County Council Planning Reference) To erect a second poultry rearing house.

19.2.4 Significance of Effects

19. The cumulative effects of other developments with the Proposed Development are assessed against the significance criteria outlined in Table 19.2. These effects are determined from the potential impacts identified in the individual assessments. Mitigation measures are identified if required, and where relevant residual impacts assessed.

Table 19.2: Determining Significance of Cumulative Effects

Significance	Effects
Major	Additional changes, due to relationship with other developments, substantially affecting the elements therein. For example a major impact is likely when a receptor of high sensitivity is affected by a high magnitude of additional change.
Moderate	Additional change, due to relationship with other developments, affecting, to a lesser degree or the elements therein. For example a moderate impact is likely when a receptor of medium sensitivity is affected by a medium magnitude of additional change.
Minor	Slight additional change, due to relationship with other developments. For example a minor impact is likely when a receptor of low sensitivity is affected by a small magnitude of additional change.
Not Significant	No or minimal perceptible additional change, due to relationship with other developments.

19.3 Assessment of Cumulative Environmental Effects

19.3.1 Cumulative Effects from Other Developments

19.3.1.1 EMF

20. The nature of Electric and Magnetic Fields (EMF) means that there is unlikely to be a cumulative impact with other developments. The Tamnamore to Omagh 110kV network reinforcement project will produce an EMF however, when EMFs from more than once source add together, the cumulative effect is not just the sum of the individual sources, but is dependent on the relative direction of the field as well. It has been assessed that there will be no significant additive effect from the Tamnamore to Omagh 110kV network reinforcement project EMF.

21. It has therefore been determined that the potential cumulative EMF impacts are **Not Significant.**

19.3.1.2 Water Environment

22. All of the other developments identified have been reviewed and assessed cumulatively with the Proposed Development. Cumulative effects are only likely during the construction phase, where one or more other developments are expected to affect a watercourse that may also be affected by the construction of the Proposed Development. The vast majority of the other developments are relatively small in scale and are located some distance from the Proposed Development, thus are unlikely to have any effect on the same watercourses sufficiently close and at the same time to have any significant effects. In addition, robust and effective mitigation measures have been set out in this ES and once implemented significant impacts from construction site runoff or spillages from the Proposed Development will be avoided. Similarly long term cumulative effects on hydrological patterns will not be significant as any identified changes will not be significant. In the context of other development proposals in the vicinity of the proposed overhead line, the proposed mitigation will ensure that cumulative impacts are **Not Significant**.

19.3.1.3 Geology and Soils

23. It is considered that none of the other developments pose a significant risk to the ground and/or groundwater conditions. Impacts arising from the Proposed Development on soils, geology and groundwater are site-specific and would be limited to the immediate area of the proposed towers. As a result, the other developments will not increase the potential effects on the ground and groundwater conditions. The nearest development is a proposed chicken shed (though planning permission expired in May 2013) located within 50 m of Tower 22, which would have no adverse impacts on the ground

and groundwater conditions. Accordingly, it is concluded that cumulative effects on the soils, geology and groundwater conditions would be **Not Significant**.

19.3.1.4 Ecology

24. The EIA of the Tamnamore to Omagh 110kV network reinforcement project determined that there are low numbers of wintering birds (swans and geese) that would be affected however, impacts would not be significant. With standard mitigation measures applied by both developments, there will be no significant cumulative effects to wintering birds. Overall, it is has been determined that there will be no significant cumulative ecological impacts between the Omagh to Tamnamore 110kV network reinforcement project and the Proposed Development.

25. It has been determined that the nature and scale of the other identified developments means that there are unlikely to be significant cumulative ecological impacts.

26. For these reasons it has been assessed that the potential cumulative ecology impacts are **Not Significant.**

19.3.1.5 Noise

27. Due to the distance between the identified developments with the potential to cause cumulative noise effects and the Proposed Development, it is considered that significant cumulative noise impacts will not occur. Accordingly, it is concluded that cumulative noise effects would be **Not Significant.**

19.3.1.6 Cultural Heritage

28. There are no identified developments that have a potential to cause significant cumulative effects on cultural heritage. This is because of the distance, scale and nature of the other developments therefore cumulative effects are considered **Not Significant**.

19.3.1.7 Landscape and Visual

29. This section of the cumulative impact chapter should be read in conjunction with Chapter 13 (Landscape and Visual) in particular, section 13.2.6.11 and Appendix 13B.

30. The landscape and visual cumulative assessment identified two developments which could result in cumulative effects, these being: Tamnamore to Omagh 110kV network reinforcement project and Poultry Houses (App No M/2010/0717/F).

<u>Existing Developments</u>

31. The Magherafelt to Tandragee 275kV overhead line (existing) is found within the context of the proposed overhead line in the immediately area surrounding of the Turleenan substation. Viewpoints 1 – 5 are all positioned within view of the existing Magherafelt –Tandragee 275kV overhead line. Two 275kV termination structures, similar to the proposed angle towers, would be constructed to transfer electricity from the existing 275kV overhead line to the substation. Both would be located to the north-east of the proposed substation and would replace one existing tower. The proposed overhead line would leave the substation to the south-west and the proposed new overhead line route originates at this point.

32. Cumulative landscape impacts resulting from the proposed overhead line in combination with existing developments of similar type and scale are taken into account within the baseline situation and the assessment of the Landscape Character Areas within the study area. These cumulative impacts, therefore, are inherent within the Landscape Character Assessment discussed previously in Chapter 13 of this ES.

Planned Developments

33. The cumulative assessment filtering process identified two developments as requiring additional cumulative assessment, see Appendix 13B. The cumulative assessment for these two developments is described below.

Tamnamore to Omagh 110kV network reinforcement project (approved)

34. This is a 50km 110kV overhead electricity line and substation between existing NIE substations at Tamnamore, Dungannon and Omagh. This substation is located approximately 4.7km to the NW of the proposed Interconnector at its closest point. The Tamnamore to Omagh line is located approximately 1.6km from the proposed Interconnector at its closest point.

Cumulative Landscape Character Effects

35. A cumulative ZTV has been produced which illustrates areas of combined visibility between the proposed Tamnamore to Omagh 110kV network reinforcement project and the Proposed Development. The ZTV shows that much of the northern part of the study area would have combined theoretical visibility, with large areas lying between the two proposals (between the M1 road corridor and western edges of Moy) and more separated large patches beyond this, towards the edges of the study area boundary. There are also some smaller patches of combined theoretical visibility on top of drumlin summits to the west of Benburb and east of Blackwatertown, although this distance (>5km) the Tamnamore to Omagh 110kV network reinforcement project is likely to be barely discernible.

LCA 64: Lough Neagh Peatlands

36. Lough Neagh Peatlands LCA is considered to have Medium Sensitivity to change. The non cumulative magnitude of change is considered to be Low - Negligible during construction, Year 1 and Year 15. Some of the areas of combined theoretical visibility, within this LCA lie within 1km of the Tamnamore to Omagh 110kV network reinforcement project, however, these same areas are distant from the Proposed Development and the cumulative magnitude of change would not change when the Proposed Development is considered in combination.

LCA 45: Dungannon Drumlins and Hills

37. Dungannon Drumlins and Hills LCA is considered to have Medium Sensitivity to change. The non cumulative magnitude of change is considered to be Low during construction, Year 1 and Year 15.

38. Areas of combined theoretical visibility, within this LCA, that lie beyond the M1 corridor have, in reality, no visibility of the Proposed Development. For the other areas of theoretical visibility within this LCA the magnitude of change would not increase when the Proposed Development is considered in combination with the Tamnamore to Omagh 110kV network reinforcement project due to a combination of distances relative to each proposal from any given part of the LCA and the layers of intervening vegetation that lie across this LCA which limit changes to the experience of character.

LCA 47: Loughgall Orchard Belt

39. Loughgall Orchard Belt LCA is considered to have Medium Sensitivity to change. The non cumulative magnitude of change is considered to be High during construction and Medium – High for Year 1 and Year 15.

40. Areas of combined theoretical visibility, within this LCA, tend to be focussed in the areas lying between the two proposals (between the M1 road corridor and western edges of Moy). Other areas to the east of the Proposed Development are distant from the Tamnamore to Omagh 110kV network reinforcement project.

41. The change to character experienced in parts of this LCA would increase slightly when the Proposed Development is considered in combination with the Tamnamore to Omagh 110kV network reinforcement project although the magnitude of change ratings would remain the same as the non cumulative assessment.

Cumulative Visual Effects

42. Viewpoints 1, 4 and 6 have been identified as having the potential for cumulative visual effects with this proposed application.

Viewpoint 1

43. Viewpoint 1 is considered to have Medium Sensitivity to change. The non cumulative magnitude of change is considered to be High during construction, Year 1 and Year 15. From this viewpoint the Tamnamore to Omagh 110kV network reinforcement project would be a distant element in views to the west and would not be viewed simultaneously with the Proposed Development. When considered in combination the addition of the Tamnamore to Omagh 110kV network reinforcement would cause barely discernible changes to the view.

Viewpoint 4

44. Viewpoint 4 is considered to have Medium Sensitivity to change. The non cumulative magnitude of change is considered to be High during construction and High – Medium for Year 1 and Year 15. From this viewpoint the Tamnamore to Omagh 110kV network reinforcement project would be a distant element in views to the west and would not be viewed simultaneously with the Proposed Development. When considered in combination the addition of the Tamnamore to Omagh 110kV network reinforcement would cause barely discernible changes to the view.

Viewpoint 6

45. Viewpoint 6 is considered to have Medium Sensitivity to change. The non cumulative magnitude of change is considered to be Medium - High during construction and Medium for Year 1 and Year 15.

46. From this viewpoint the Tamnamore to Omagh 110kV network reinforcement project is theoretically visible along the A29 road corridor, in reality views from this viewpoint are restricted by subtle variations of road alignment that restrict views to the straight section that the Tamnamore to Omagh 110kV network reinforcement project crosses. Other sections of the Tamnamore to Omagh 110kV network reinforcement project would be screened by drumlin slopes and successive layers of vegetation that intervene.

47. When considered in combination the addition of the Tamnamore to Omagh 110kV network reinforcement would cause no additional changes to the view.

<u>Poultry Houses (App No M/2010/0717/F (determination pending)</u>

48. This is an application for 2 No proposed Poultry Houses (Each Containing 23000 Chickens), 4 No Feed Bins and an Office Changing & Generator Building. It is located to the south of the Proposed Development substation and approximately 100m from the nearest Proposed Development tower.

49. Viewpoints 2, 3 and 5 have been identified as having the potential for cumulative visual effects with this proposed application.

Viewpoint 2

50. Viewpoint 2 is considered to have Medium Sensitivity to change. The non cumulative magnitude of change is considered to be High during construction, Year 1 and Year 15. From this viewpoint, when the Proposed Development is considered in combination, the addition of the proposed poultry houses would cause barely discernible changes to the view due to partial screening from roadside trees that line Derrygally Way.

Viewpoint 3

51. Viewpoint 3 is considered to have Medium Sensitivity to change. The non cumulative magnitude of change is considered to be High during construction, Year 1 and Year 15. From this viewpoint, the addition of the proposed poultry houses would cause minor changes to the view, when the Proposed Development is considered in combination. The cumulative magnitude of change is therefore considered to be Low during construction, Year 1 and Year 15 and as a result, the cumulative impact would be Minor Adverse during construction, in the winter year of commissioning and in summer 15 years after commissioning.

Viewpoint 5

52. Viewpoint 5 is considered to have Medium Sensitivity to change. The non cumulative magnitude of change is considered to be Low - Medium during construction, Year 1 and Year 15. From this viewpoint, when the Proposed Development is considered in combination, the addition of the proposed poultry houses would cause barely discernible changes to the view.

<u>Cumulative Landscape and Visual Summary</u>

53. The approach to the assessment of landscape and visual cumulative impact is set out in Chapter 13 Section 13.2.6.11 and Appendix 13B. The landscape and visual cumulative assessment identified two developments which had the potential for cumulative effects, these being: Tamnamore to Omagh 110kV network reinforcement project and Poultry Houses (App No M/2010/0717/F). It has been determined that although there would be slight increases in magnitude for some of the landscape and visual resource when the Proposed Development is considered in combination with these two applications, there would be no significant additional or cumulative impacts. Therefore the cumulative landscape and visual impacts are considered to be **Not Significant** as defined in Table 19.1 as a result of the Proposed Development and the assessed other developments.

19.3.1.8 Community Amenity and Land Use

54. It has been assessed that there are no other developments (as outlined in Section 19.2.3) which could have significant cumulative effects to community amenity and land use including agriculture. This is due to the distance, scale and nature of the other developments.

55. It has therefore been determined that the cumulative community amenity and land use effects are **Not Significant**.

19.3.1.9 Socio-economics

56. It has been assessed that there are no other developments which could have significant cumulative impacts on socio-economics in the area due to the distance, scale and nature of these other developments therefore effects are **Not Significant.**

19.3.1.10 Telecommunications and Aviation Assets

57. It has been determined that the Proposed Development will have no impacts on telecommunications and aviation assets; and thus cumulative impacts with other developments will be **Not Significant**.

19.3.1.11 Flood Risk Assessment

58. In terms of flood risk, it has been concluded that there will be no cumulative effects. This outcome is substantiated by the assessment of the Proposed Development concluding no significant effect and the principles of Planning Policy Statement 15 (DOE) which should appropriately manage the potential for other developments to cause impacts affecting the Proposed Development or elsewhere. Therefore cumulative flood risk effects are **Not Significant.**

19.3.1.12 Transport

59. The timing of construction, the proposed construction routes likely to be used and geographical distances from the working areas means that there are unlikely to be any significant cumulative impacts with the Omagh Tamnamore 110kV network reinforcement project and the Proposed Development. At the same time; due to the geographical distances and the proposed construction routes likely to be

used to access the working areas, the other developments are not of the scale and nature to result in significant transport impacts.

60. In addition to the developments listed in Section 19.2.3 of this chapter, an additional search for planning applications within 5km of the proposed works was undertaken for the transportation assessment (in line with best practice – see Chapter 18 of this ES for further details). The following two applications have been granted permission and could be of significance due to site development and potential accesses:

- M/2010/0870/F: - Proposed Housing Development consisting of 47 No. Dwellings (3 No. Detached, 34no. Semi-Detached and 10 Townhouses) and associated site works; and
- O/2012/0460/F: - Housing development and associated site works consisting of 2 No. Detached Dwellings and 8 No. Townhouses

61. In order to take account of the traffic implications, the volumes of traffic generated by these developments have been calculated and included in the traffic model (as outlined in Chapter 18 [Transport] of this ES)

62. It has been determined that the cumulative transport impacts are **Not Significant**.

19.4 Conclusions

63. An assessment of the likely significant cumulative effects of the Proposed Development with other developments has been undertaken. Also included in the assessment is a summary of interacting effects of the Proposed Development between assessment topics.

64. The assessment chapters in this ES (Chapters 7 – 18) contain assessments of the likely significant interacting effects arising from the Proposed Development. During the assessment process, coordination took place between assessment specialists to ensure that interacting impacts arising from the Proposed Development were identified, assessed and, where appropriate, mitigated.

65. The assessment of cumulative impacts between the Proposed Development and other developments has included identification of the other planned developments which have not yet been constructed. This has led to the identification of other projects such as the Tamnamore to Omagh 110kV network reinforcement project. This is an approved 50km 100kV overhead line which will be located approximately 1.6 km from the Proposed Development at its closest point. Other developments also include proposed chicken sheds and wind turbines.

66. No planning application has been formulated or submitted by EirGrid for the portion of the Tyrone-Cavan Interconnector within the Republic of Ireland and the form of their proposals is as yet undetermined. In circumstances in which EirGrid has yet to conclude its public consultation exercise and EirGrid’s proposed development has yet to crystallise sufficiently for NIE to conduct such a cumulative impact assessment, NIE is unable to conduct a cumulative impact assessment as part of this ES. However, once EirGrid’s proposal has crystallised sufficiently, this will be done.

67. The cumulative effects are predicted to be **Not Significant**.

19.5 References

Design Manual for Roads and Bridges. 2008. Volume 11, Section 2, Part 5: HA 205/08 Assessment and Management of Environmental Effects.

Available at:

http://www.dft.gov.uk/ha/standards/dmrb/vol11/section2/ha20508.pdf

Department of the Environment. 2012. Development Control Advice Note (DCAN 10) Environmental Impact Assessment.

