Capital Project 966

CP 966 Environmental Constraints Report

July 2020

EirGrid

Capital Project 966

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Contents

Abbreviations	
ACA	Architectural Conservation Areas
AAP	Areas of Archaeological Potential
AEOS	Agri Environmental Options Scheme
AIS	Air insulated
ASI	Archaeological Survey of Ireland
CAFE	Cleaner Air for Europe
CFRAM	Catchment Flood Risk Assessment and Management
CPD	County Development Plan
CSO	Central Statistics Office
EHV	Extra High Voltage
EPA	Environmental Protection Agency
GIS	Geographic Information System
GSI	Geological Survey Ireland
HDD	Horizontal Directional Drilling
IGHS	Irish Geological Heritage Sites
i-WeBS	Irish Wetland Bird Survey
LCA	Landscape Character Area
MVAr	Mega Volt Amps (reactive)
MCA	Multi-Criteria Analysis
NIAH	National Inventory of Architectural Heritage
NHA/ pNHA	Natural Heritage Area/ Proposed Natural Heritage Area
NPWS	National Parks and Wildlife Services

Abbreviations	
OHL	Overhead Line
OPW	Office of Public Works
PWS	Public Water Supply
RMP	Record of Monuments and Places
RPS	Records of Protected Structures
RBMP	River Basin Management Plan
SAC	Special Area of Conservation, designated under the EU Habitats Directive
SI	Statutory Instrument
SMR	Sites and Monuments Record
SPA	Special Protection Area, designated under the EU Birds Directive
TPC	Total Project Cost
TSO	Transmission System Operator
TSSPS	Transmission System Security and Planning Standards
UGC	Underground cable
WFD	Water Framework Directive
XLPE	Cross-linked polyethylene

Executive Summary

Capital Project 966 (CP 966) is a proposed development that will help transfer electricity to the east of the country and distribute it within the network in Meath, Kildare and Dublin. The project will help meet the growing demand for electricity in the east. This growth is due to increased economic activity and the planned connection of new data centres in the region. CP 966 aims to strengthen the transmission network between Dunstown substation in Kildare and Woodland substation in Meath - and suggests a number of technical solutions to do so.

The main three technological solutions being considered are:

- Technology 1: Up-voltage option – 220 kV OHL circuits to 400 kV circuits (Gorman - Maynooth – Dunstown);
- Technology 2: New 400 kV OHL option;
- Technology 3: New Under Ground Cable (UGC);
  - Option 3A: 220kV UGC (12m cable swathe);
  - Option 3B: 400kV UGC (one conductor per phase; single12m cable swathe);
  - Option 3C: 400kV UGC (two conductors per phase):
    - Sub Option 3Ci: two conductors in a single 24m swathe;
    - Sub Option 3Cii: two conductors in two separate 12m swathes.

Note: Sub Option 3Ci has been determined to be not feasible in the Cable Feasibility Report (Report Number 321084AE-REP-001) and so will not be considered in this assessment.

This Environmental Constraints Report has been prepared to identify the environmental constraints that should be considered for the CP 966 project. As part of this assessment, a Project Study Area has been developed. This area identifies where the options for CP 966 may be located. The environmental constraints within the Study Area have been categorised based on EirGrid's standard scale along a range from "more significant"/"more difficult"/"more risk" to "less significant"/"less difficult"/"less risk".