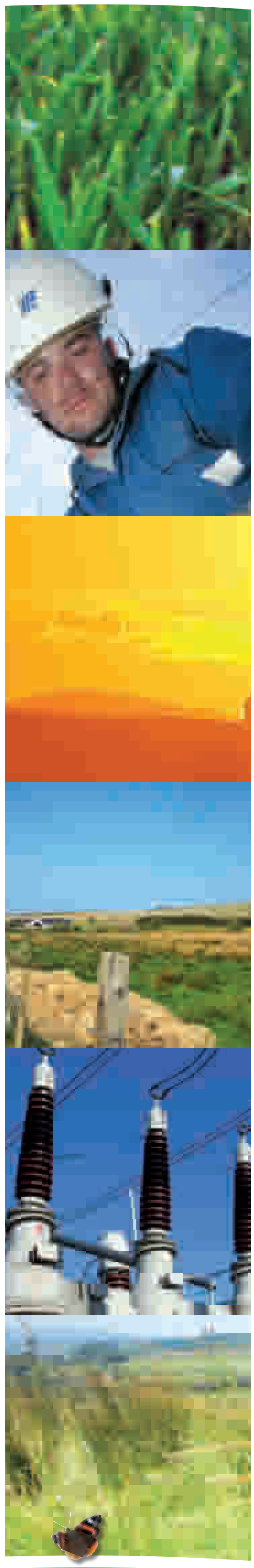
European Commission. 1999. Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions.

Available at:

http://ec.europa.eu/environment/eia/eia-studies-and-reports/guidel.pdf

Office of the Deputy Prime Minister. 2000. Environmental Impact Assessment: Guide to Procedures.

Tyrone - Cavan Interconnector



Chapter 20

Transboundary Impacts

Consolidated Environmental Statement

Volume 2

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20 Transboundary Impacts

20.1 Introduction

1. Part VI of the EIA Regulations sets out specific requirements governing development likely to affect other (EU) Member States. In sum, these requirements specify that where effects are likely member states should be informed and given the opportunity to participate in the planning process within the jurisdiction of the Proposed Development.

2. This is relevant to the Proposed Development, which, comprising the Northern Ireland portion of the Tyrone-Cavan Interconnector, is likely to have effects within the Republic of Ireland. To this end this Chapter provides a summary of likely environmental effects on other Member States (more commonly called “transboundary impacts”) determined as part of the EIA for the Proposed Development.

3. This chapter is intended to be a summary of the transboundary impacts. Full details of the impact assessment are contained in the other Chapters of this ES as relevant. The EIA of the Proposed Development has been based on an assessment of the likely significant impacts and as such has included receptors and impacts within the Republic of Ireland, as required by the EIA Regulations, regardless of jurisdiction. It is therefore recommended that the entirety of this ES should be read in order to gain a full appreciation of the transboundary (and all other) impacts.

4. It should be noted that transboundary impacts arising from EirGrid’s proposals for construction of a continuing overhead line within the Republic of Ireland will be reported separately through a separate Environmental Impact Statement (EIS); this should be referred to in considering potential impacts in the Republic of Ireland.

20.2 EMF

5. EMF emitted across the border resulting from the Proposed Development will comply with the ICNIRP and EU guidelines on exposure of the general public to EMF.

20.3 Water Environment

6. The River Basin District (RBD - defined by the Water Framework Directive) through which the Proposed Development is routed is an international RBD with watercourses and surface runoff flowing in a generally southerly direction over the border. Water quality within this area is considered likely to be similar to that elsewhere within the study area and as such will predominantly range from fair to good.

7. The tributary of the Clontibret Stream originates south of the border and flows north. No direct effects to this watercourse will occur as a consequence of the Proposed Development. Development of towers 99-102 are in areas where runoff drains to a tributary of this stream. However, all of these sites have been assessed and no adverse effects are predicted, with the implementation of mitigation measures set out in this assessment. Therefore, there will be no transboundary effects on the surface water environment as a result of the Proposed Development.

20.4 Soils, Geology and Groundwater

8. Impacts on soils, geology and groundwater are site-specific and would be limited to the immediate area of the proposed towers. Accordingly, it is considered that any effects on the ground and groundwater conditions arising from the construction of the southernmost towers 98 to 101, closest to the boundary with ROI, would not extend across the border. Tower 102 is located approximately 100m from the boundary. However, it is considered highly unlikely that the construction of the tower will pose a risk of a significant impact on the geology and groundwater conditions in the Republic. It is concluded that the Proposed Development would have no transboundary impacts on these features.

20.5 Ecology

9. Works within Northern Ireland will have no direct impacts on habitats within the Republic of Ireland. There is some potential for impacts on mobile species, but none of these are likely to be significant. Badgers, otters and bats may have territories that straddle the border, but the nature of the Proposed Development means that these species are unlikely to be significantly adversely affected.

10. There will be no impacts on sites designated for their conservation interest at either European or national level within the Republic of Ireland.

11. There is a potential collision risk for wintering swans that use feeding sites on both sides of the border. However, the numbers using the Blackwater catchment in the Republic of Ireland are generally restricted to 20-40 birds (Crowe 2005), and birds using the lakes of south Armagh are also generally present in very small numbers. However, sightings of marked birds confirm that birds that use the Keady lakes may also use sites in the Republic during the same winter. 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. Measures to render the overhead line more visible in those parts considered to present the greatest risk will be implemented, and will reduce the overall risk of collision.

12. Transboundary residual impacts on native flora and fauna of works carried out within Northern Ireland are likely to be negligible. Likely impacts on overflying birds and other mobile species which use both jurisdictions will persist throughout the overhead line operational period.

20.6 Noise

13. Because of the distance from the nearest receptors in the Republic of Ireland and the nearest proposed working area, there will be no significant transboundary noise or vibration impacts during construction. The predicted noise levels produced by work along the overhead line route within Co. Armagh will not cause the WHO guidelines to be exceeded at any property within County Monaghan.

14. Sections of the overhead line route at towers 100, 101 and 102 (Derrynoose Road, Doohat Road) and the oversail in Crossbane are located close to the border. An existing farm dwelling is located in excess of 250m to the west of tower 102 on the Co. Monaghan side of the border. The nearest property to the centreline of the overhead line is approximately 54m away in Co. Monaghan, located to the south of the oversail section in the townland of Crossbane. From the predicted noise levels, it has been determined that there will be no significant noise impact will be present due to the operation of the overhead line route. The predicted noise levels produced by overhead line route within Co. Armagh will not cause the WHO guidelines to be exceeded at any property within Co. Monaghan.

15. All other properties on the Co. Monaghan side of the border are further away and benefit from increased attenuation due to distance.

20.7 Cultural Heritage

16. Within a study area of seven kilometres either side of the Proposed Development there are 73 sites recorded on the Record of Monuments and Places (RMP). The seven kilometre study area was requested by Monaghan County Council. The 84 sites recorded on the RMP span from the earlier prehistoric through to the post-medieval period. None of the sites are Areas of Archaeological Potential or have designated protection other than that conferred from being listed on the RMP. The designation and legal protection of archaeological sites as National Monuments is provided for under the National Monuments Acts 1930-2004.

17. Of the 84 recorded sites, 31 are raths and seven are souterrains dating to the Early Christian period; these make up the bulk of the sites. Megalithic tombs and a standing stone are also recorded although these number six in total. Further sites are comprised of enclosures and earthworks, mainly identified from aerial photographic surveys. It is likely that these date from either the later prehistoric or Early Christian periods although alternative dates cannot be ruled out. A number of church and graveyard sites are also present within the study area. The site of a battle at Clontibret, fought in 1595, is located to the east of the village of the same name.

18. The sites analysed should be considered alongside the sites within Northern Ireland as interrelated sites rather than as separate and discreet entities. The site types found within County Armagh include raths, standing stones, megalithic tombs, churches and holy wells. These correlate with the site types found within the Republic of Ireland. These sites would not have been separated by a border and would have been linked along lines such as geographic, geological and environmental factors, as well as social and cultural interrelationships.

19. There will be no physical impact on any of the cultural heritage sites within the Republic of Ireland by the proposed overhead line within Northern Ireland.

20. The Ulster Canal, which runs from the River Blackwater in Armagh to the River Finn in County Monaghan, is not considered to be impacted by transboundary setting effects.

21. The other sites within the extended seven kilometre study area range in value between low and medium. The impacts to setting arising from the erection of the overhead line in Northern Ireland on cross border sites are considered to be limited due to the height of the proposed towers and associated lines and the distances to these sites. As noted in the Landscape Assessment in Chapter 13, it is considered that beyond 5km vegetation, local variations in topography, inclement weather and lighting will shield, partially interrupt or obscure views of the proposal. In addition, the overhead line tower structures are unlikely to be prominent or become focal points at distances of 5km or greater due to reduced perceptibility. Therefore further assessment of individual sites is not necessary.

22. As there are no significant transboundary impacts anticipated, the significance of impact is neutral.

20.8 Landscape and Visual

23. The proposed overhead line route does not cross the border and therefore there are no resulting physical transboundary landscape effects. Landscape Character areas within the Republic of Ireland that lie within 5km of the Proposed Development, have the potential to experience landscape character effects as a result of the Proposed Development and the assessment from these LCAs therefore represents the transboundary landscape character assessment.

24. The transboundary LCAs are Blackwater Valley and Drumlin Farmland LCA and the Mullyash Uplands LCA and landscape character effects have been assessed for these LCAs within this chapter as presented in detail in this chapter and summarised below:

- LCA 6: Mullyash Uplands - Landscape character impacts of the proposed overhead line and towers would be **Moderate Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

- LCA 2: Blackwater Valley and Drumlin Farmland - Landscape character impacts of the proposed overhead line and towers would be **Minor Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

25. Visual receptors that lie within the Republic of Ireland have the potential to experience visual effects as a result of the Proposed Development and the assessment of these receptors therefore represents the transboundary visual assessment.

26. Receptors that are considered transboundary receptors are as presented in detail in this chapter and summarised below:

<u>Viewpoints</u>

- Viewpoint 31: Crossaghy Road - Visual impacts of the proposed overhead line and towers would be **Moderate Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning.
- Viewpoint 32: Minor road north-east of Castleshane - Visual impacts of the proposed overhead line and towers would be **Negligible** during construction, in the winter year of commissioning and in summer 15 years after commissioning.
- Viewpoint 33: Scenic view from Tullybuck (Clontibret) - **No Impact** has been assessed during construction, in the winter year of commissioning and in summer.
- Viewpoint 34: Mullyash Mountain - Visual impacts of the proposed overhead line and towers would be **Minor Adverse** during construction, in the winter year of commissioning and in summer 15 years after commissioning.

<u>Settlements</u>

27. There are no settlements within the Republic of Ireland that lie within the 5km study area of the Proposed Development.

<u>Individual Properties</u>

28. Property receptors within the Republic of Ireland that lie within the 500m study area of the Proposed Development have the potential to experience visual effects and the assessment of these receptors therefore represents the transboundary assessment of individual properties. These properties have been identified as J50, J51, J51+and J62. To avoid unnecessary duplication please refer to section 13.6.2.2 which presents the detailed assessment of these properties.

<u>Transport Corridors and Paths</u>

29. The Monaghan Way, R214, N2 and R184 are all situated in the Republic of Ireland and within 5km of the Proposed Development. To avoid unnecessary duplication please refer to section 13.6.2.3 which presents the detailed assessment of these receptors.

30. Owing to the nature of the oversail section in the townland of Crossbane (being a section of line that must be supported by towers yet to be finalised by EirGrid), the landscape and visual transboundary assessment of the Proposed Development must be considered in the context of EirGrid's proposal. Once EirGrid's proposal has crystallised sufficiently, this will be done.

20.9 Community Amenity and Land Use

31. As part of the Baseline Conditions (section 14.3), community facilities within the Republic of Ireland have been included in this assessment, as per Figure 14.1.

32. The towers and overhead line in Northern Ireland will be at an appropriate distance from community receptors in County Monaghan such that impacts from traffic, noise and EMFs would not be significant. Transboundary impacts are limited to landscape and visual impacts arising from medium to long distance views of the line route from community facilities in the Republic of Ireland. These impacts will not be significant.

33. As the overhead line approaches the border crossing at Doohat or Crossreagh part of farm (Ref Number LCT001) on the southern side of the border is within the 60m corridor at each side of the overhead line. Similarly as the overhead line over hangs land north of the border at Crossbane parts of farms (Ref Numbers LCT007 and LCT008A) on the southern side of the border are within the 60m corridor – including a farm yard on land parcel LCT008A which is 15 meters south of the overhead lines.

20.10 Socio – Economics

34. The Armagh/ Monaghan border area is not in one of the NITB's established tourism regions and there are no available NITB statistics.

35. According to Tourism Ireland's publication, 'Facts & Figures 2011 - Island of Ireland Overseas Visitors', Monaghan attracted 48,000 of visitors to the whole island of Ireland in 2011. This is low compared to other regions, such as Dublin 3,805,000 visitors and Cork 1,123,000 visitors. This would indicate that while tourism is an established part of the local economy, it is not a major economic element.

36. There are no tourism destination sites (attractions or hospitality) within 5kms of the Proposed Development in Country Monaghan. It is noted that the landscape and visual assessment states that beyond 5km vegetation, local variations in topography, inclement weather and lighting will shield, partially interrupt or obscure views of the proposal. Impacts to tourism in the RoI will be indirect and limited to distant views from public places (such as roads) and to the setting of cultural heritage sites. The Cultural Heritage assessment (Chapter 12) notes that no significant transboundary impacts are anticipated.

37. Due to a lack of visitor attractions and low visitor numbers in the border areas of Armagh and Monaghan through which the Proposed Development passes, it not anticipated that there will be any likely significant transboundary effects to tourism.

38. In terms of employment in the study area, numbers employed in the hospitality industry within the area are low compared to other regions of RoI. Significant job losses would not occur because of temporary construction impacts or operational impacts associated with the Proposed Development.

39. It is thus determined that there would not be significant negative impacts on transboundary tourism or employment as a result of the Proposed Development. There will be a positive impact during construction relating to construction investment and employment.

20.11 Telecommunications and Aviation Assets

40. No objections or potential impacts were highlighted by the telecommunication or aviation consultees and it is concluded that there will be no significant impacts to telecommunications or aviation assets in Northern Ireland as a result of the Proposed Development. It has been determined that there are no transboundary telecommunications or aviation assets impacts arising from the Proposed Development.

41. There are no likely significant transboundary telecommunication or aviation assets impacts.

20.12 Flood Risk Assessment

42. The Proposed Development has very little potential for transboundary effects in terms of the consideration of flood risk. There is a small element of the southern section of the Proposed Development that is located within a catchment which drains to the south, into ROI. Towers 98 – 102 are located with a catchment that would drain to the west and then as a tributary of the River Blackwater, returning to the north in Northern Ireland and the origins of the Proposed Development.

43. As discussed within Chapter 18 (Flood Risk), there are no significant effects identified within the assessment and, hence, no anticipated transboundary effects.

20.13 Transport

44. As the Proposed Development will not require any significant traffic movements with the Republic of Ireland, there are no transboundary effects.

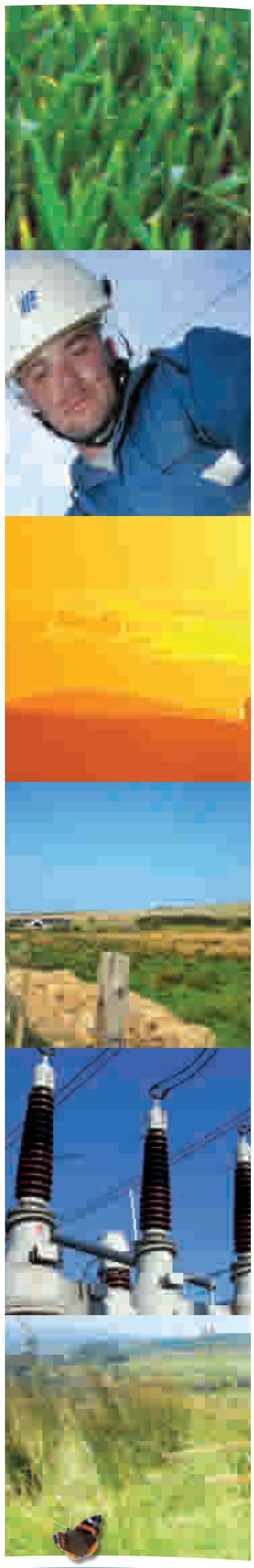
20.14 Conclusions

45. Based on the assessments carried out in this ES, as summarised in this Chapter, transboundary impacts are predicted to range from negligible to minor adverse apart from landscape impacts (on the Mullyash Uplands LCA) and visual impacts (viewpoints 30 and 31), primarily to visual receptors in close proximity to the Proposed Development.

Tyrone - Cavan Interconnector

Chapter 21

Mitigation Summary and Conclusions



Consolidated Environmental Statement

Volume 2

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21 Mitigation Summary and Conclusions

21.1 Introduction

1. This Chapter provides a summary of the findings of this ES. There are three sections:

- Mitigation Summary – a table summarising the mitigation measures as outlined in the assessment chapters;
- Residual Impact Summary – a table summarising the residual impacts as outlined in the assessment chapters; and,
- Conclusions – a summary of the key findings of chapters in this ES.

21.2 Mitigation Summary

2. As described throughout each of the previous chapters of this ES, there are instances where the environmental effects associated with the Proposed Development may require mitigation measures. These measures are deemed necessary to minimise environmental impacts during the construction and operational phases of the Proposed Development.

3. Table 21.1 provides a collective summary of the proposed mitigation measures to ensure compliance during and beyond the construction contract period. This table is called the Schedule of Environmental Commitments.

4. Specifically, the following have been tabulated:

- Mitigation measure item number;
- Approximate location of mitigation measure;
- Mitigation objective and commitment;
- An outline of the mitigation measure;
- Timing of the mitigation measure;
- Monitoring requirements; and,
- Any additional comments.

5. As described in the Table, there may be a requirement for additional consultation to be carried out during the contract period (i.e. with statutory bodies and other interested parties). Prior to commencing the works consultation will take place between NIE and landowners to ensure that landowners are aware of the specific works that will take place pursuant to the Proposed Development.

6. All mitigation measures will be monitored by NIE to ensure compliance and will be contractually enforced. Any particular monitoring requirements beyond this are identified within the table.

7. Table 21.1 only provides a brief summary of the overall committed mitigation measures. Reference should be made to individual Chapters of this ES for more detail and further explanation.

21.3 Residual Impact Summary

8. Table 21.2 provides a collective summary of the environmental effects described throughout each of the previous Chapters of this ES (7-20), taking into account the effectiveness of measures (where appropriate) to mitigate adverse impacts, thus allowing for the overall significance of effect to be rated. Specifically, the following have been tabulated:

- Description of Predicted Impact;
- Mitigation Objective and Commitment;
- Sensitivity / Value of Receptor;
- Duration of Impact (Short / Long Term);
- Magnitude of Impact with Mitigation;
- Significance of Impact with Mitigation;
- Description of Likely Effects; and,
- Reference to the relevant mitigation measures (see Table 21.1 and relevant chapters).

9. As Table 21.2 only provides a brief summary of the overall environmental effects, reference should be made to individual Chapters of this ES for further explanation and understanding.

21.4 Conclusions

21.4.1 Need

10. The proposed Interconnector is an infrastructure development of long term importance for Northern Ireland, and will deliver specific benefits for electricity customers in all three of the following key areas:

11. The proposed Interconnector complies with EU Directives that require enhanced electricity interconnection between EU member states and improved conditions for energy competition throughout Europe. The development of the Tyrone – Cavan Interconnector has been part funded by the EU Trans European Networks (TEN-E) programme, in which it has been listed as a “priority project”.

12. The proposed Interconnector is jointly supported by the Governments of both the UK and the Republic of Ireland and is fully compliant with Northern Ireland energy policy, having received specific support from the Department of Enterprise, Trade and Investment (DETI). The project is also supported by the Northern Ireland Authority for Utilities Regulation (the Utility Regulator).

13. The high voltage transmission system acts as a strategic “backbone” for the electricity system and is designed and constructed to provide a very high level of reliability and dependability. The transmission system currently incorporates an interconnector linking Tandragee in Northern Ireland to Louth in the Republic of Ireland, but the design and characteristics of this existing interconnector are insufficient to meet the challenges presented by the future requirements of the all-island electricity market and the introduction of a large amount of renewable power generation.

14. Additional interconnection capacity must be designed and constructed to integrate with the existing transmission system, and should be capable of providing an additional transfer capacity of 1,500MW.

15. Policies PSU 2 and PSU 8 of the Planning Strategy for Rural Northern Ireland require the applicant to demonstrate a need for the Proposed Development. This Chapter has addressed that requirement.

21.5 Planning and Development Context

16. The Proposed Development is EIA development under the terms of the EIA Regulations, and accordingly this ES has been prepared having regard to Schedule 4 of the EIA Regulations and DCAN 10, which provides advice on the operation of the EIA Regulations.

17. This ES demonstrates that the Proposed Development has been designed with due regard to the Regional Development Strategy for Northern Ireland, and has been closely assessed in the context of all relevant Strategic Planning Guidelines, Planning Policy Statements and the policies set out within the Planning Strategy for Rural Northern Ireland.

18. In terms of the underlying or guiding principle as set out in PPS 1 General Principles, paragraph 3 page 4 (also expressed in broadly similar terms in paragraph 59, page 23) the Proposed Development would, as required by the *"public interest...."* be "*carried out in a way that would not cause demonstrable harm to interests of acknowledged importance."* In summary, the Proposed Development complies with the overall thrust of current planning policy. In any event, if there were shown to be harm, policy requires that harm to be balanced against the overriding and imperative need for the Proposed Development.

19. The environmental impacts of the Proposed Development have been rigorous examined through the EIA process as documented in this ES. The environmental information gathered in this process has demonstrated, in relation to the planning policies, that there will be adverse impacts of varying degrees on some facets of the environment. However, in the overall balancing exercise involved in considering a wide range of often competing planning policy, guidance and standards, these adverse environmental impacts are more than outweighed by the strategic need for the Proposed Development as set out in Chapter 2, Need, which demonstrates a clear overriding national and regional need for the development in accordance with relevant planning policy on major projects and new infrastructure and the unsuitability of alternatives as set out in Chapter 4.

20. The economic benefits of the proposed Interconnector are strongly in the public interest and have been demonstrated as a key component of the justification of need. As confirmed in a recent statement by the Minister of the Enterprise Trade and Investment, the Interconnector is:

> *"an absolute necessity and* [the lack of the Proposed Interconnector] *is costing consumers in Northern Ireland a large amount of money. Therefore it is imperative that it is progressed very soon".*

21.6 Alternatives

21. The examination and evaluation of technological alternatives described in this revised and consolidated Part One of Chapter 4 has been performed in accordance with the EIA Regulations, which require that an ES should contain *"An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects".*

22. Part One of Chapter 4 has re-examined identified alternatives for achieving enhanced transmission system interconnection between Northern Ireland and the Republic of Ireland meeting the specific performance requirements set out in Chapter 2, Need and having regard to key environmental issues. The process involved a number of separate elements including the consideration of options for the initial design capacity, an assessment of available transmission methods, and the identification of critical performance features required of the proposed Interconnector.

23. The examination of technological alternatives contained within Part One of Chapter 4 includes reference to studies and reports produced by internationally recognised consultants, some commissioned by NIE, EirGrid and SONI, and others commissioned by Government. The more recent reports commissioned have also been considered. The conclusions from these reports have informed and updated NIE's and EirGrid's assessment of the alternatives, and confirmed their view that the most practical solution to meet the need for interconnection would be a HVAC overhead transmission line

24. The principal conclusions confirming the selection of an overhead line as the selected method for delivery of the proposed Interconnector are as follows:

- The rejection of undersea technology as presenting unnecessary elements of risk, environmental impact and significant additional cost where practical over land transmission system connection alternatives exist;
- Recognition that HVDC including VSC technology offers no significant technical or environmental advantages, but presents considerable additional significant complexity, cost and risk in comparison with HVAC technology;
- The worldwide predominance of HVAC overhead lines for transmission applications, and the absence of any transmission application worldwide of an underground HVAC cable circuit approaching the length of the proposed Interconnector at the designed voltage;
- The significant additional lifetime cost and technical complexity associated with the adoption of underground cable technology for high voltage transmission circuit applications;
- The superior reliability and performance of AC overhead line technology when applied to integrated transmission systems.

25. The overall conclusion drawn by NIE, in relation to its established development policy for high voltage transmission lines, and as informed and supported by the specific technical studies described in this section, is that the re-examination of the transmission alternatives fully supports and confirms NIE's proposal to construct the Proposed Development by means of a 400kV AC single circuit overhead transmission line.

26. This Part Two of Chapter 4 has described the process undertaken by NIE to evaluate alternative positions for transmission system connection, viable route corridors for an overhead transmission line between the selected connection point and the transmission system in the ROI, and detailed overhead line route selection within NI.

27. Part Two also describes the process undergone to evaluate alternatives for location, design and layout of the proposed substation.

28. The substation site selection and overhead line routeing process described in Part Two of Chapter 4 has been performed in accordance with NIE's objective to minimise the environmental impact of the Proposed Development in accordance with its published Guidelines.

29. Numerous alternatives have been considered for the connection, design, location and routeing of the Proposed Development:

- Alternative system connection options. The identification of five possible and technically feasible solutions. Of these five, two (the Western Option and the Multiple 110kV Option) were rejected at a relatively early stage since they were considered to present poor power transfer capabilities in comparison with other feasible options.
- Alternative study areas were identified in association with the remaining three connection options, two alternative "Mid-Country" connection options (including the eventually selected option of a connection between Drumkee and Kingscourt) and an Eastern connection option that would have duplicated the existing interconnector connection between Tandragee and Louth.
- Identification and assessment, having regard to the likely significant environmental impacts, of alternative route corridor options within the Mid-Country and Eastern study areas, leading to the choice of a preferred route corridor between Drumkee and Kingscourt.
- The identification and evaluation of alternatives to the detailed overhead line routeing within the preferred route corridor, and the application of established overhead line routeing principles (including land owner consultation and a combination of environmental and practical considerations) to the identification of a finalised route for the proposed overhead line.
- The identification and evaluation of three alternative substation locations in the vicinity of the chosen transmission system connection point, leading to the choice of Turleenan near Moy, County Tyrone (rather than the initial presumption of a location near Drumkee).

- The evaluation of alternatives for the substation design and layout, and the final choice of GIS in order to reduce the overall footprint and environmental impact of the proposed substation.

30. The Proposed Development has been subject to an extensive examination of alternatives. As this Part Two of Chapter 4 has demonstrated, the mitigation of environmental impacts by design has been a fundamental aspect of NIE's development process, and the location of the proposed substation and the routeing of the proposed overhead line are both considered to represent the best overall options amongst the many alternatives considered throughout the development process.

21.7 EMF

31. This chapter of the Environmental Statement has explained the policy position on EMFs in the UK, including Northern Ireland. In essence, EMFs should comply with the relevant international exposure guidelines; one precautionary policy ("optimum phasing", a feature that can be incorporated into the design of some overhead lines) has been adopted; but other precautionary measures relating to overhead lines are not adopted. The proposed overhead line and substation are compliant with the UK policy.

32. The closest residential property to the route of the overhead line is 54m away from the centreline of the overhead line. Exposures to EMFs from the overhead line at these distances are much lower than the maximum directly under the line, and a small fraction of the exposure guidelines. However, in fact all exposures from the overhead line are compliant with the guidelines, regardless of distance.

33. Underground cables eliminate the external electric field. The magnetic field from an underground cable directly over the line of the route is often higher than for the equivalent overhead line, but to the sides, the magnetic field from the cable is always lower. Government policy is that it is not justified to place overhead lines underground solely on grounds of EMFs.

34. The authoritative reviews of the science, e.g. by the Health Protection Agency and by the World Health Organization are the appropriate source of conclusions on the state of the scientific evidence on EMFs. There is some uncertainty in the science, but that uncertainty is already taken account of in the policies that have been set and which this Proposed Development complies with. NIE is confident that any new scientific developments are taken account of as they arise, and that all relevant specific scientific concerns or studies are already taken into account in the formulation of scientific conclusions and of policy.

35. Concerns have been raised about the effects of EMFs on farming, flora and fauna. The authoritative view is that the evidence does not identify any such effects (with minor exceptions, e.g. an effect of electric fields on the structure of beehives, which is readily eliminated by simple mitigation methods).

36. Concerns have been raised about the effect of EMFs on pacemakers, other active implanted medical devices, and hearing aids. These devices are almost entirely immune from any interference at the levels of EMFs produced by the overhead line, and overhead lines are not regarded as a source of interference by the relevant regulatory body, who have no record of any patient ever coming to harm as a result of an overhead line.

21.8 Water Environment

37. As a linear development, the proposed overhead line will cross a number of surface watercourses that vary in size, importance and sensitivity. The majority of the watercourses are small unnamed streams or drains that are tributaries of the larger River Blackwater, Ballymartrim Water and River Rhone. All of these surface waters are included on the Protected Areas Register as a result of their fisheries interests and their ecological status.

38. In identifying the location of the overhead line towers watercourses have been physically avoided as much as is practicably possible. However, there is the potential during construction of the overhead line and substation for temporary adverse impacts on the surface water environment leading to short term reductions in water quality. Where works adjacent to watercourses are unavoidable, these can be effectively managed by implementing good working practices and adherence to relevant legislation and current good practice including PPGs.

39. In assessing the significance of impacts careful attention has been made to the importance of the water receptors and the magnitude of any effect, taking into account the relatively small scale and duration of the works. Regardless, it is an offence to knowingly pollute a Controlled Water and therefore irrespective of the impact assessment, adequate mitigation measures have been set out to prevent pollution occurring in all locations.

40. At nine locations ephemeral (or possible ephemeral) ditches may be impacted during construction works to install tower foundations, but these will be reinstated resulting in no overall effect. The proximity of the River Rhone to the substation construction site means that it may be indirectly impacted by contaminated site runoff, resulting in an effect of Slight Adverse; however the impacts will be of short term deterioration with no long lasting effects. All other effects are neutral.

41. It is proposed, that as part of the preconstruction works, thorough landowner consultation will be undertaken to develop a construction methodology that avoids an impact on the operation of the Linwoods willow plantation bioremediation system, or provides alternative means by which the effluent currently treated by the system can be temporarily disposed off in accordance with the existing site discharge consents. If it proves impossible to achieve this, the effluent will be taken off site to a suitable treatment facility (see Chapter 15 for further details). This will ensure there is no significant water quality impact downstream of the treatment area.

42. During operation it is predicted that there will be no permanent or long term adverse impacts from the towers, nor from the substation providing that the drainage system is well maintained and NIE operate a Pollution Prevention Plan.

43. The Proposed Development is considered to be compliant with the objectives of WFD designated water bodies within the study area.

21.9 Soils, Geology and Groundwater

44. The Proposed Development has the potential to cause minor local adverse effects on geology, geomorphology, hydrogeology and soils along the route. Land take for the tower bases and the substation along the length of the overhead line would entail disturbance of surface materials (soils and drift) during construction and would remove the tower base locations and the substation site from other productive uses.

45. The tower bases have been selected to avoid areas of known peat and the consequent absence of risk of potential slope failures arising from poor cohesion of disturbed peat bodies. No peat was found in the boreholes and trial pits on the proposed substation site and there is no evidence from a site walkover of the presence of peat on the site.

46. The geological conditions that would be affected by the construction of the principal elements of the Proposed Development are of widespread occurrence in the area and the works associated with the Proposed Development would have no significant impact on their local or regional availability for study.

47. The two designated geological ASSIs in the vicinity of the Proposed Development would not be affected by the proposed construction and operation of the development.

48. The large scale and widespread occurrence in the area of the geomorphological features that would be affected by the Proposed Development also mean that tower and substation construction would have a minor impact on these features. The setting of these features also would be preserved and their relationships within the landscape would continue.

49. The main effect on geology and soils of the Proposed Development is likely to be limited to the localised loss of good quality soil within the bounds of the working areas, in particular the substation. However, the relatively small scale of the tower bases and their dispersed distribution means that losses in individual fields will be of low significance. Construction sites avoid potentially high risk, contaminated land and known areas of peat. Proposed mitigation measures would reduce the potential degree and extent of soil degradation and hence reduce the significance of any adverse effect.

50. The proposed excavation for the towers and the substation would result in the generation of approximately 103,730m^3 of surplus materials. It is anticipated that these would comprise naturally excavated materials with no contamination potential. These materials would be managed by removal off-site for disposal to landfill.

51. There is no evidence that the towers or the substation would impact on any areas of contaminated ground. Accordingly, there is no risk that water pumped from the excavations for the towers or from the substation would contain chemical contaminants which would pose a risk to the quality of the surface water systems.