More significant/difficult/risk Less significant/difficult/risk

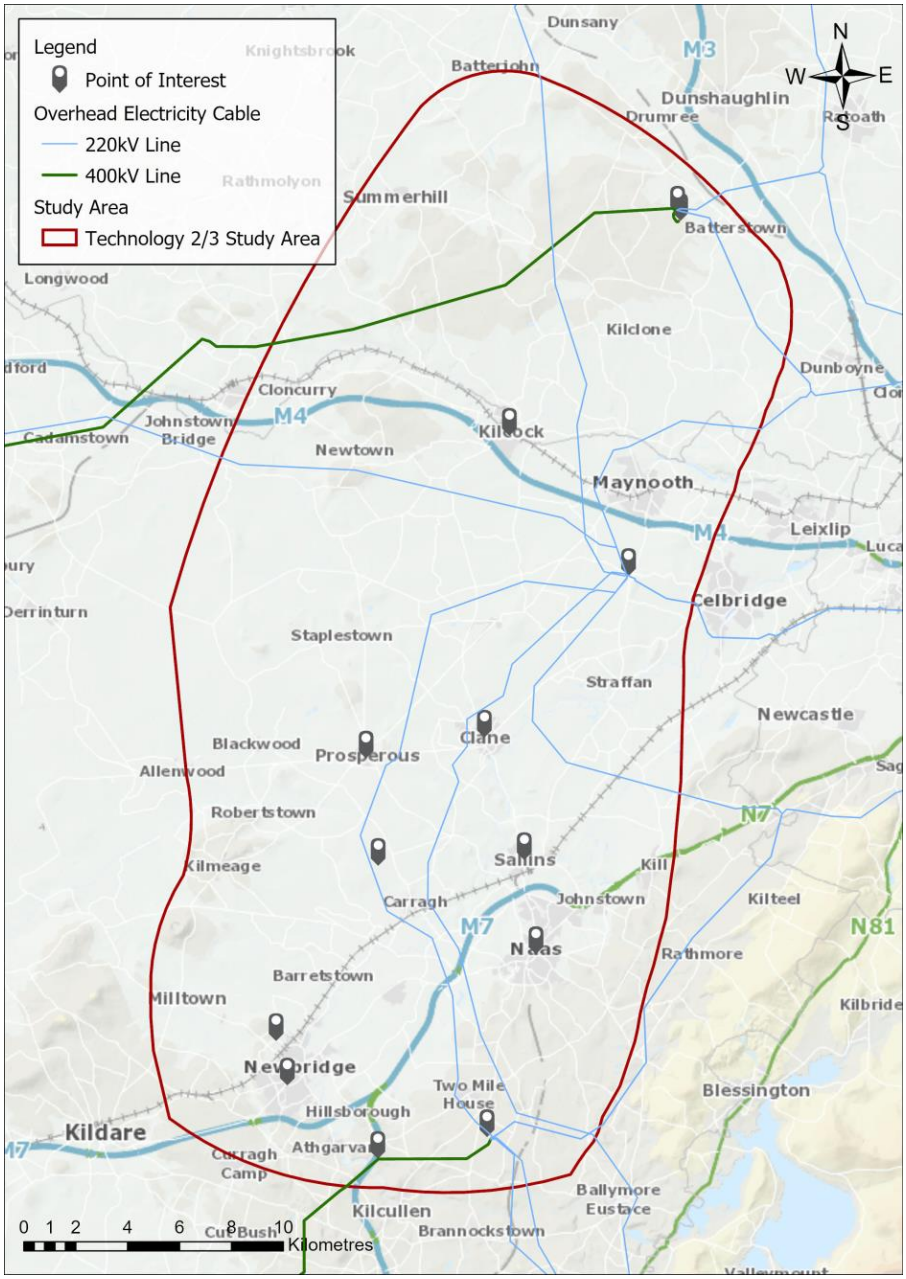


Figure 1.1 CP 966 Project Study Area at Step 3 (December 2019)

Types of Environmental Constraints

A number of constraints have been identified in order to determine an optimum technical solution and the help determine the most appropriate location. The constraints are considered under the following topic headings:

- Biodiversity,
- Soils and Water Impacts;
- Land Use (including forestry, bogs, peats, horticulture and roads);
- Landscape and Visual; and
- Cultural Heritage (Archaeological and Architectural Heritage).

A separate Social Impact Assessment report (321084AE-REP-003) will address socio-economic issues.

Overview of the Project Study Area

Biodiversity

There are five Special Areas of Conservation and 12 proposed Natural Heritage Areas in the Project Study Area. In addition to the formally designated sites, there are meadow habitats, various pockets of native woodland and biodiversity-rich hedgerows and trees throughout the area.

Soils and Water

The Project Study Area is predominantly made up of limestones with some areas of shale and sandstones in the north west and calcareous greywacke siltstone and shale in the south east. Subsoils are predominantly made up of sandstone and limestone tills, with a large area of peatlands to the west. There are 12 Geological Heritage Sites within the Project Study Area. There are 44 Water Framework Directive river waterbodies within the Project Study Area. These waterbodies drain to the Boyne, Liffey, Tolka and Barrow. The watercourse status is varied across the Project Study Area, ranging from Poor to Good. Flooding may be an issue in some areas of the Project Study Area, particularly within the Liffey sub-basin around Newbridge, Clane, Straffan and areas to the south west of Maynooth. There are 22 Groundwater bodies within the Project Study Area, the largest being the Dublin Groundwater body. Groundwater in the area is generally Good status with the exception of two landfill and industrial areas which are of Poor Groundwater Status. There are areas of Highly Vulnerable Groundwater to the south west of the Study Area at Newbridge and the central eastern side at Naas, Sallins, Clane, Straffan, Newbridge and Maynooth as well as in the west at Newtown and the north west at Summerhill. There are two Public and Group Supply Source Protection Areas within the Project Study Area at Johnstown and Robertstown.

Land Use

The land use in the area is predominantly agricultural with more built up urban areas around the towns and villages. There are areas of forestry to the west of the Project Study Area between Robertstown and Horltand, as well as some smaller scattered areas further north and south. There are also some large areas of peatlands to the west of the Project Study Area. Road infrastructure, bridges, canals, and rail are prominent in the area.

Landscape and Visual

There are 12 Landscape Character Areas within the Kildare area of the Project Study Area. Within the Meath area of the Project Study Area there are four Landscape Character Areas. Both South East Lowlands area and Royal Canal area are identified as Medium sensitivity LCAs with Regional Importance; Royal Canal is High Value landscape and South East Lowlands a Very High landscape. Tara Skryne Hills and Rathmoylan Lowlands are identified as High Sensitivity landscapes with Rathmoylan Lowlands High Value and National Importance and Tara Skryne Hills has Exceptional Value and National / International Importance. There are also a number of other scenic routes and viewpoints across the Project Study Area including routes providing views of Ballynafagh Lake in the centre of the Project Study Area, the Western Boglands in the north west, and of the Curragh in the south west and several viewpoints along bridges crossing the railway line from Maynooth to Kilcock and river views along the Rye Water north of Maynooth.

Cultural Heritage

In terms of built heritage, there are significant clusters of National Inventory of Architectural Heritage and Records of Protected Structures sites around Kilcock, Maynooth, Naas and Newbridge. To a lesser extent, there are also clusters of sites around the smaller urban areas of Phepotstown, Clane, Straffan, Sallins, Prosperous and Robertstown. The walled towns of Kildare and Naas are regarded as single recorded monuments in Kildare's County Development Plan 2017 – 2023. Kildare has its own Conservation and Management Plan. National Monuments are widely distributed throughout the project Study Area, with the more significant clusters occurring around Moynalvy, Agher, Cloncurry, Maynooth, Clane, Naas and Newbridge. There are also a cluster of National Monuments around Dunstown substation. There is also a possibility of unknown, undesignated archaeological and architectural remains being discovered within the Project Study Area. Areas of Archaeological Potential have been assigned to Kildare, Silliothill, Naas, Rathmore, Kill, Oughterard, Cloncurry, Clane and Celbridge. There have been a cluster of archaeological excavations around Maynooth town, and archaeological finds have been

recorded to the west of Maynooth. A large number of archaeological finds have also been recorded around Sallins and Naas, particularly to the south east of Naas. A smaller cluster of finds is centred around Newbridge.

Combined Assessment

The appraisal of each of the technologies is summarised in Table 1.1**Error! Reference source not found.**. From an environmental perspective, the highest risk technology is Technology 3, the UGC; specifically, Option 3C, the 400kV two conductors per phase option. This presents the highest risk to the greatest number of environmental aspects. Technology 2, the new OHL has the highest risk rating for the landscape and visual constraint. The up-voltage option represents the lowest risk to the environment.

Table 1.1 Options Assessment Summary

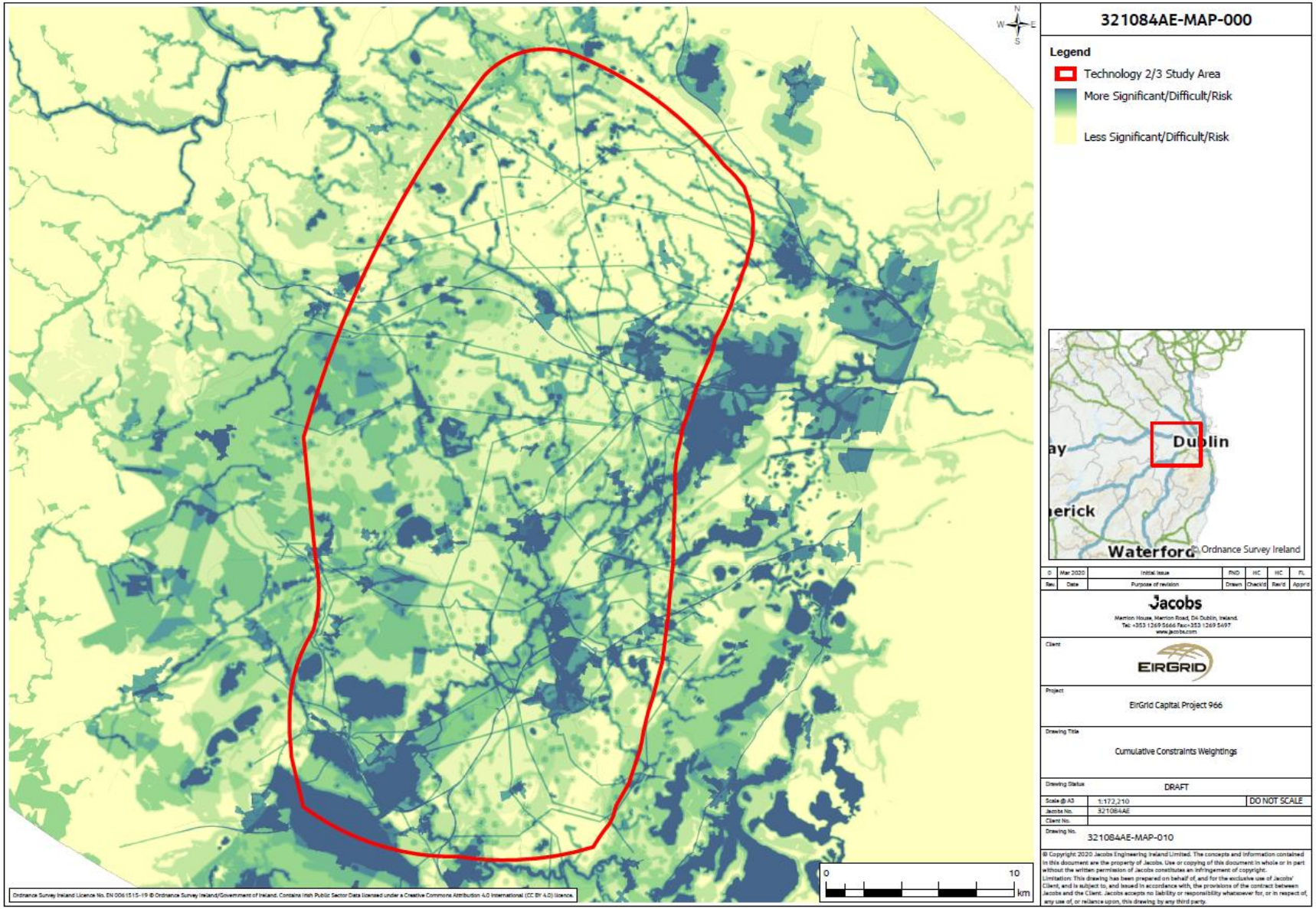
Topic	Technology 1				Technology 2	Technology 3		
	Up-voltage	1A	1B	1C	New OHL	3A	3B	3C
Biodiversity								
Soil & Water								
Planning Policy & Land Use								
Landscape & Visual								
Cultural Heritage								
Summary								