52. The construction of the towers has the potential to cause a temporary modification in the groundwater level and flow where dewatering is required to facilitate construction. Additionally there is a potential impact on water quality through dewatering and the discharge of the pumped water to the surface and/or groundwater systems. However, it is concluded that any potential impacts could be adequately managed by mitigation measures implemented on the site

53. In summary, it is concluded that the construction and operation of the Proposed Development pose no significant risk to groundwater. Any minor impacts will be controlled by standard procedures and pre-construction mitigation measures.

21.10 Ecology

54. The assessment indicates that provision of the proposed Turleenan substation and the proposed overhead line between the substation site and the border with the Republic of Ireland will have a minimal impact on the ecology of the line route. The habitats present within the survey area are generally ecologically impoverished and of low value both intrinsically and as supporting habitats for protected fauna.

55. The site is dominated by intensive agriculture and the species and habitats reflect this with semi improved and improved grassland and species poor heavily managed hedgerows regularly occurring. Those areas of greater value to biodiversity have been avoided as far as possible by the development proposals and many years of ecological survey have allowed the route to be refined to avoid those areas of greater value in the local context.

56. The Proposed Development covers a large area of land but has a small footprint and therefore the potential for effects is low. Permanent land take is low and habitats lost are generally of low ecological value. Animals quickly habituate to new infrastructure in the environment and with mitigation the long term effects on biodiversity will be negligible.

57. The legislative requirements with regard to nature conservation are contained in national and European instruments, which must be considered alongside the requirements pertaining to the impacts of the Proposed Development on the study areas outlined in the other Chapters of this ES. The potential for the Proposed Development to have an adverse impact on the designation features of European sites has been considered. No recognised sites of international, national or local conservation value will be adversely affected. The Proposed Development will therefore have a negligible impact on sites of recognised conservation importance.

58. Mitigation measures are in the main designed to avoid impacts on habitats and species of conservation concern through the implementation of good working practices and awareness of the potential impacts of the works on ecological receptors. Where there is the potential for limited impacts on these receptors, the impacts will be reduced through the adoption of appropriate timing of activities, pre-construction survey of such features as badger setts and bat roosts, and through limiting the extent of

actions that will adversely affect habitats of conservation concern. Habitat creation at the substation site will increase the extent of habitats of conservation value, potentially increasing the area suitable for nesting birds.

59. The major spatial impact will be the loss of the cumulative area of land required for tower bases and the substation; however, since the great majority of tower sites will be in species-poor fields devoted to agricultural grassland of low conservation value, the ecological significance of this impact will be negligible. Siting of towers in or near hedgerows will result in some localised loss of short lengths of hedgerow, but there will be limited minor adverse impacts on the ecological function of the hedgerows at each location. The loss of mature hedgerow trees, although at a small scale in relation to the length of the line route, and in terms of ecological function at a landscape scale, will reduce habitat diversity locally. Areas of significant conservation interest, such as species-rich grassland, river channels and wetlands will be avoided as tower location sites. Following removal of temporary access tracks and storage areas every care will be taken to ensure there will be no remaining areas of compacted land (see Landscape and Visual Chapter).

60. The overhead line will have limited adverse impact on the mammal, bird and invertebrate species using the line route. Known main badger setts are remote from tower sites, and impacts on subsidiary setts are likely to be time-limited. The siting of towers away from river banks, and the techniques used for stringing lines across watercourses, mean that otters will not be adversely affected. A number of trees potentially used by bats will be removed, but the impact on bat populations is likely to be imperceptible. There will be a potential for bird species to collide with the proposed overhead line, but for the most vulnerable species, particularly swans, it is unlikely that there will be a significant adverse impact at a population or local level; the provision of deflectors at appropriate sections of the line will reduce the potential for impact further.

61. The construction of the proposed substation will require the removal of existing, mainly grassland, habitats of low conservation value, together with a number of hedgerow trees. The landforming required to accommodate the substation provides opportunities for habitat creation that will increase the biodiversity interest of the site.

62. Habitat losses will be restricted in the main to areas of low conservation value, and there will be limited adverse impact on animal species.

21.11 Noise

63. An extensive noise survey has been conducted around the proposed overhead line route and substation site to establish the existing noise levels. The receiving environment is predominantly rural and the background and ambient noise levels reflect this.

64. Potential noise levels from the construction and operation of the Proposed Development have been predicted in this assessment.

65. It is predicted that the highest noise emissions levels from the Proposed Development will be that of construction noise of the substation and the overhead line. However, this impact will be short term and of a limited nature. Mitigation measures have been provided to reduce the potential ‘worst case’ impact from construction noise and it is recommended that the contractor liaises with the local Environmental Health Officers and residents throughout the contract. The residual impact of construction noise and vibration following the implementation of these mitigation measures is not predicted to be significant.

66. Once complete the operational noise impact of the proposed overhead line route, towers, and substation will be limited to intermittent corona noise and continuous transformer/plant noise at the substation. The line and substation noise emissions have been predicted and assessed and no mitigation is proposed for noise emissions arising from the operational stage of the Proposed Development. The predicted levels are below the recommended levels and targets set by the WHO and the British Standards BS8233:1999 and BS4142:1997 and are thus within acceptable limits in both Northern Ireland.

21.12 Cultural Heritage

67. An archaeological watching brief should be maintained during removal of topsoil and subsoil in all areas of disturbance. All sites will be fenced during construction to avoid accidental damage. The Proposed Development will impact the setting of several archaeological sites and built heritage features. The setting of heritage assets is largely reliant upon long distance views, and therefore mitigation measures such as screen planting are not appropriate as they would adversely affect the context of the sites and therefore there will be no reduction in the significance of impact upon individual sites.

68. The overall significance of impact is considered to be moderate adverse due to impacts upon the setting of designated sites within the wider area.

21.13 Landscape and Visual

69. An overhead line of the size and nature of the Proposed Development will inevitably have landscape and visual impacts. However significant efforts have been taken in both the design and routeing process to minimise these impacts as much as possible. Based on the alternative options considered therefore, the Proposed Development would result in the least impacts to the landscape and visual resource of the study area, for an infrastructure project of this nature.

70. The proposed overhead line and substation would be located within an area of Northern Ireland that is primarily agricultural, consisting of low rolling hills, shallow valleys and structured fields, which often have overgrown hedgerows and many mature trees. Orchards are a prominent feature in the north of the study area. The rural hinterland close to the main settlement of Armagh area is populated with many scattered farms, dwellings and small commercial buildings. A few small villages are located along secondary and minor roads and around local educational or commercial centres. There are some valued and higher quality landscapes within the study area including a number of Registered Historic Parks, Gardens and Demesnes. An assessment of the impact to the setting of listed buildings and ancient monuments can be found in Chapter 12 Cultural Heritage.

71. The route of the proposed overhead line was selected based on the results of a number of alternatives studies which examined the environmental, technical and economic constraints present between various route corridors, line route options, and design details. Landscape and visual impacts were two primary environmental constraints that influenced the selection of the preferred route corridor, the line route, and the components of the now Proposed Development.

72. The alternatives studies were therefore the principal means by which the permanent and operational effects of the overhead line and substation have been mitigated. Whilst the Proposed Development would give rise to some adverse impacts it is considered to result in the least damaging impacts when compared to alternatives examined as part of the alternatives studies. For a more detailed description of alternatives refer to Chapter 4 Alternatives.

73. Detailed routeing of the line has sought to achieve the best fit with the landscape using landform and vegetation whilst recognising the technical constraints of the construction and operation of an overhead line.

74. After construction, the towers and overhead lines would remain as significant visual elements in the landscape. Existing lines/poles along with the proposed overhead line route would, nevertheless, combine to reduce the quality of the existing landscape.

75. Over time any vegetation cut back would re-grow and any new replacement planting would become established. Inspection and any repairs would be undertaken, but the level of activity in the landscape would be greatly reduced to a required minimum.

76. Mitigation measures would reduce visual impacts of the proposed substation and would see the embankments, earth bunds and entrance road heavily planted with predominantly native woodland.

Over time, as the mitigation landscape matures, views of the substation would be filtered and assimilated back into the local landscape setting.

77. The landscape assessment indicates that there would be significant adverse impacts upon the landscape of some parts of the study 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 it is considered that the landscape and visual resource of the wider study area 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.

21.14 Community Amenity and Land Use

78. There will be overall an Imperceptible impact to agricultural land as a result of the Proposed Development. There will be an imperceptible or slight adverse impact to 96% of the affected land parcels during construction and operation.

79. A garden centre will be oversailed in part by the proposed overhead line, which will have a temporary moderate adverse impact during construction. Beyond that there is a day nursery approximately 900m from the Proposed Development and a primary school approximately 700m away. The significant impacts to residential, commercial and community facilities will be limited to the construction phase of the Proposed Development. These impacts arise from temporary disruption to residential properties along some of access tracks which use non-adopted roads. These will be temporary major impacts; however they will be limited to approximately 29 working days at each tower location.

80. During construction, there will be some diversion to existing electricity and telephone lines, which may result in temporary interruptions.

81. There are currently four planning permissions for chicken sheds directly under the proposed overhead line. There would be Imperceptible impacts on two of the planning permissions for the proposed chicken sheds (O/2009/0804/F and O/2009/0804/F) because the overhead line would not overhang the buildings. There would be a major adverse impact on planning permission M/2008/0143/F (if constructed if constructed as planning permission expired in May 2013) because tower 22 is located in this site. Assuming there is the required clearance there would be a Moderate Adverse impact on planning permission O/2009/0807/F due to the location of the conductors over the buildings. It is assumed that these houses can be safely built and operated as long as the required safety clearance from the overhead line is provided (as per NIE policy document 6/025).

21.15 Socio-economics

82. There will be a positive impact on employment, including direct employment and indirect employment. There will also be an indirect positive impact on the hospitality industry in the local area at the construction stage of the Proposed Development, as contractors and other workers may stay in the wider regional area during construction.

83. The impacts of the Proposed Development on visitors and visitor spending, employment and local hospitality businesses in the development area have been assessed and it is considered that there will be no significant negative impacts.

84. The savings of £7m per year for Northern Irish electricity consumers estimated by DETI are considered to be a significant positive effect to the economy.

85. Impacts to tourism will not be direct as no tourist sites will be physically impacted by the Proposed Development. The key sites within the study area (the Argory, Navan Centre and Benburb Priory) will have views of the construction and operational phases but it is considered that these impacts will not be significant. Four recreational routes will be oversailed by the Proposed Development and will experience a minor adverse impact during construction.

86. As there will be a significant negative impact to the running of a bioremediation area used by the Linwoods facility, mitigation and compensation will be required to be agreed with the landowner/operator.

21.16 Telecommunications and Aviation Assets

87. As part of the EIA, extensive consultation took place with the authorities responsible for transmissions associated with radio (domestic and commercial), television, aviation and the emergency services that have telecommunications assets.

88. No objections or potential impacts were highlighted by the telecommunication or aviation consultees. It is concluded that there will be no significant impacts to telecommunications or aviation assets as a result of the Proposed Development.

89. The Proposed Development will meet all Electromagnetic Compatibility requirements as set out by legislation.

21.17 Flood Risk

90. A Flood Risk Assessment (FRA) has been carried out following the guidance and requirements set out in PPS15 and consultation with the Rivers Agency and the Northern Ireland Planning Service.

91. Although the substation boundary includes land recognised as being in the 1% AEP floodplain, there is no permanent built development at the substation within this area.

92. The Proposed Development can be considered to be of regional importance and consists of essential infrastructure that has an operational requirement to be at this location.

93. During the construction period of the substation, the temporary alignment of the access road will encroach onto the floodplain; however, this is not considered to be significant, is temporary in nature and could be offset by providing temporary floodplain storage. However, give the scale of the impact, this is not considered to be required and has been confirmed in consultation with the Rivers Agency.

94. The Proposed Development has been assessed with source and site controls to develop an outline strategy. The runoff from the future development will be attenuated within the boundary of the substation area and controlled to ensure that it does not exceed the runoff from the existing undeveloped site. The assessment has been carried out for all rainfall events up to and including the 1% AEP event, including an allowance for future climate change of a 20% increase in rainfall intensity in accordance with UKCIP guidelines.

95. A SWMS has been developed to assess the requirements of SuDS to mitigate the effects of the development on the increased surface water runoff and also to provide adequate treatment.

21.18 Cumulative and Interrelationship of Impacts

96. An assessment of the likely significant cumulative effects of the Proposed Development with other developments has been undertaken. Also included in the assessment is a summary of interacting effects of the Proposed Development between assessment topics.

97. The assessment chapters in this ES (Chapters 7 – 18) contain assessments of the likely significant interacting effects arising from the Proposed Development. During the assessment process, coordination took place between assessment specialists to ensure that interacting impacts arising from the Proposed Development were identified, assessed and, where appropriate, mitigated.

98. The assessment of cumulative impacts between the Proposed Development and other developments has included identification of the other planned developments which have not yet been constructed. This has led to the identification of other projects such as the Tamnamore to Omagh 110kV network reinforcement project. This is an approved 50km 100kV overhead line which will be located approximately 1.6 km from the Proposed Development at its closest point. Other developments also include proposed chicken sheds and wind turbines.

99. No planning application has been formulated or submitted by EirGrid for the portion of the Tyrone-Cavan Interconnector within the Republic of Ireland and the form of their proposals is as yet undetermined. In circumstances in which EirGrid has yet to conclude its public consultation exercise and EirGrid's Proposed Development has yet to crystallise sufficiently for NIE to conduct such a cumulative impact assessment, NIE is unable to conduct a cumulative impact assessment as part of this ES. However, once EirGrid's proposal has crystallised sufficiently, this will be done.

100. The cumulative effects are predicted to be **Not Significant**.

21.19 Transboundary Impacts

101. Based on the assessments carried out in this ES, as summarised in this Chapter, transboundary impacts are predicted to range from negligible to minor adverse apart from landscape impacts (on the Mullyash Uplands LCA) and visual impacts (viewpoints 30 and 31), primarily to visual receptors in close proximity to the Proposed Development.

Table 21.1: Schedule of Environmental Commitments

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Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
GENERAL CONSTRUCTION						
5.1	Substation	Noise mitigation of transformers	The transformers will be immediately south of the GIS building. They will be connected via underground cabling and will be contained by 12.5m high wall barriers on three sides. This is a fire protection and noise mitigation measure	Construction phase	None	
5.2	Substation	Mitigation of the drainage for the proposed substation site (hardstanding area and access road)	The drainage for the proposed substation site (hardstanding area and access road) has been designed in accordance with the Sustainable Drainage Systems (SuDS) principles and the Construction Industry Research and Information Association (CIRIA) SuDS Manual 2007. A three stage treatment to ensure water quality has been designed.	Construction and operational phases	Ongoing	
5.3	General	Mitigation of the existing field drainage systems (e.g. piped drainage pipes)	If existing drainage is discovered at the location of a tower foundation, typically this drainage will be removed from the tower foundation construction area. New drainage trenches will be dug on one or as many sides of foundation as required, or alternatively a number of drains can be replaced by a larger single drain inserted, which bisects the tower foundation. Any new drainage is based on a new site specific drainage design that will be completed by the appointed contractor and in agreement with the affected landowner(s)	Construction phase	None	
WATER ENVIRONMENT (CHAPTER 8)						
8.1	Towers 20, 21, 33, 44, 48, 68, 78, 81, and 87	Reinstatement of ephemeral drainage ditch impacted during construction of the tower	Pre-construction survey to record existing conditions. Landscape proposals to reinstate ditch following completion of the works.	Following installation of the tower.	None.	Not applicable.