Heat Mapping

To map the environmental constraints within the Project Study Area, GIS heatmapping analysis has been used. This involved two steps, initial data preparation and then a weighted overlay.

Initial preparation involved using professional judgement and EirGrid methodologies to assign each constraint a risk category in accordance with the EirGrid colour code for options appraisal and a distance buffer. The buffer distances applied reflect the potential level of risk / significance / sensitivity associated with each constraint.

The heat map of environmental constraints is presented overleaf.


321084AE-MAP-000
Legend
Technology 2/3 Study Area
More Significant/Difficult/Risk
Less Significant/Difficult/Risk
Dublin
Waterford
Ordnance Survey Ireland
0
10
km
Initial Issue
Purpose of revision
Jacobs
EIRGRID
EirGrid Capital Project 966
Cumulative Constraints Weightings
DRAFT
1:172,210
DO NOT SCALE
321084AE
321084AE-MAP-010

1. Introduction

1.1 What is Capital Project 966?

Capital Project 966 (CP 966) is a proposed development that will help transfer electricity to the east of the country and distribute it within the network in Meath, Kildare and Dublin. The project will help meet the growing demand for electricity in the east. This growth is due to increased economic activity and the planned connection of new data centres in the region. A significant number of Ireland's electricity generators are located in the south and south west. This is where many wind farms and some modern, conventional generators are located. This power needs to be transported to where it is needed.

The power is mainly transported cross-country on the two existing 400 kV lines from the Moneypoint station in Clare to the Dunstown substation in Kildare and Woodland substation in Meath. Transporting large amounts of electricity on these 400 kV lines could cause problems that would affect the security of electricity supply throughout Ireland, particularly if one of the lines is lost unexpectedly.

To solve this emerging issue, EirGrid needs to strengthen the electricity network between Dunstown and Woodland to avoid capacity and voltage problems.

Capital Project 966 aims to strengthen the transmission network between Dunstown and Woodland substations - and suggests a number of technical solutions to do so.

1.2 Framework for Grid Development Explained

EirGrid follow a six-step approach when they develop and implement the best performing solution option to any identified transmission network problem. This six-step approach is described in the document 'Have Your Say' published on EirGrid's website[1]. The six steps are shown on a high-level in Figure 1.1. Each step has a distinct purpose with defined deliverables and represents a lifecycle of a development from conception through to implementation and energisation.

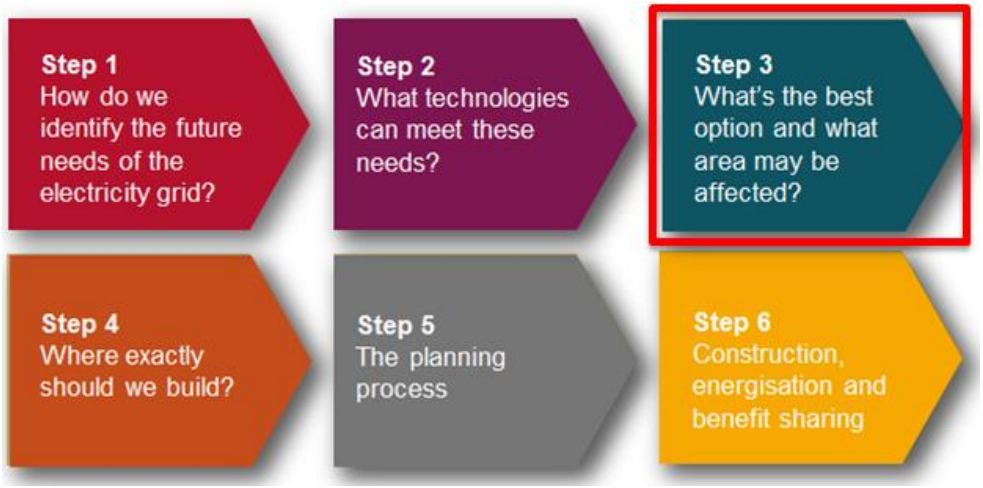


Figure 1.1 EirGrid's six-Step Framework for Grid Development

[1] http://www.eirgridgroup.com/the-grid/have-your-say/

CP 966 is in Step 3 of the above process. The aim of Step 3 is to identify a best performing solution option to the need identified. There are four remaining technical viable options to be investigated in Step 3. All options create a connection between Woodland and Dunstown substations and have common reinforcements associated in relation to voltage support devices and 110 kV uprates. The main four options are:

- Up-voltage existing 220 kV circuits to 400 kV to create new Dunstown – Woodland 400 kV overhead line (OHL);
- A new 400 kV overhead line;
- A new 220 kV underground cable; and
- A new 400 kV underground cable.

Common reinforcements to all four options (outcome of Step 2, may change in Step 3):

- Uprating of the Bracklone – Portlaoise 110 kV overhead line; and
- Dynamic reactive support device in greater Dublin area rated at approximately ±250 MVAr

These options will be evaluated against five criteria: technical, economic, environmental, deliverability and socio-economic and each criterion incorporates a number of sub-criteria. It shall be noted that the overall assessment is carried out by EirGrid, but certain aspects are investigated and assessed by various consultants and their assessment will feed into the overall assessment.

In this report, because of common constraints relating to the two underground cable options, the options are considered as three different technologies: up-voltage; new overhead line; and new underground cable. Then options are considered within those technologies, as appropriate. Further details are provided in Section 2 of this report.

1.3 Aims and Contents of the Environmental Constraints Report

EirGrid has engaged Jacobs to assess the environmental constraints that should be taken into account for CP 966. This report is aimed at presenting the findings of this investigation. The finding will feed into EirGrid's overall evaluation of the three technologies.

In particular, the purpose of this report is to:

- Define a study area that reflects the expected construction and operation footprint for all of the technologies and the potential distance over which environmental impacts could occur during the construction or operation of these solutions (see Section 2.1);
- Identify and describe the types of environmental constraints that are most likely to be affected by the construction and energisation of EirGrid's best performing solution (see Section 3);
- Identify the principal environmental constraints likely to arise during the construction or operation of each of the solutions (See Sections 5 to 7); and
- Summarise, evaluate and compare the constraints applicable to each of the solutions (See Sections 5 to 7 and Section 8).

1.4 Environmental Multi-Criteria Assessment

This report describes the environmental constraints within the study area(s) and includes a Multi-Criteria Assessment (MCA) of environmental criteria in the context of each technical option. This will be combined with

findings from the feasibility studies, Social Impact Assessment and other investigations and feed into a wider MCA being undertaken by EirGrid to identify the best performing option(s).

1.4.1 Scale Used to Assess each Criterion

The effect on each criterion parameter is presented along a range from “more significant”/”more difficult”/“more risk” to “less significant”/”less difficult”/“less risk”.

The following scale is used to illustrate each criterion parameter:

More significant/difficult/risk Less significant/difficult/risk

This risk scale is clarified by text, as follows:

- High: dark blue;
- Moderate-high: blue;
- Moderate: dark green;
- Low-moderate: green; and
- Low: cream.

1.5 Relationship to other Technical Reports

Parallel to this report, technical studies are being prepared to investigate the feasibility of the options. In addition, a Social Impact Assessment Scoping Report has been prepared.

Jacobs has prepared the following reports for CP 966:

- 321084AE-REP-001 – CP 966 Cable Route Feasibility Report;
- 321084AE-REP-003 – CP 966 Social Impact Assessment Scoping Report; and
- 321084AE-REP-004 to 12 – CP 966 Technical Requirements Feasibility Reports.

This report (the CP 966 Environmental Constraints report) has the reference 321084AE-REP-002.

2. The Project

2.1 Technologies Being Considered

The technological solutions being considered in this report are:

- Technology 1: Up-voltage of 220 kV OHL circuits to 400 kV circuits (Gorman - Maynooth – Dunstown);
- Technology 2: New 400 kV Overhead Line (OHL);
- Technology 3: New Under Ground Cable (UGC):
  - Option 3A: 220kV UGC (12m cable swathe);
  - Option 3B: 400kV UGC (one conductor per phase; single 12m cable swathe);
  - Option 3C: 400kV UGC (two conductors per phase):
    - Sub Option 3Ci: two conductors in a single 24m swathe;
    - Sub Option 3Cii: two conductors in two separate 12m swathes.

Note: Sub Option 3Ci has been ruled as not feasible in the Cable Feasibility Report (321084AE-REP-001) and so will not be considered in this assessment.

Further details for each of these are provided in Sections 5 to 7 of this report, where each technology is considered consecutively.

Common reinforcements to all four options (outcome of Step 2, may change in Step 3):

- Uprating of the Bracklone – Portlaoise 110 kV overhead line; and
- Dynamic reactive support device in greater Dublin area rated at approximately ±250 MVAr.

2.2 Study Areas

The Project Study Area is defined as the area investigated for the possible installation of any of the technologies identified in Step 2.