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
8.2	All construction sites	To prevent water pollution	Construction will be undertaken in accordance with a CEMP, best practice guidance, and any consents and licences required by regulatory bodies. Site specific mitigation measures will be developed following a risk assessment to be completed during detailed design. Section 8.5 sets out a palette of mitigation measures that can be adopted to ensure that pollution does not occur.	During construction.	A monitoring strategy has been proposed during construction.	
8.3	All construction sites	To prevent water pollution	A Pollution Prevention Plan, including an emergency response procedure, will be included in the CEMP. Any vehicles used on site will well maintained and checked daily. Drip trays will be fitted to static plant and biodegradable oil used. Spill kits will be stored on site and staff trained in their use. Concrete will be batched offsite. Fuel will be stored and refuelling activities will only take place in designated areas of the working areas. Concrete washing activities will also only take place in the working areas and wash waters collected for appropriate disposal offsite at a licensed land fill.	During construction.	A monitoring strategy has been proposed during construction.	
SOILS, GEOLOGY AND GROUNDWATER (CHAPTER 9)						
9.1	Construction area	Minimise impacts to soils	Controlling working practices, for example, by minimising land take to that required for the construction process; avoiding repetitive handling of soils; minimising vehicle movements off-road; and minimising the size of stockpiles to reduce compaction of soils. Re-instatement of soils to their original location, wherever practical.	Construction Phase	None	None

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
9.2	Construction area	Prevent spread of Potato Wart Disease (PWD).	NIE would contact DARD regarding the safe disposal or replacement of soils affected by Potato Wart Disease (PWD). Where off-site removal of infested soil is unavoidable, NIE would seek advice on the selection of suitable disposal sites and agree a methodology for the works prior to the issue of the necessary movement licence, which would include the measures to be adopted to prevent the spread of the disease. Even if affected soils are not removed off-site, NIE will agree with the Contractors measures to minimise the risk of spreading of the disease, such as cleaning the wheels of all lorries leaving the construction areas prior to accessing the public road and cleaning of all tools and earth-moving equipment after use in infested areas to avoid carrying infested soil onto unaffected agricultural land.	Construction Phase	None	None
9.3	Construction area	Effective treatment of spoil material	NIE would ensure that a methodology would be agreed for the disposal of all spoil arising from the excavations and that any disposal of the spoil on agricultural land would not be carried out without the benefit of appropriate permissions from the statutory authority (DOE and DARD).	Construction Phase	None	None
9.4	General	Dealing with unexpected contaminated land	Specific proposals would be prepared as part of the CEMP, following the granting of planning permission to facilitate the management of any contaminated material unexpectedly excavated as part of the construction of the development.	Pre-construction	None	None

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
9.5	Water well survey study area (approximately 300m from the tower locations).	Minimising impact to private water supplies	A water well survey would be carried out over an area approximately 300m from each tower location where dewatering will be required. If private wells, boreholes or springs are present in the survey area, an assessment would be carried out of the likely impact of dewatering pumping on the source and the need for the provision of a temporary alternative supply for the period of dewatering. Should the assessment show that there is a risk of derogation of an existing water supply source, a replacement supply would be provided. This may consist of the provision of a temporary supply, such as a water bowser, to ensure a continued water supply to properties.	Construction Phase	Monitoring required during construction	None
9.6	Substation	Controlling storage of materials	Impacts on groundwater following construction of the Proposed Development would be limited to issues associated with the storage and use of contaminants (i.e. oils and fuels) at the proposed substation. Provided that these substances are stored and used in accordance with standard guidelines and practices, potential risks to groundwater and surface water quality would be negligible.	Operational phase	Ongoing to ensure compliance	None
9.7	Substation	Minimise groundwater deterioration from sewage and foul water disposal	Use of septic tank soakaway. The soakaway drains will be appropriately located to allow attenuation of contaminants in the underlying unsaturated zone. There will be a minimum 2m of unsaturated ground below the soakaway drains.	Operational phase	None	None
9.8	Construction area	Minimise impacts from dewatering	(See Water Environmental Mitigation (Chapter 8) for details)	Pre - construction and Construction Phase	Ongoing during preconstruction and construction.	None

Table 21.1: Schedule of Environmental Commitments

Item	Location	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring Requirements	Comment
ECOLOGY (CHAPTER 10)						
10.1	General	To minimise impacts to Hedgerows and scattered trees	Works in the vicinity of trees should conform to BS 5837:2012, Trees in relation to design, demolition and construction- Recommendations. Hedgerows will be protected by scaffolding when conductors are drawn between towers. Where hedgerows in the vicinity of towers are to be lowered, a height of at least 2m should be retained in order to maintain bat flightlines. Minimal lengths of hedgerow should be removed where this is essential, and gaps should be replanted with native species following the works. Wherever possible, hedgerow trees will be pollarded rather than removed. New hedges of equal length planted where hedgerows removed (or donation made to conservation charity to plant replacement trees)			
10.2		To minimise impacts to Fen	Trampling and the use of machinery on saturated, quaking surfaces will be avoided.			
10.3		To minimise impacts to Breeding birds	Any removal/reduction of hedgerow trees, cutting of hedgerows and clearing of scrub will take place outside the bird-nesting period, which in Northern Ireland is generally taken as March to August inclusive. This will apply to both the construction and operational (line maintenance) phases. Potential bird nesting habitat in close proximity to works that take place between March and August should be checked by a competent ecologist to ensure that there will be no adverse impact on protected bird species.			
10.4		To minimise impacts to Wintering birds	Attachment of clearly visible markers on overhead lines posing a high collision risk. To be fitted to the earth line (highest line) between T30 and T43.			

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
10.5		To minimise impacts to Bats	A dusk and dawn bat survey will be carried out at potential roosts immediately prior to demolition/felling. If bats are found work will be suspended until consultation with NIEA. If bats are found after/during demolition/ felling work must be stopped until consultation with NIEA. Felling of potential roosting trees will be carried out in the presence of a licensed bat worker following best practice guidelines. 100 new bat boxes provided to mitigate for loss of potential tree roosts. Hedgerow replacement to compensate for loss of foraging habitat although all hedgerows will be cut to only 2m keeping commuting integrity intact.			
10.6		To minimise impacts to Badgers	Any excavations left unattended overnight should be either covered or ramped in at least one location to allow mammals to avoid becoming trapped. Repeat badger surveys will be carried out within 100m of the development immediately prior to the commencement of work. If setts are found work will be suspended until consultation with NIEA.			
10.7		To minimise impacts to Otter	Any excavations left unattended overnight should be either covered or ramped in at least one location to allow mammals to avoid becoming trapped.			
10.8		To minimise impacts to Irish hare	Any excavations left unattended overnight should be either covered or ramped in at least one location to allow mammals to avoid becoming trapped.			

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
10.9		To minimise impacts to Fish/Watercourses	Waters high in suspended solids produced as a result of de-watering during the excavation and construction of tower bases should be contained and treated prior to discharge. Treatment will be provided to intercept surface water draining from the substation site, and will intercept any suspended solids prior to discharge of water to a watercourse. The contractor will be required to provide a method statement designed to prevent adverse impacts on rivers and other watercourses. Tower locations will be sufficiently remote from watercourse channels, to ensure that work practices do not result in bank damage, and care will be taken to prevent ingress of silt into watercourses. Where crossing of watercourses for construction access is unavoidable, an initial draw-line will be flown across major rivers, which will then be used for winching the operational conductors to the tower position. The initial draw-line will be thrown across narrow watercourses, and a similar procedure followed.			
10.10		To minimise impacts to Smooth newt	Waters high in suspended solids produced as a result of de-watering during the excavation and construction of tower bases should be contained and treated prior to discharge. Treatment will be provided to intercept surface water draining from the substation site, and will intercept any suspended solids prior to discharge of water to a watercourse. The contractor will be required to provide a method statement designed to prevent adverse impacts on rivers and other watercourses. Tower locations will be sufficiently remote from watercourse channels, to ensure that work practices do not result in bank damage, and care will be taken to prevent ingress of silt into watercourses. Where crossing of watercourses for construction access is unavoidable, an initial draw-line will be flown across major rivers, which will then be used for winching the operational conductors to the tower position. The initial draw-line will be thrown across narrow watercourses, and a similar procedure followed.			

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
10.11		To minimise impacts to White clawed crayfish	Waters high in suspended solids produced as a result of de-watering during the excavation and construction of tower bases should be contained and treated prior to discharge. Treatment will be provided to intercept surface water draining from the substation site, and will intercept any suspended solids prior to discharge of water to a watercourse. The contractor will be required to provide a method statement designed to prevent adverse impacts on rivers and other watercourses. Tower locations will be sufficiently remote from watercourse channels, to ensure that work practices do not result in bank damage, and care will be taken to prevent ingress of silt into watercourses. Where crossing of watercourses for construction access is unavoidable, an initial draw-line will be flown across major rivers, which will then be used for winching the operational conductors to the tower position. The initial draw-line will be thrown across narrow watercourses, and a similar procedure followed.			
NOISE AND VIBRATION (CHAPTER 11)						
11.1	Development wide	To not exceed threshold values for airborne sound generated by construction activities at nearest noise sensitive receptors	Adopt best practice for construction of the substation and towers and limit hours of working	Construction	Occasional monitoring using type 2 Sound level meter at noise sensitive receptors.	Threshold for significant effects based on BS5228:2009

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
11.2	Development wide	To not exceed threshold values for ground borne vibration generated by construction activities at nearest noise sensitive receptors	Adopt best practice for construction of the substation and towers and limit hours of working	Construction	Occasional monitoring- vibration levels during construction phase will fall to typical ambient levels given separation distances	Threshold for significant effects based on BS5228:2009 and BS7385:1993
11.3	Development wide	To meet WHO Guidelines on Community noise	Limited number of HGV movements per hour or daily basis near to dwellings on haul routes	Construction	N/A	Assessed using haul road method in BS5228:2009. Takes account of HGV movements/ speed/distance from receptor
11.4	Development wide	To not exceed threshold values for noise and vibration under BS4142:1997, BS8233:1999, WHO Guidelines on Community Noise 1999 and BS5228:2009/BS7385:1993	Substation has significant attenuation due to structure and distance to nearest noise sensitive receptors	Operational	N/A.	External noise targets based on lowest recorded background noise levels near to the proposed substation

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
11.5	Development wide	To not exceed threshold values for noise and vibration under BS4142:1997, BS8233:1999, WHO Guidelines on Community Noise 1999 and BS5228:2009/BS7385:1993	Substation has significant attenuation due to structure and distance to nearest noise sensitive receptors	Operational	N/A.	External noise targets based on lowest recorded background noise levels near to the proposed substation
CULTURAL HERITAGE (CHAPTER 12)						
12.1	Development wide	To record any previously unrecorded archaeological remains.	Archaeological watching brief	Construction	Ongoing	
12.2	Site 71 (Near to Tower 91)	To ensure protection of the rath	Fence off prior to construction	Construction	During set-up and intermittently.	
LANDSCAPE AND VISUAL (CHAPTER 13)						
13.1	Substation site	Minimise landscape and visual impacts	Landscape proposals (including earth mounding) are proposed at the substation site. Proposed planting would be implemented in the first planting season following completion of the earth works Plant species chosen would be fast growing native species to complement existing planting in the local area. The planting would be protected by rabbit proof fencing and would be subject to a management program to ensure objectives are met.	Construction Phase	Ongoing maintenance	

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
13.2	Substation	Minimise landscape and visual impacts	Complete earth mounding and planting prior to the installation of substation components. Provide the minimum height of bunds to immediately screen the lower construction elements. Grade new landforms gradually into existing surrounding levels. New planting to complement existing visual character - use indigenous hedge and trees along with fast growing nurse and climax trees. Minimise the use of roadside signs relating to the completed development. All metal security fencing would be finished in galvanised/painted grey. Other field enclosures would be timber post with appropriate galvanised wire, and planted with local hedge and tree species, to match existing. Security lighting will be activated by movement sensors only and will be located to minimise lighting spillage and pollution on the local area. Reflective finishes on all construction elements have been avoided. To further reduce the visual impact, the buildings have been designed to complement the building appearance and character local to the area, with particular regard to their scale, form and finish, as detailed in Chapter 5 of the ES.	Construction and Operational Phase	Ongoing maintenance	
13.3	Tower Working Areas	Restoration of affected vegetation post construction	At the end of the construction process, land affected by the working areas would be fully reinstated as pasture or planted to replace any vegetation lost as a result of the works. Care would be taken to ensure there would be no remaining areas of compacted land. Any fencing and/or hedging removed to accommodate working areas or access tracks would be replaced to an equivalent or better quality in keeping with the rural landscape upon completion of the construction period.	Construction Phase	Five year maintenance period (to be agreed with landowner)	
13.4	Temporary access tracks	Restoration of affected vegetation post construction	Temporary access tracks and track-ways would be reinstated following construction.	Construction Phase	Five year maintenance period (to be agreed with landowner)	

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
13.5	Temporary Access Widening and Visibility Splays	Restoration of affected vegetation post construction	If it is determined by the Department that temporary traffic measures are not to be used, existing accesses could be temporarily enlarged to accommodate the larger types of construction vehicles. The area of affected vegetation would be reinstated.	Construction Phase	Five year maintenance period (to be agreed with landowner)	
13.6	Temporary Low Voltage crossings	Restoration of affected vegetation post construction	There are 18 existing electricity lines to be undergrounded, which will be undertaken by open trench. This will result in an impact to 89m of hedgerows and treelines, which will be reinstated post construction	Construction Phase	Five year maintenance period (to be agreed with landowner)	
13.7	Permanent Tower Bases	Restoration of affected vegetation post construction	The permanently affected area of the towers is smaller than the required construction area. Of the area affected by construction, roughly 66% can be reinstated post construction. It is possible for vegetation including hedgerows to grow under each of the proposed towers; however as worst case it has been assumed that 296m of hedgerows and treelines and 3 trees will be permanently lost	Construction Phase	Five year maintenance period (to be agreed with landowner)	

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
13.8	Permanent area adjacent to the overhead line	Restoration of affected vegetation during operational phase	All vegetation adjacent to the conductors with the potential to fall onto the conductors will be trimmed to ensure safety clearances. This will form part of the ongoing maintenance of the Proposed Development. This is standard practice and is done for all existing overhead lines. Less trimming will be required further from the conductors as there will be less potential for falling vegetation onto the overhead line. The trimming regime will involve a scalloping or profiling effect which will minimise the effect on vegetation. It is assumed that an area of 30m from the edge of the conductors (on either side) will be required to be examined for falling hazards. The level of trimming required will be directly related to the distance from the overhead line and the height of the vegetation - i.e. the further from the overhead line, the less vegetation that is required to be trimmed. The vast majority of this vegetation within the 30m zone will be unaffected because of its height and distance from the overhead line but for safety reasons, any branches, etc with the potential to fall on the overhead line will be trimmed. Hedgerows within the 30m zone are currently regularly maintained by landowners to an approximate height of between 1m and 3m and so will not require further trimming.	Operational Phase	Ongoing maintenance	
COMMUNITY AMENITY AND LAND USE (CHAPTER 14)						
14.1	Construction phase	Minimise traffic disruption to residential, commercial and community facilities	Maintain access to residential, commercial and community facilities during construction including recreational routes such as walking and cycling routes.	Construction phase	None	See Chapter 18
14.2	Construction phase	Minimise disruption to road using community events	Roads to be maintained during construction and to be left in a condition suitable for current road use community events (e.g. road bowls). Liaison will be undertaken with community groups as appropriate to ensure mitigation of any disturbance to access.	Construction phase	None	
14.3	Construction phase	Minimise disruption to existing services	Interruptions to electrical and telephone lines should be kept to a minimum with notice given to the affected users.	Construction phase	None	

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
14.4	Construction phase	Fencing of substation site to prevent disruption	The site of the proposed substation will be fenced off prior to construction to ensure that the construction activities within the site have no impact on adjoining farm land.	Construction phase	None	
14.5	Construction phase	Landowner Liaison	An access officer 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	Construction phase	None	
14.6	Construction phase	Maintain access to agricultural land	NIE will ensure that land owners have reasonable access to all parts of their farm during the construction phase to minimise or eliminate temporary farm fragmentation impacts. Where existing access roads are affected or fenced off, NIE will make all reasonable efforts to provide alternative access.	Construction phase	None	
14.7	Construction phase	Reinstatement of Hedgerows and drains/ditches	Hedgerows and drains/ditches should be reinstated after completion of works as far as is practical	Construction phase	None	
14.8	Construction phase	Follow disease protocols	Disease protocols will be adhered to and NIE will comply with any DARD regulation pertaining to animal or plant diseases. Before surveying commences the land owners will be met and a pre-survey interview will be completed. The purpose of this interview is to ask the land owner to notify NIE of any animal diseases and other risks which may arise from dangerous livestock (e.g. bulls);	Construction phase	None	
14.9	Construction phase	Landowner Notification	Farmers will be notified at least 1 week in advance of any works commencing on their farms. The contractor will make all reasonable efforts to accommodate the farmers grazing and cropping programmes and reschedule works if practical to do so.	Construction phase	None	
14.10	Construction phase	Agronomy pre-condition	An agronomy pre-condition survey will be carried out	Construction phase	None	
14.11	Construction phase	Fencing of construction areas to prevent disruption	Appropriate fencing will be erected to exclude livestock from sites of construction and to keep livestock within farm boundaries	Construction phase	None	