Figure 2.1 shows the Project Study Area for CP 966. The study area selected will provide a high likelihood that all technologies can be feasibly accommodated with it. It should be understood that this study area will be used for Technologies 2 and 3; however, Technology 1, the up-voltage of 220kV to 400kV could be more refined as the 220 kV route is an existing OHL. Details of the Technology 1 Study Area are provided in Section 5 of this report.

2.2.1 Development of the Study Area

The study area identified in Step 2 was used as a basis of the development of a study area. As part of this Step of the project (Step 3), the Project Study Area has been further refined by considering a wide variety of factors. These included technical requirements of the project, road network presence, settlements, presence of existing electrical utilities, physical constraints e.g. motorway, river or rail crossings and some environmental constraints. In particular, the Project Study Area has been confined to the west by peatlands and likely difficulties with construction and environmental protection in these areas and to the east by the western edge of the conurbations surrounding Dublin.

The current Project Study Area is smaller than the Step 2 Study Area but is still large enough for the examination of feasible options for the project. In addition, the Project Study Area is not precisely congruent with the assessment Study Area, which has some flexibility in terms of potential social impact and constraints; where a

wider perspective is often needed, for example in terms of for example in terms of birds' migratory routes or hydrological connections to designated rivers outside of the Project Study Area. The assessment of the project will cover all likely significant environmental impacts whether they occur inside the study areas or outside of it.

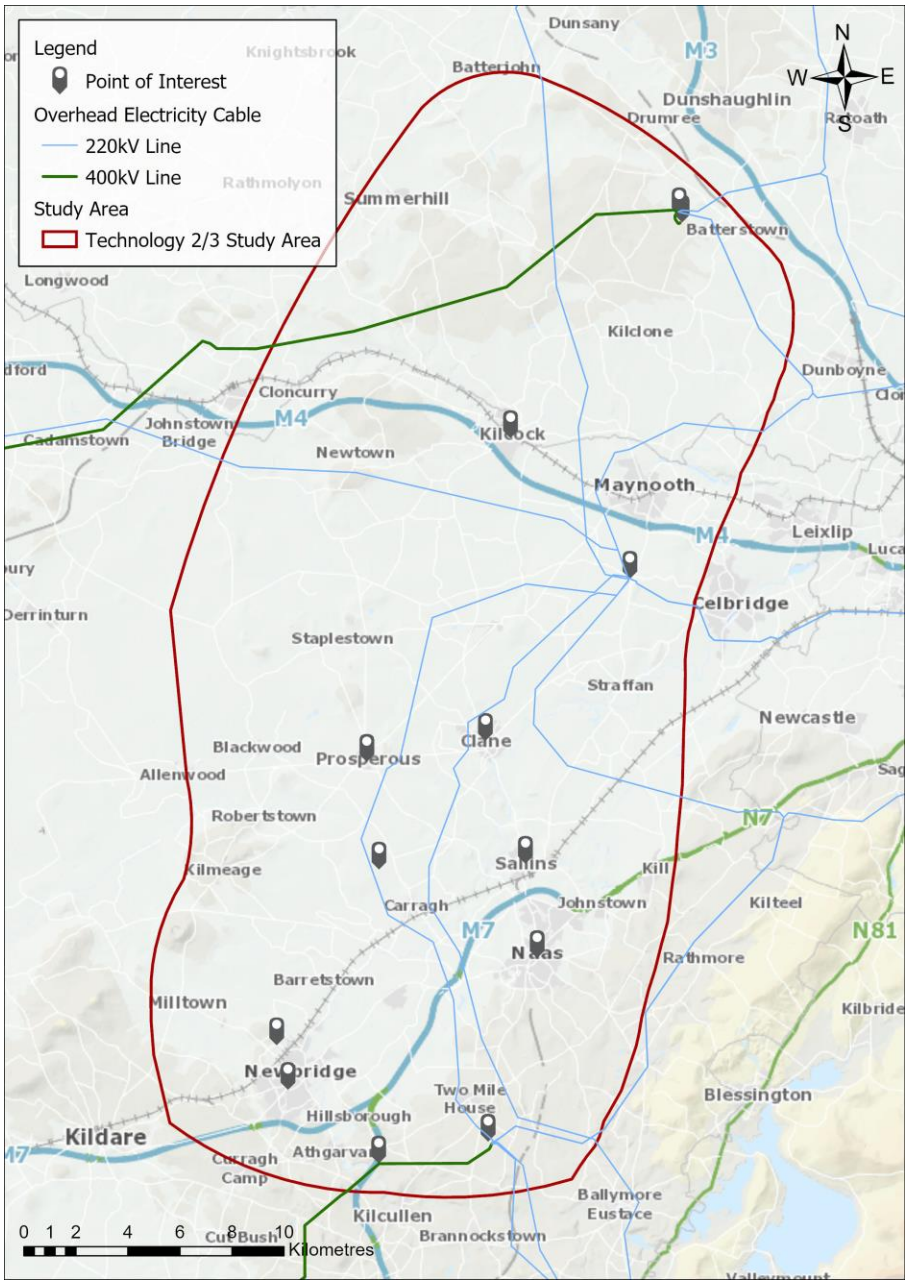


Figure 2.1 CP 966 Project Study Area at Step 3 (December 2019)

This Project Study Area is used for Technologies 2 and 3; however, Technology 1, the up-voltage of 220kV to 400kV could be more refined as the 220kV route is an existing OHL. Details of the Technology 1 Study Area are provided in Section 5 of this report.

3. Environmental Constraints Considered

3.1 Introduction

This section of the report introduces the environmental constraints that have been considered and organises them under particular environmental topics to aid understanding and presentation of the assessment findings. These topics have been selected as they are the most likely to represent the key considerations, constraints, risks and opportunities for the project.

Only environmental constraints are described in this report; the socio-economic constraints are described in the Social Impact Assessment Scoping Report (321084AE-REP-003) (SIA report). It is acknowledged that there is potential for environmental issues to result in socioeconomic effects; this is particularly the case for the effects on amenity of local communities which could be adversely affected by noise, air quality, views and traffic. Notwithstanding this interrelationship, this report does not consider amenity effects; these are only presented in the SIA report.

The national picture for Ireland is presented in this section to give the overall context for the choice of the constraints and their associated topics: Sections 5 to 7 describe the baselines for each topic in relation to the study areas; consider the key issues and potential impacts in relation to these; and present a high-level assessment of the environmental performance of each technology (and options where applicable), using EirGrid's MCA colour codes to illustrate the findings.

3.2 Environmental Topics

The environmental constraints have been organised into the following topics:

- Biodiversity,;
- Soils and Water Impacts;
- Planning Policy and Land Use;
- Landscape and Visual; and
- Cultural Heritage (Archaeological and Architectural Heritage).

3.2.1 Biodiversity, Flora & Fauna

In 1997, the Habitats Directive (92/43/EEC) was transposed into Irish law by the European Communities (Natural Habitats) Regulations, S.I. 94 of 1997 as amended. The Regulations were subsequently revised and consolidated in the European Communities (Birds and Natural Habitats) Regulations 2011, S.I. 477 of 2011. The main purpose of the Directive is to ensure the appropriate conservation of natural habitats and wild fauna and flora. Under the Directive, Member States like Ireland were required to establish an ecological network of SACs (sites which host a range of natural habitats and species listed in Annex I and II of the Directive) and SPAs as designated under the Birds Directive (2009/147/EC).

On a national level, Natural Heritage Areas (NHAs) are areas considered important for their habitats or species of plants and animals whose habitat needs protection. NHAs are designated under the Wildlife (Amendment) Act 2000. They include a large number of raised bogs and blanket bogs, as well as landforms and geological features. In addition, there are 630 proposed NHAs (pNHAs) in Ireland. These were published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. These sites vary significantly in size.[i]

Prior to statutory designation, pNHAs are subject to limited protection, in the form of:

- Agri-environmental farm planning schemes such as Rural Environment Protection Scheme (REPS 3 and 4) and Agri Environmental Options Scheme (AEOS) continue to support the objective of maintaining and enhancing the conservation status of pNHAs;
- Forest Service requirement for NPWS approval before they will pay afforestation grants on pNHA lands; and
- Recognition of the ecological value of pNHAs by Planning and Licensing Authorities.[ii]

Nature Reserves are also important to wildlife, and these are protected under Ministerial order. There are currently 78 Statutory Nature Reserves in Ireland. Most are owned by the State, but some are owned by organisations or private landowners.[iii]

Other protected sites that are nationally important for birds include Wildfowl Sanctuaries and Refuges for Fauna. There are no such sites within the Study Area.

There is also a wide range of important non-designated habitats in Ireland. For example, the Project Study Area includes non-designated ancient woodland, native woodland, bogs and semi-natural grasslands.

3.2.2 Soils and Water Impacts

Geology and Soils

As part of the Irish Geological Heritage (IGH) Programme, a partnership between the Geological Survey of Ireland (2017) and the NPWS, the Geological Survey of Ireland has identified important geological and geomorphological sites which could be conserved as NHAs. Until designation is confirmed, these sites are classified as Irish Geological Heritage Sites (IGHSs). There are over 900 IGHSs identified around Ireland.

The main rock type in Ireland is carboniferous limestone, which covers approximately 50% of Ireland in the low-lying centre of the country.

There is no legislation solely directed to soil protection in Ireland. In 2006, the European Commission developed a Soil Thematic Strategy that aims to protect soils and ensure the sustainable use of soils across Europe.

Soil quality in Ireland is generally of good quality. Brown fertile earth, which is quite shallow, makes up most of the soil formation and is mostly found in the midlands and eastern counties. Of Ireland's landmass, 68% is used for agriculture due to this brown earth being rich and fertile. The other large soil type is gley, which is peaty soil, mainly found in the low-lying centre of Ireland. This soil has a large clay composition and is poorly drained. Brown podzolics and grey-brown podzolics also make up a large part of the soil formation of Ireland and are mainly found in the central and southern counties of Ireland. Podzolic soils are typical of the geology and landscape of those areas, typically found on sandy deposits on forested soils (EPA, 2012).