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
14.12	Construction phase	Minimise impact of rock breaking or pilling ,if required	Where rock breaking or pilling are required, owners of livestock in adjoining fields will be notified in advance.	Construction phase	None	
14.13	Construction phase	Minimise impacts to land drains	Land drains which may be potentially affected during tower foundation excavations and excavations for undergrounding will be redirected and/or reconnected in a manner that maintains existing land drainage. Before surveying commences the pre-survey interview with land owners will identify location of drains	Construction phase	None	
14.14	Construction phase	Minimise impacts to soil	All disturbed field surfaces will be reinstated. These works may be carried out by the land owner, the contractor or an agreed third party, as agreed with the land owner. Works will not be carried out following extreme rainfall to minimise damage to soil surface and minimise run-off risks. All soil disturbance works and remedies will comply with agreements made with land owners	Construction phase	None	
14.15	Construction phase	Minimise impacts from concrete	Concrete will be mixed off-site and imported to the site. The pouring of concrete for tower bases will take place within a designated area using a geosynthetic material to prevent concrete runoff into the surrounding soil. Any soil contaminated by concrete spillage will be removed to an approved waste facility	Construction phase	None	
14.16	Construction phase	Minimise impacts from pumped water	If water is being pumped from a construction site, a water filtration system will be utilised to minimise impacts on water sources.	Construction phase	None	
14.17	Construction and Operational phase	Ensure Health and Safety	NIE will provide safety information directly to all affected land owners. Anti-climbing platforms will be installed on all towers to prevent people climbing the towers	Construction phase	None	
14.18	Construction and Operational phase	Minimise impacts to electric fences	In rare cases where electric fences induce an electrical current, electric fence filters will be installed	Construction phase	None	

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
SOCIO-ECONOMICS (CHAPTER 15)						
15.1	Construction and Operational phase	Minimise impacts to the Linwoods bioremediation area	Mitigation measures will be required to minimise the impact to the bioremediation area. Further consultations will be required with the owner and operator of the area. It may be possible to accommodate the normal harvesting operation within the construction timetable in order to minimise losses. If this is not possible, compensation will be required for the loss of the value of the crop. In terms of the effluent treatment, consultations with the owner and operator in order to determine the layout of the pipe network and what remedial works will be required during construction and the operation of the Proposed Development. The consultations will also be needed to determine the nature of the effluent material, the rate of production from the facility, rate of discharge and the current condition of the treatment system. It is likely that alterations will be required to the pipe network, which is currently laid above ground along the rows of planted willow. If there is not capacity in the treatment system to accommodate a reduction in the willow area, alternative treatment will have to be agreed with the owner and operator (e.g. off site treatment by tanker) or compensation agreed.	Construction and Operational phase	None	
TELECOMMUNICATIONS AND AVIATION ASSETS (CHAPTER 16)						
16.1	Construction and Operational phase	To ensure no impacts to TV and radio reception	In the unlikely event of interference arising, adjustments to the orientation of the aerial of the radio or television or a similar solution should remedy the problem. No mitigation is proposed as part of this EIA.	Construction and Operational phase	Monitoring through any public complaints to NIE.	This has been assessed to be unlikely to occur.
16.2	Construction and Operational phase	To ensure no impacts to aviation	Prior to construction, the Defence Geographic Agency (DGA) (the body responsible for maintaining the aviation mapping database for the CAA and MoD) will be provided with detailed mapping of the Proposed Development (both construction and operation phase details). The Irish Aviation Authority will also be informed.	Construction and Operational phase	None	

Table 21.1: Schedule of Environmental Commitments

Item	Location	Mitigation Objective and Commitment	Mitigation Measure	Timing of Mitigation Measure	Monitoring Requirements	Comment
FLOOD RISK ASSESSMENT (CHAPTER 17)						
17.1	Substation	Prevent increased runoff rates and volume	Implement Surface Water Management Strategy	During Construction	None	
17.2	All Construction Locations	Prevent increase flood risk during construction from dewatering activities	During flooding events, dewatering activities to be ceased to avoid increased discharges	During construction	None	
17.3	All Construction Locations	Prevent loss of floodplain	Ensure that any excavated material is not stored within the floodplain	During construction	None	
TRANSPORT (CHAPTER 18)						
18.1	Entrance to 31 No. listed access tracks.	Traffic Management measures	Traffic Management measures at site access - 31No. access tracks including AT2, AT10, AT14, AT20, AT24-25, AT26, AT29, AT33, AT35, AT43, AT45, AT47, AT48A, AT49, AT51, AT52, AT52SL, AT54, AT67, AT71SL2, AT74SL2, AT76, AT80, AT86, AT87B, AT88, AT89, AT90, AT93-94, AT99 and AT100.	Construction Phase	None	
18.2	Entrance to 5 No. listed access tracks and to feeder road	Traffic Management measures	Traffic Management measures required at site access and also en route to the access from the feeder road - 5No.access tracks including AT75, AT97, AT98, AT102A and AT102B.	Construction Phase	None	
18.3	Entrance to17 No. listed access tracks.	Access widening	Access requires widening to accommodate construction vehicles - 17No. access tracks including AT7, AT13, AT18, AT19, AT30, AT34, AT41-42, AT50, AT78A, AT78B, AT79, AT81, AT82, AT83A, AT83B, AT84 and AT91.	Construction Phase	None	
18.4	Entrance to 3 No. listed access tracks and to feeder road	Access widening and traffic management measures	Access requires widening to accommodate construction vehicles and traffic management measures required en route to the access from the feeder road - 3No. access tracks including AT74, AT74SL1 and AT74SL2	Construction Phase	None	

Table 21.1: Schedule of Environmental Commitments						
Item	**Location**	**Mitigation Objective and Commitment**	**Mitigation Measure**	**Timing of Mitigation Measure**	**Monitoring Requirements**	**Comment**
18.5	Entrance to 101 listed access tracks (all proposed)	Access widening in-line with DCAN 15 advice	If it is determined by the Department of the Environment that temporary traffic measures are not to be used and existing accesses should be temporarily enlarged to DCAN 15 standards, then measures 18.1 to 18.4 will be superseded by this mitigation measure - 18.5. The low-loaders could enter the proposed sites and make deliveries off the public road network without requiring road or lane closures. The area required for the temporarily enlarging the existing accesses has been identified and included within the planning application boundary. Where the accesses are required to be widened to accommodate construction machinery, vegetation will be cleared and any affected services and drainage will be amended to ensure normal operation during the construction phase.	Construction Phase	None	
18.6	General	Construction Traffic Management Plan	Prior to construction, a Construction Traffic Management Plan would be prepared and submitted to Roads Service for consideration following consultation with other stakeholders such as the Police Service of Northern Ireland. An outline plan has been drawn up at this stage; see Annex 10 of Annex 12 of Appendix 18A. However, the appointed contractor would finalise this traffic management plan with Roads Service and adhere to its detailed during the construction of the line.	Construction Phase	None	
18.7	General	Travel Plan Framework	Notwithstanding a Travel Plan Framework has been developed, which includes measures related to the proposed substation. The measures include providing a staff notice board detailing sustainable transport modes and all HGVs visiting the site will be provided with information regarding suitable 'haul routes' before undertaking their journeys.	Operational Phase	Ongoing to ensure effectiveness	

NB As the Proposed Development is compliant with Government policies for the control of EMFs, specifically with the relevant quantitative exposure guidelines, no additional mitigation measures are called for.

Table 21.2: Summary of Residual Impacts

Table 21.2: Summary of Residual Impacts								
Item	**Description of Impact**	**Mitigation Objective and Commitment**	**Sensitivity / Value of Receptor**	**Duration of Impact Short/Long Term**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Description of Likely Impacts**	**Mitigation Item on No.**
WATER ENVIRONMENT (CHAPTER 8)								
8.1	Construction works affecting ephemeral drainage ditches.	Ditches will be reinstated.	Low	Short term, temporary	Moderate adverse	Neutral	No overall effect	8.1
8.2	Physical effects to morphology of watercourse from widening field access	Ditches will be reinstated.	Low	Short term, temporary	Moderate adverse	Neutral	No overall effect	8.1
8.3	Silt contaminated construction site runoff (multiple sources)	Various mitigation measures have been proposed, which will be made site specific following detailed design	Low to Very High	Short term, temporary	Moderate Adverse to Negligible	Slight to Neutral	Potential for short term deterioration of water quality, but no long lasting effects.	8.2
8.4	Direct chemical / fuel spillages and contaminated construction site runoff.	Various measures have been proposed, which will be made site specific following detailed design	Low to Very High	Short term, temporary	Moderate Adverse to Negligible	Slight to Neutral	Potential for short term deterioration of water quality, but no long lasting effects.	8.3
8.5	Substation site runoff during operation	Filter drains, oil interceptors and storage pond	River Rhone - High Drainage ditch - low	Long term, permanent	Negligible	Neutral	No effect	N/A
8.6	Oil spillage risk from substation site during operation	Filter drains, oil interceptors and storage pond	River Rhone - High Drainage ditch - low	Long term, permanent	Negligible	Neutral	No effect	N/A
SOILS, GEOLOGY AND GROUNDWATER (CHAPTER 9)								
9.1	Construction phase impacts on soils and geology	Minimise soil disturbance and re-use on site, where practical	Low	Short Term	Low (High at substation)	Negligible	None	9.1 - 9.4
9.2	Construction phase impacts on groundwater	Minimise impacts on groundwater level, flow and quality. Groundwater	Negligible to high	Short Term	Low to negligible	Negligible	Derogation of existing water supply	9.5

Table 21.2: Summary of Residual Impacts								
Item	**Description of Impact**	**Mitigation Objective and Commitment**	**Sensitivity / Value of Receptor**	**Duration of Impact Short/Long Term**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Description of Likely Impacts**	**Mitigation on Item No.**
		monitoring during tower construction, where identified.						
9.3	Operational phase impacts on soils and geology	None	N/A	None	N/A	N/A	None	N/A
9.4	Operational Phase impacts on groundwater	Controlling storage of materials at substation. Foul water disposal at substation.	Low	Long Term	Negligible	Negligible	Groundwater and surface water contamination	9.6, 9.7
ECOLOGY (CHAPTER 10)								
10.1	Lough Neagh and Lough Beg SPA/Ramsar/ IBA Potential and permanent loss of habitat for breeding and migratory birds. Potential collision risk with overhead lines of birds using the site and birds passing over the site. Potential effect on designating features of site as an SPA, Ramsar site and IBA.	Interconnector route follows lower ground reducing the potential for overflying birds to come into contact with the overhead line. The route avoids known areas of importance for vulnerable species. A Test of Likely Significance, as required by Article 6 of the Habitats Directive, was carried out to assess the potential impacts of the Proposed Development on the designation features of the European sites.	Very high	Long Term	Negligible	Neutral	Bird collision risk with the overhead line.	
10.2	Wintering birds Potential collision risk with overhead power lines	Routeing of overhead lines as low as possible Attachment of clearly visible markers on overhead lines posing a high collision risk	Very High	Long Term	Negligible	Neutral	Bird collision risk with the overhead line.	

Table 21.2: Summary of Residual Impacts

Item	Description of Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact Short/Long Term	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Description of Likely Impacts	Mitigation Item on No.
10.3	Bats Loss of foraging and commuting corridors. Loss of potential roosts, foraging habitat and commuting corridors through felling of mature trees and removal of hedgerows.	A dusk and dawn bat survey will be carried out at potential roosts immediately prior to demolition/felling. If bats are found work will be suspended until consultation with NIEA. If bats are found after/during demolition/ felling work must be stopped until consultation with NIEA. Felling of potential roosting trees will be carried out in the presence of a licensed bat worker following best practice guidelines. 108 new bat boxes provided to mitigate for loss of potential tree roosts. Hedgerow replacement to compensate for loss of foraging habitat although all hedgerows will be cut to only 2m keeping commuting integrity intact.	High	Short Term	Negligible	Neutral	Disruption of flight lines during construction because of the proximity of construction operations.	
10.4	Lough Beg ASSI Potential and permanent loss of habitat for breeding and migratory birds. Potential collision risk with overhead lines of birds using the site and birds passing over the site.	Interconnector route follows lower ground reducing the potential for overflying birds to come into contact with the overhead line. The route avoids known areas of importance for vulnerable species.	High	Long Term	Negligible	Neutral	Bird collision risk with the overhead line.	

Table 21.2: Summary of Residual Impacts

Item	Description of Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact Short/Long Term	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Description of Likely Impacts	Mitigation on Item No.
10.5	Lough Neagh ASSI Potential and permanent loss of habitat for breeding and migratory birds. Potential collision risk with overhead lines of birds using the site and birds passing over the site. Potential effect on freshwater habitat and vascular plants.	Interconnector route follows lower ground reducing the potential for overflying birds to come into contact with the overhead line. The route avoids known areas of importance for vulnerable species. SuDS pond at substation will act as intercept for silt and pollutants to prevent direct spillage. CEMP will ensure best practice is adhered to during construction minimizing potential for spills.	High	Long Term	Negligible	Neutral	Bird collision risk with the overhead line.	
10.6	Badgers Removal of pasture resulting in loss of potential foraging habitat. No badgers recorded in immediate area. Potential disturbance of setts.	Any excavations left unattended overnight will be either covered or ramped in at least one location to allow mammals to avoid becoming trapped. Repeat badger surveys will be carried out within 100m of the development immediately prior to the commencement of work. If setts are found work will be suspended until consultation with NIEA.	Medium	Short Term	Negligible	Neutral	Temporary changes to badger ranging and foraging behaviour within the vicinity of the Proposed Development.	
10.7	Fish Potential for sediment release into adjacent watercourse. Potential disturbance of habitat and increased sediment run-off	A SuDS pond will be established in the early stages of substation construction, in order to minimise the potential for sediment release into the adjacent watercourse. The contractor will be required to provide a CEMP designed to prevent adverse impacts on	Medium	Short Term	Negligible	Neutral	Short term sediment release into watercourse as a result of construction of the substation or tower bases.	

Table 21.2: Summary of Residual Impacts								
Item	**Description of Impact**	**Mitigation Objective and Commitment**	**Sensitivity / Value of Receptor**	**Duration of Impact Short/Long Term**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Description of Likely Impacts**	**Mitigation Item on No.**
		rivers and other watercourses. Waters high in suspended solids produced as a result of de-watering during the excavation and construction of tower bases should be contained and treated prior to discharge. Settlement ponds will be provided to intercept surface water draining from the substation site, and will intercept any suspended solids prior to discharge of water to a watercourse. The contractor will be required to provide a method statement designed to prevent adverse impacts on rivers and other watercourses. Tower locations will be sufficiently remote from watercourse channels, to ensure that work practices do not result in bank damage, and care will be taken to prevent ingress of silt into watercourses. Where crossing of watercourses for construction access is unavoidable, an initial draw-line will be flown across major rivers, which will then be used for winching the operational conductors to the tower position. The initial draw-line will be thrown across narrow watercourses,						

Table 21.2: Summary of Residual Impacts								
Item	**Description of Impact**	**Mitigation Objective and Commitment**	**Sensitivity / Value of Receptor**	**Duration of Impact Short/Long Term**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Description of Likely Impacts**	**Mitigation Item No.**
		and a similar procedure followed.						
10.8	Insects Potential loss of food plants	Proposed tower sites will avoid fields that support a relatively rich herb flora. Access tracks will follow existing tracks where possible, new tracks will avoid areas of conservation interest.	Medium	Short Term	Negligible	Neutral	No impact as other herb rich flora exist adjacent to the site.	
10.9	Irish hare Loss of foraging habitat on improved grasslands Potential direct disturbance of activity during construction	Any excavations left unattended overnight should be either covered or ramped in at least one location to allow mammals to avoid becoming trapped.	Medium	Short Term	Negligible	Neutral	No impact	
10.10	Otter Potential direct disturbance of activity during construction Disturbance of riverine habitat	Any excavations left unattended overnight should be either covered or ramped in at least one location to allow mammals to avoid becoming trapped.	Medium	Short Term	Negligible	Neutral	No impact	

Table 21.2: Summary of Residual Impacts

Item	Description of Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact Short/Long Term	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Description of Likely Impacts	Mitigation on Item No.
10.11	Smooth newt Potential impact on suitable habitats	Waters high in suspended solids produced as a result of de-watering during the excavation and construction of tower bases should be contained and treated prior to discharge. Settlement ponds will be provided to intercept surface water draining from the substation site, and will intercept any suspended solids prior to discharge of water to a watercourse. The contractor will be required to provide a method statement designed to prevent adverse impacts on rivers and other watercourses. Tower locations will be sufficiently remote from watercourse channels, to ensure that work practices do not result in bank damage, and care will be taken to prevent ingress of silt into watercourses. Where crossing of watercourses for construction access is unavoidable, an initial draw-line will be flown across major rivers, which will then be used for winching the operational conductors to the tower position. The initial draw-line will be thrown across narrow watercourses, and a similar procedure followed.	Medium	Short Term	Negligible	Neutral	No impact.	

Table 21.2: Summary of Residual Impacts								
Item	**Description of Impact**	**Mitigation Objective and Commitment**	**Sensitivity / Value of Receptor**	**Duration of Impact Short/Long Term**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Description of Likely Impacts**	**Mitigation Item on No.**
10.12	White clawed crayfish Potential impact on habitat and increased sediment load.	Waters high in suspended solids produced as a result of de-watering during the excavation and construction of tower bases should be contained and treated prior to discharge. Settlement ponds will be provided to intercept surface water draining from the substation site, and will intercept any suspended solids prior to discharge of water to a watercourse. The contractor will be required to provide a method statement designed to prevent adverse impacts on rivers and other watercourses. Tower locations will be sufficiently remote from watercourse channels, to ensure that work practices do not result in bank damage, and care will be taken to prevent ingress of silt into watercourses. Where crossing of watercourses for construction access is unavoidable, an initial draw-line will be flown across major rivers, which will then be used for winching the operational conductors to the tower position. The initial draw-line will be thrown across narrow watercourses, and a similar procedure followed.	Medium	Short Term	Negligible	Neutral	No impact.	

Table 21.2: Summary of Residual Impacts								
Item	**Description of Impact**	**Mitigation Objective and Commitment**	**Sensitivity / Value of Receptor**	**Duration of Impact Short/Long Term**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Description of Likely Impacts**	**Mitigation on Item No.**
10.13	Breeding birds Removal of limited nesting and foraging habitats due to removal of poor quality hedgerows. Potential loss of nest sites and foraging habitat by removal of hedgerows.	Any removal/reduction of hedgerow trees, cutting of hedgerows and clearing of scrub will take place outside the bird-nesting period, which in Northern Ireland is generally taken as March to August inclusive. This will apply to both the construction and operational (line maintenance) phases. Potential bird nesting habitat in close proximity to works that take place between March and August should be checked by a competent ecologist to ensure that there will be no adverse impact on protected bird species. Replacement, improved habitat for breeding birds provided around the sub station	Low	Short Term	Negligible	Neutral	Loss of hedgerows which have been checked for nests prior to removal.	
10.14	Fen Potential disturbance of habitat	Significant wetland areas will be avoided. Trampling and the use of machinery on saturated, quaking surfaces will be avoided.	Low	Short Term	Negligible	Neutral	There will be tower foundations and access tracks in marshy grassland.	

Table 21.2: Summary of Residual Impacts								
Item	**Description of Impact**	**Mitigation Objective and Commitment**	**Sensitivity / Value of Receptor**	**Duration of Impact Short/Long Term**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Description of Likely Impacts**	**Mitigation Item No.**
10.15	Hedgerows Removal of majority of hedgerows within the vicinity of the substation. All hedgerows removed are species poor and of low ecological value. Better structured roadside verges will be retained.	Works in the vicinity of trees will conform to BS 5837:2012, Trees in relation to design, demolition and construction- Minimal lengths of hedgerow should be removed where this is essential, and gaps should be replanted with native species following the works. Wherever possible, hedgerow trees will be pollarded rather than removed, New hedges of equal length planted where hedgerows removed (or donation made to conservation charity to plant replacement trees).	Low	Long Term	Negligible	Neutral	Hedge removal will be undertaken where necessary, however only after pollarding and pruning options have been exhausted.	

Table 21.2: Summary of Residual Impacts

Item	Description of Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact Short/Long Term	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Description of Likely Impacts	Mitigation Item on No.
10.16	Hedgerows and scattered trees Loss of a limited number of hedgerows all of low conservation value. Cutting back of tall trees within hedgerows. Loss of continual connective habitat for mammals and birds using the hedgerow.	Works in the vicinity of trees should conform to BS 5837:2012, Trees in relation to design, demolition and construction- Tower locations will avoid hedgerows wherever possible and no species-rich hedgerows will be affected by the works. Hedgerows will be protected by scaffolding when conductors are drawn between towers. Where hedgerows in the vicinity of towers are to be lowered, a height of at least 2m should be retained in order to maintain bat flightlines. Minimal lengths of hedgerow should be removed where this is essential, and gaps should be replanted with native species following the works. Wherever possible, hedgerow trees will be pollarded rather than removed, New hedges of equal length planted where hedgerows removed (or donation made to conservation charity to plant replacement trees)	Low	Short Term	Negligible	Neutral	A limited number of trees will be removed and in all other cases, hedge heights will be cut to 2m and trees will be selectively thinned and pruned to ensure line safety.	

Table 21.2: Summary of Residual Impacts								
Item	**Description of Impact**	**Mitigation Objective and Commitment**	**Sensitivity / Value of Receptor**	**Duration of Impact Short/Long Term**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Description of Likely Impacts**	**Mitigation on Item No.**
10.17	Lowland meadow Potential disturbance of habitat	Proposed tower sites will avoid fields that support a relatively rich herb flora. Access tracks will follow existing tracks where possible, new tracks will avoid areas of conservation interest.	Low	Short Term	Negligible	Neutral	Disturbance to habitats.	
10.18	Mixed ashwood Potential disturbance of habitat Lopping of tall trees	Access tracks will follow existing tracks where possible, new tracks will avoid areas of conservation interest.	Low	Long Term	Negligible	Neutral	Selective lopping of tall trees.	
10.19	Oakwood Potential disturbance of habitat Lopping of tall trees	Access tracks will follow existing tracks where possible, new tracks will avoid areas of conservation interest.	Low	Long Term	Negligible	Neutral	Selective lopping of tall trees.	
10.20	Scattered trees Removal of scattered trees within hedgerows within the vicinity of the substation.	Works in the vicinity of trees will conform to BS 5837:2012, Trees in relation to design, demolition and construction- Replacement trees to be included in the landscape proposals.	Low	Long Term	Negligible	Neutral	Removal of trees around the substation.	
10.21	Wet woodland Potential disturbance of habitat Lopping of tall trees	Access tracks will follow existing tracks where possible, new tracks will avoid areas of conservation interest.	Low	Long Term	Negligible	Neutral	Selective lopping of tall trees.	
NOISE (CHAPTER 11)								
11.1	Construction phase Substation and towers To nearest noise sensitive receptors within 400m Development wide	To not exceed threshold values for airborne sound generated by construction activities at nearest noise sensitive receptors	Adopt best practice for construction of the substation and towers and limit hours of working	Construction	Occasional monitoring using type 2 Sound level meter at noise sensitive receptors.	Threshold for significant effects based on BS5228:2009		

Table 21.2: Summary of Residual Impacts								
Item	**Description of Impact**	**Mitigation Objective and Commitment**	**Sensitivity / Value of Receptor**	**Duration of Impact Short/Long Term**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Description of Likely Impacts**	**Mitigation on Item No.**
11.2	Construction phase Substation and towers To nearest noise sensitive receptors within 400m Development wide	To not exceed threshold values for ground borne vibration generated by construction activities at nearest noise sensitive receptors	Adopt best practice for construction of the substation and towers and limit hours of working	Construction	Occasional monitoring-vibration levels during construction phase will fall to typical ambient levels given separation distances	Threshold for significant effects based on BS5228:2009 and BS7385:1993		
11.3	Construction traffic for Substation and towers Development wide	To meet WHO Guidelines on Community noise	Limited number of HGV movements per hour or daily basis near to dwellings on haul routes	Construction	N/A	Assessed using haul road method in BS5228:2009. Takes account of HGV movements/speed/distance from receptor		
11.4	Operational phase Substation To nearest noise sensitive receptors within 400m Development wide	To not exceed threshold values for noise and vibration under BS4142:1997, BS8233:1999, WHO Guidelines on Community Noise 1999 and BS5228:2009/BS7385:1993	Substation has significant attenuation due to structure and distance to nearest noise sensitive receptors	Operational	N/A.	External noise targets based on lowest recorded background noise levels near to the proposed substation		
11.5	Operational phase towers To nearest noise sensitive receptors within 400m Development wide	To not exceed threshold values for noise and vibration under BS4142:1997, BS8233:1999, WHO Guidelines on Community Noise 1999 and BS5228:2009/BS7385:1993	Substation has significant attenuation due to structure and distance to nearest noise sensitive receptors	Operational	N/A.	External noise targets based on lowest recorded background noise levels near to the proposed substation		

Table 21.2: Summary of Residual Impacts

Item	Description of Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact Short/Long Term	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Description of Likely Impacts	Mitigation Item on No.
11.6	Operational phase substation and towers To nearest noise sensitive receptors within 400m Cumulative noise/vibration impact for nearest receptors to the substation	To not exceed threshold values for noise and vibration under BS4142:1997, BS8233:1999, WHO Guidelines on Community Noise 1999 and BS5228:2009/BS7385:1993	Substation has significant attenuation due to structure and distance to nearest noise sensitive receptors	Operational	N/A	Assessment of cumulative noise and vibration impact from the substation and towers. External noise targets based on lowest recorded background noise levels near to the proposed substation		
CULTURAL HERITAGE (CHAPTER 12)								
12.1	Impacts on the setting of 164 & 166 Trew Mount Road. Listed Building.	N/A	High	Long Term	Minor negative	Slight adverse	Impact to the setting.	
12.2	Impacts on the setting of 142 Moy Road, Grade B1 listed building.	N/A	High	Long Term	Minor negative	Slight adverse	Impact to the setting.	
12.3	Impacts on the setting of the Gate Lodge for Tullydowey House. Listed Building.	N/A	High	Long Term	Moderate negative	Moderate adverse	Impact to the setting.	
12.4	Impacts on the setting of Tullydowey House. Listed Building.	N/A	High	Long Term	Minor negative	Slight adverse	Impact to the setting.	
12.5	Impacts on the setting of Mullyloughan house/ Glenaul House. Listed Building.	N/A	Medium	Long Term	Minor negative	Slight adverse	Impact to the setting.	
12.6	Impacts on the setting of Rawes Fort. Scheduled Monument.	N/A	High	Long Term	Moderate negative	Moderate adverse	Impact to the setting.	

Table 21.2: Summary of Residual Impacts

Item	Description of Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact Short/Long Term	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Description of Likely Impacts	Mitigation on Item No.
12.7	Impacts on the setting of a rath.	N/A	Medium	Long Term	Moderate negative	Moderate adverse	Impact to the setting.	
12.8	Impacts on the setting of a rath.	N/A	Medium	Long Term	Moderate negative	Moderate adverse	Impact to the setting.	
12.9	Impacts on the setting of Mullan Fort. Scheduled Monument	N/A	High	Long Term	Moderate adverse	Moderate adverse	Impact to the setting.	
12.10	Impacts on the setting of a possible enclosure at Ballydoo. Scheduled Monument.	N/A	High	Long Term	Minor negative	Slight adverse	Impact to the setting.	
12.11	Impacts on the setting of The Argory Registered Garden.	N/A	High	Long Term	Minor negative	Slight adverse	Impact to the setting.	
12.12	Impacts on the setting of The Argory. Listed Building Grade B+.	N/A	High	Long Term	Negligible	Slight adverse	Impact to the setting.	
12.13	Impacts on the setting of a rath and souterrain at Lisglynn. Scheduled Monument.	N/A	High	Long Term	Minor negative	Slight adverse	Impact to the setting.	
12.14	Impacts on the setting of Stone Tower, Grade B1 listed building.	N/A	High	Long Term	Minor negative	Slight adverse	Impact to the setting.	
12.15	Impacts on the setting of The Grange, Grade B listed building.	N/A	High	Long Term	Minor negative	Slight adverse	Impact to the setting.	
LANDSCAPE AND VISUAL (CHAPTER 13)								
13.1	Physical Landscape Effects	Minimise impact of substation and tower construction	Medium - High	Long term	Low - Negligible	Minor Adverse (Year 15)		13.1 – 13.8
13.2	Designated Landscapes	Minimise impact of substation and tower construction	Medium - High	Long term	Negligible - Medium	Negligible - Moderate Adverse (Year 15)		13.1 – 13.8
13.3	Northern Ireland Landscape Character Areas	Minimise impact of substation and tower construction	Medium - High	Long term	Negligible - High	Negligible – Moderate/Major Adverse (Year		13.1 – 13.8

Table 21.2: Summary of Residual Impacts								
Item	**Description of Impact**	**Mitigation Objective and Commitment**	**Sensitivity / Value of Receptor**	**Duration of Impact Short/Long Term**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Description of Likely Impacts**	**Mitigation on Item No.**
						15)		
13.4	Settlements	Minimise impact of substation and tower construction	Medium - High	Long term	Negligible - High	Negligible – Major Adverse (Year 15)		13.1 – 13.8
13.5	Individual Properties	Minimise impact of substation and tower construction	Medium - High	Long term	High	19 properties major adverse (Year 15)		13.1 – 13.8
13.6	Individual Properties	Minimise impact of substation and tower construction	Medium - High	Long term	High – Medium	201 properties moderate - major adverse (Year 15)		13.1 – 13.8
13.7	Individual Properties	Minimise impact of substation and tower construction	Medium - High	Long term	Low, Low-Medium, Medium	103 properties moderate adverse (Year 15)		13.1 – 13.8
13.8	Individual Properties	Minimise impact of substation and tower construction	Medium - High	Long term	Low-Negligible	31 properties minor - moderate adverse (Year 15)		13.1 – 13.8
13.9	Individual Properties	Minimise impact of substation and tower construction	Medium - High	Long term	Negligible	64 properties minor adverse (Year 15)		13.1 – 13.8
13.10	Individual Properties	Minimise impact of substation and tower construction	Medium - High	Long term	No change	9 properties no effect. (Year 15)		13.1 – 13.8
13.11	Transport Corridors and Paths	Minimise impact of substation and tower construction	Low-Medium	Long term	No change - Moderate Adverse	No Impact – Moderate (Year 15)		13.1 – 13.8
13.12	Viewpoints	Minimise impact of substation and tower construction	Low-High	Long term	No change - High	No Impact – Moderate/Major		13.1 – 13.8

Table 21.2: Summary of Residual Impacts								
Item	**Description of Impact**	**Mitigation Objective and Commitment**	**Sensitivity / Value of Receptor**	**Duration of Impact Short/Long Term**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Description of Likely Impacts**	**Mitigation Item No.**
COMMUNITY AMENITY AND LAND USE (CHAPTER 14)								
14.1	Residential, Commercial and Community Facilities	None required	High - Very High	N/A	None	No impact	No impact	14.1
14.2	Disruption to Existing Services	None required	Very High	N/A	None	No impact	No impact	14.2
14.3	Current Planning Permissions	None required	Medium - High	N/A	None	No impact	No impact	14.3
14.4	Agricultural land (overall)	Minimise disruption to agricultural land	Low - High	Long term	Very low - very high	Slight adverse	Landtake, disturbance, inconvenience	14.4 - 14.8
14.5	Agricultural land - Farm 001	Minimise disruption to agricultural land	Low	Long term	Very high	Major adverse	Landtake, disturbance, inconvenience because of substation	14.4 - 14.8
14.6	Agricultural land - 1036	Minimise disruption to agricultural land	Low	Long term	Very high	Major adverse	Landtake, disturbance, inconvenience because of substation	14.4 - 14.8
SOCIO-ECONOMICS (CHAPTER 15)								
15.1	Tourism Impacts to the Argory	Landscape mitigation planting at the substation site.	High	Long term	Low	Minor	There will be possible but limited views of the Proposed Development set in the context of existing electrical infrastructure. The grounds and house will be largely unaffected but views will be possible and the significance of the impact will be reduced with time.	
15.2	Tourism Impacts to the Navan Centre and Benburb Priory	N/A	High	Long term	Negligible	Negligible		
15.3	Tourism Impacts to the Recreational Trails	N/A	High	Long term	Negligible	Negligible		

Table 21.2: Summary of Residual Impacts

Item	Description of Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact Short/Long Term	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Description of Likely Impacts	Mitigation on Item No.
15.4	Linwoods Bioremediation area	Further consultations will be required with the owner and operator of the area. In terms of the effluent treatment, consultations with the owner and operator in order to determine the layout of the pipe network and what remedial works will be required during the operation of the Proposed Development. It is likely that alterations will be required to the pipe network, which is currently laid above ground along the rows of planted willow. If there is not capacity in the treatment system to accommodate a reduction in the willow area, alternative treatment will have to be agreed with the owner and operator (e.g. tankering for off site treatment at a waste water treatment works) or compensation agreed.	High	Long term	High	Major adverse	Impacts to the level of effluent that can be treated and the volume of willow as a biofuel crop.	
15.5	Visitors and visitor spending, employment and local hospitality businesses	N/A	High	Long term	Negligible	Negligible		
15.6	Regional economy	N/A	High	Long term	High	Major Positive	The savings of £7m per year for Northern Irish electricity consumers estimated by DETI.	

Table 21.2: Summary of Residual Impacts								
Item	**Description of Impact**	**Mitigation Objective and Commitment**	**Sensitivity / Value of Receptor**	**Duration of Impact Short/Long Term**	**Magnitude of Impact With Mitigation**	**Significance of Impact With Mitigation**	**Description of Likely Impacts**	**Mitigation Item No.**
TELECOMMUNICATIONS AND AVIATION ASSETS (CHAPTER 16)								
16.1	Interference to electronic equipment and telecommunications	None required	High	N/A	Negligible	Neutral	No significant residual impacts	N/A
16.2	Interference to aviation	Mapping to be provided to statutory authorities	High	Long Term	Negligible	Neutral	No significant residual impacts	16.1
FLOOD RISK (CHAPTER 17)								
17.1	Temporary loss of 1-in-100 flood plain due to temporary access to substation.	None required	High	Short Term	Low	Not Significant	Temporary loss of 1-in-100 flood plain	N/A
17.2	Temporary loss of 1-in-100 flood plain due to construction of 7 towers and 3 access tracks.	None required	High	Short Term	Low	Not Significant	Temporary loss of 1-in-100 flood plain	N/A
TRANSPORT (CHAPTER 18)								
18.1	No significant residual impacts.							
CUMULATIVE AND INTERACTIONS (CHAPTER 19)								
19.1	No significant residual impacts.							
TRANSBOUNDARY (CHAPTER 20)								
20.1	No significant residual impacts.							

22 Abbreviations and Terms

This table outlines the key technical terms associated with the Proposed Development

TECHNICAL TERM	DESCRIPTION/EXPLANATION
Angle Tower	The “Angle” or “tension” towers are so called as they are used to accommodate bends / turns in the line route.
Cable	An insulated conductor designed for undersea or underground installation.
Circuit	A group (of usually three) conductors, or bundles of conductors, used for the transmission of electricity.
Cross-arm	Horizontal support across the tower which holds the insulators and conductors.
Conductor	The wires that carry the electricity.
Guarding Locations	The protection of road and river crossings.
Insulator	Insulators are required to tie the live conductors to the support structures while at the same time insulating the conductor from the earthed metal of the support structure. The proposed insulator for use on this 400kV overheads line is the composite type.
Shield Wire	Shield wire, also known as earth wire or ground wire, is installed above the live conductors. Shield wires are also conductors but they serve a very different purpose to that of the live conductors. Their main purpose is to shield the live conductors from lightning. Should lightning strike the line it will in all likelihood strike a shield wire rather than a live conductor as they are installed above the live conductors.
Stringing Locations	Where the stringing machinery is located.
Stringing Operation/Procedure	Stringing of overhead lines refers to the installation of phase conductions and shieldwires on the proposed towers.
Substation	Electricity generated at power stations is fed into and from the transmission system through associated substations. They control the flow of power through the system by means of transformers and switchgear, with facilities for control, fault protection and communications.
Towers	Overhead transmission line supports (sometimes commonly known as pylons).
Suspension tower	A suspension tower is used where the line route is straight. These towers are called suspension towers because the electricity conductors are suspended from the cross arm and are not pulling against the crossarm.
Transmission System	Very high voltage (typically 275kV and above) networks used for strategic high capacity power transfers.

ABBREVIATION OR TERM	MEANING	DESCRIPTION/EXPLANATION
%	Percentage	
µA	Microampere	
µT	Microtesla	A measurement unit for magnetic field strength, being equal to one millionth of one Tesla.
nT	nanotesla	
A	Ampere	A measurement unit of electrical current.
AADT	Annual Average Daily Traffic	
AAWT	Annual Average Weekday Traffic	
AC	Alternating Current	A continually oscillating electrical current, being reversed many times in a second. The national standard frequency is 50 Hertz (cycles per second).
AEWA	Agreement on Conservation of African-Eurasia Migratory Waterbirds	
AEP	Annual Exceedance Probability	
AIS	Air Insulated Switchgear	
AOD	Above Ordnance Datum	A level expressed as a height above mean sea level.
AONB	Area of Outstanding Natural Beauty	
Aquifer		A water-bearing body of rock. There is a range of aquifers varying between highly permeable aquifers capable of supporting large rates of abstraction, such as the Derrycreevy Sandstone, to weakly permeable aquifers capable of yielding only small quantities of water.
ASSIs	Areas of Special Scientific Interest	

ABBREVIATION OR TERM	MEANING	DESCRIPTION/EXPLANATION
ATC	Automated Traffic Counters	
Attenuation		The ability of the ground conditions naturally to reduce the concentrations of contaminants in water percolating through the soil. Attenuation processes typically are most active in the unsaturated zone.
AWI	Ancient Woodland Inventory	
BATNEEC	Best Available Technique not Entailing Excessive Cost	
BBS	Breeding Bird Survey	
BCT	Bat Conservation Trust	
Boulder Clay (till)		A gravelly clay deposited by the action of glaciers, typically of low permeability.
BTO	British Trust for Ornithology	
CAA	Civil Aviation Authority	
C/UC	Classified/Unclassified Roads	
CEDaR	Centre for Environmental Data and Recording	
CEMP	Construction Environmental Management Plan	
CER	Commission for Energy Regulation	The regulatory authority for energy regulation in the Republic of Ireland.
CIRIA	Construction Industry Research and Information Association	
Contaminated land		Any land which appears to the local authority [NIEA] in whose area it is situated to be in such a condition, by reason of substances in, on or under the land that – (a) significant harm is being caused or there is a significant possibility of such harm being caused; or (b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.

ABBREVIATION OR TERM	MEANING	DESCRIPTION/EXPLANATION
Controlled waters		Inland freshwaters (lakes, ponds and watercourses), groundwaters, coastal waters and territorial waters extending three miles from the coast, which are controlled by NIEA.
CRF	Calculation of Congestion Reference Flows	
DARD	Department for Agriculture and Rural Development	One of 11 Northern Ireland Departments. DARD includes the Rivers Agency.
dB	Decibel	
DC	Direct Current	A flow of current continuously in the same direction.
DCAL	Department of Culture, Arts and Leisure	
DCAN	Development Control Advice Note	
DCENR	Department of Communications, Energy and Natural Resources (RoI)	Previously the Department of Communications Marine and Natural Resources (DCMNR).
DCMNR	Department of Communications Marine and Natural Resources (RoI)	Has been renamed Department of Communications, Energy and Natural Resources (DCENR).
DETI	Department of Enterprise, Trade and Investment (Northern Ireland)	One of 11 Northern Ireland Departments. The DETI is the department responsible for economic development in NI and for developing the energy policy.
DGA	Defence Geographic Agency	
DMRB	Design Manual for Roads and Bridges	
DOE	Department of the Environment (Northern Ireland)	One of 11 Northern Ireland Departments. The DOE includes both the Planning Service and the Northern Ireland Environment Agency.
DRD	Department for Regional Development	One of 11 Northern Ireland Departments. DRD includes the Roads Service.

ABBREVIATION OR TERM	MEANING	DESCRIPTION/EXPLANATION
Drift deposits		Glacial and fluvio-glacial deposits laid down either beneath ice sheets or deposited as the ice retreated or from outwash rivers. Often referred to as superficial deposits.
Drumlin		Elongated mounds of glacial deposits, generally boulder clay, frequently referred to as a 'basket of eggs' topography.
DTM	Digital Terrain Model	
Dyke		A fine or medium grained igneous rock intruded into an older host rock. The intrusion cuts across the bedding or structural plane of the host rock.
EHC	Environmental Health Criteria	
EIA	Environmental Impact Assessment	An assessment of the possible impact—positive or negative—that a proposed project may have on the environment, conducted in accordance with Directive 85/337/EEC, as amended by 97/11/EC and 2003/35/EC (EIA Directive) as implemented into EU member states.
EIS	Environmental Impact Statement	Document summarising an EIA. Referred to within the UK as an Environmental Statement (ES).
ELF	Extremely Low Frequency	
EMF	Electric and Magnetic Fields	
ES	Environmental Statement	Document summarising an EIA. Also known in the Republic of Ireland as Environmental Impact Statement (EIS).
ESBI	Electricity Supply Board International	
ESCR	Earth Science Conservation Review	

ABBREVIATION OR TERM	MEANING	DESCRIPTION/EXPLANATION
Esker		An elongated ridge of sand and gravel deposited either beneath an ice mass or as the ice retreated from a sub-glacial stream.
EU	European Union	
Forb		A forb is a herbaceous flowering plant that is not a graminoid (grasses, sedges and rushes). The term is used in biology and in vegetation ecology, especially in relation to grasslands[1] and understory.
FCD	Fish (Consolidated) Directive	
FFD	Freshwater Fish Directive	
FRA	Flood Risk Assessment	
GAC	Gaelic Athletic Club	
GEC	Good Ecological Status	
GFC	Gaelic Football Club	
GIL	Gas Insulated Transmission Lines	
GIS	Gas Insulated Switchgear	High voltage switchgear with metal encapsulated conductors that are insulated by specialised gas.
GLVIA	Guidelines for Landscape and Visual Impact Assessment	
Groundwater		Water held within the saturated zone of a body of rock.
HAP	Habitat Action Plan	
HGV	Heavy Goods Vehicle	
HPA-RPD	Health Protection Agency: Radiation Protection Division	
HV	High Voltage	
HVDC	High-Voltage Direct Current	
Hz	Hertz	
Hydraulic characteristics		The features of an aquifer, permeability and storativity, which control groundwater flow and the extent and degree of effects on groundwater level and flow as a result of activities such as dewatering.
Ibid.	A term used to indicate that the reference was as cited previously.	
ICDs	Implanted Cardioverter Defibrillators	

ABBREVIATION OR TERM	MEANING	DESCRIPTION/EXPLANATION
ICNIRP	International Commission on Non-Ionizing Radiation Protection	
IBA	Important Bird Area	
IfA	Institute for Archaeology	
IRBD	International River Basin District	
Karst		A landscape developed from the action of chemical erosion of limestone by percolating water and groundwater. This often results in the formation of swallow holes (surface depressions) and a network of underground channels and caves enhancing water movement.
km	Kilometre	
kV	Kilovolt	
kV/m	Kilovolts per metre	
LBAP	Local Biodiversity Action Plan	
L_A	A-weighted sound pressure level (in decibels, dB).	The measured sound level incorporating a logarithmic base and weighting system to approximate the manner in which humans perceive sound. An increase in 10 dB is approximately equivalent to a perceived doubling of loudness.
$L_{Aeq,T}$		Equivalent continuous A-weighted sound pressure level (in decibels, dB), over a given time interval 'T'. An average of the energy associated with the noise at a location over a given time interval. Where a time interval is not given it is typically considered as a continuous level. Indicates the activity noise level of a source. Typical source descriptions include "ambient noise", "specific noise" and "residual noise" as defined in BS4142.
$L_{A50,T}$		A-weighted sound pressure level (in decibels, dB) obtained using "Fast" time-weighting that is exceeded for 50% of the given time interval.
$L_{A90,T}$		A-weighted sound pressure level (in decibels, dB) obtained using "Fast" time-weighting that is exceeded for 90% of the given time interval.
LCAs	Landscape Character Areas	
LMA	Local Management Area	
m	Metre	
M	Million	
MBR	Monuments and Buildings Record	
MCC	Manual Classified Counts	

ABBREVIATION OR TERM	MEANING	DESCRIPTION/EXPLANATION
MES	Moderate Ecological Status	
Metamorphism		Natural processes by which rocks are changed by the actions of heat, pressure and fluids within the earth's crust.
MOD	Ministry of Defence	
MW	Megawatt	
Over-deepened valleys		A valley eroded in the bedrock by glacial action with a base level typically below current seal level. The valley subsequently has been infilled with a range of fluvio-glacial drift deposits.
NBN	National Biodiversity Network	
NGC	National Grid Company	
NHAs	Natural Heritage Areas (Republic of Ireland)	
NI	Northern Ireland	
NIAUR	Northern Ireland Authority for Utility Regulation	Formally known as the Northern Ireland Authority for Energy Regulation (OFREG)
NIEA	Northern Ireland Environment Agency	
NIPS	Northern Ireland Priority Species	
NIRSG	Northern Ireland Raptor Study Group	
NITB	Northern Ireland Tourist Board	
NIWSSG	Northern Ireland Whooper Swan Study Group	
NL	Number of lanes per direction	CRF formula
NPPF	National Planning Policy Framework	
NRPB	National Radiological Protection Board	On 1 April 2005 the NRPB became part of the Health Protection Agency.
NRTF	National Road Traffic Forecast	
Ofcom	Office of Communications	
OS	Ordnance Survey	
OSNI	Ordnance Survey Northern Ireland	

ABBREVIATION OR TERM	MEANING	DESCRIPTION/EXPLANATION
PAD	Pre-Application Discussion	A consultation arrangement with the DOE Planning Service for strategic projects.
PB Power	Parsons Brinkerhoff Power Division	
PES	Poor Ecological Status	
Perched water		Isolated pockets of groundwater, typically present at a shallow depth within made ground or in mixed superficial deposits. The water is held above *(i.e. perched)* the level of the main groundwater table on lenses and bands of low permeability material.
Permeability		The ability of a rock to transmit groundwater. Permeability comprises a mixture of Intergranular permeability within the body of the rock and secondary permeability, imparted by fissures and fractures. The permeability of a rock controls the rate of groundwater flow.
Piezometric level		The level to which groundwater would rise in a confined aquifer where the groundwater is held under pressure beneath low permeability strata.
PkD	Directional split (%) of the peak hour flow	CRF Formula
PkF	Proportion (%) of the total daily flow (2way) that occurs in the peak hour	CRF Formula
PPGs	Pollution Prevention Guidelines	
PPSs	Planning Policy Statements	PPSs set out the policies of the DOE on particular aspects of land use planning and apply to the whole of Northern Ireland. They replace many of the earlier planning policies contained within the PSRNI.
PSNI	Police Service of Northern Ireland	
RA	Rivers Agency	
RBD	River Basin District	
RBMP	River Basin Management Plan	
Reactive Compensation		Equipment to control the reactive power, or charging current, spontaneously produced by AC underground cables and, to a lesser extent AC overhead lines, to permit more efficient operation of the system.
RPA	Roof Protection Area	
RMS	Root Mean Square	
ROI	Republic of Ireland	
RPA	Register of Protected Areas	
RSPB	Royal Society for the Protection of Birds	
Ruderal		A ruderal species is a plant species that is first to colonize disturbed lands. Likely to referred to as weeds but not always correct.

ABBREVIATION OR TERM	MEANING	DESCRIPTION/EXPLANATION
Salmonid		Of, belonging to, or characteristic of the family Salmonidae, which includes the salmon, trout, and whitefish.
SAC	Special Areas of Conservation	
SAP	Species Action Plan	
SEM	Single Electricity Market	
SLNCI	Sites of Local Nature Conservation Interest	
SOCC	Species of Conservation Concern	
SPA	Special Protection Area	
SuDS/SDS	Sustainable Urban Drainage System	Drainage system
SWMS	Surface Water Management Strategy	
TA	Transport Assessment	
Taxa/Taxon		Taxon (plural: taxa) is a group of one (or more) populations of organism(s), which a taxonomist adjudges to be a unit. Usually a taxon is given a name and a rank, although neither is a requirement.
TB	Tuberculosis	
TEN-E	EU Trans European Networks	
TEPCO	Tokyo Electric Power Company	
TN	Target Note	
TRICS	Trip Rate Information Computer System	
UK	United Kingdom	
UKBAP	United Kingdom Biodiversity Action Plans	
Unconformably		The structural relationship between rock types of two different ages, often exhibited by a junction at which the two rock types have different angles of dip, which typically reflects a break in deposition and subsequent earth movements.
UWT	Ulster Wildlife Trust	
V	Volt	A measurement unit of electrical voltage.
V/m	Volts per metre	The unit of voltage gradient (electric stress or electric field).
Wf	Width Factor	CRF Formula
WFD	Water Framework Directive	
WHO	World Health Organisation	
WMU	Water Management Unit (of the NIEA)	
WWT	Wildfowl and Wetlands Trust	
ZTV	Zone of Theoretical Visibility	

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