Surface Water

The Water Framework Directive (WFD) is one of the key instruments in the protection of water resources. It aims to maintain "High" and "Good" status waters and prevent deterioration in the status for all waterbodies, including rivers, lakes, estuaries, coastal waters and groundwater. The WFD is transposed into Irish law by a number of regulations, including:

- European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003);
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272 of 2009);

- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010);
- European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2010 (S.I. No. 610 of 2010);
- European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011 (S.I. No. 489 of 2011); and
- European Union (Water Policy) Regulations 2014 (S.I. No. 350 of 2014).

There are five classes of WFD status for surface water bodies and two classes for groundwater bodies, and the status is determined by that of the poorest quality element.

The second River Basin Management Plan (RBMP) for Ireland 2018-2021[iv] consider the whole of Ireland as the river basin under consideration. Figure 3.1 is an extract from the RBMP and shows the key statistics for Ireland in terms of the catchments and types of waterbody included; and compliance with EU standards (2015).

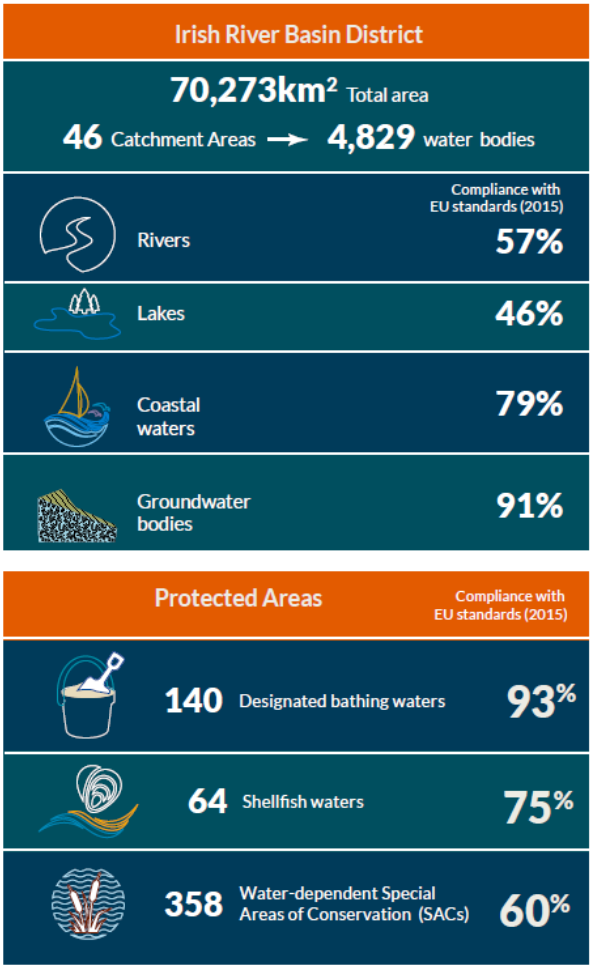


Figure 3.1 Extract from RBMP 2018-2021

The current status (2010-2015) of water bodies in the Study Area is shown in Appendix A, Map 321084AE-MAP-003.

Flood Risk

The frequency of flood events in Ireland has been increasing and, with climate change, is expected to increase further. Increased flooding can cause pressure on all infrastructure including energy infrastructure such as power stations, substations and transmission lines.

The Floods Directive (2007/60/EC) required member states to develop Flood Risk Management Plans for areas of existing and future potentially significant flood risk. The Floods Directive was transposed into Irish law by the EU (Assessment and Management of Flood Risks) Regulations 2010 and sets out the responsibilities of the Office of Public Works (OPW).

OPW has been implementing the Directive mainly through the Catchment Flood Risk Assessment and Management (CFRAM) Programme, through which 29 draft Flood Risk Management Plans have been developed. Approximately 300 Areas for Further Assessment have been established along with a range of measures to reduce or manage the flood risk within each catchment.

3.2.3 Planning Policy and Land Use

Planning Policy and Legislation

The Planning and Development Act 2000 (as amended) forms the foundation for planning in Ireland. It covers a large range of planning-related issues, and combines a wide range of different legislation into one place, including:

- The purpose and content of regional planning guidelines, development plans and local area plans;
- How the process of applying for and obtaining planning permission works;
- Special requirements for protected structures, conservation areas and areas of special planning control;
- Ireland's planning appeals and enforcement processes;
- A description of Strategic Development Zones; and
- A description of the Environmental Impact Assessment (EIA) process and which projects are required to undertake EIA.

There have been a number of amendments to the Act since 2000; taken together these are known as the 'Planning and Development Acts'.

These Acts are underpinned and implemented by the Planning and Development Regulations 2001 (and amendments).

Land Use and Cover

The total land cover in the Project Study Area is 759.3km^2:

- 68% of Ireland's total landcover is agricultural land, and over 84% of the total land cover within the Project Study Area is used for agriculture (639.5km^2);
  - Almost 69% of agricultural land in the Project Study Area is devoted to pasture, hay and grass silage;
  - 12% to non-irrigated arable land; and
  - 2.5% to heterogeneous agricultural areas.

- Peatlands and wetlands are the second most widespread land cover type in Ireland, covering almost one-fifth (20.6%) of the country;
  - 4.06% of the landcover in the Project Study Area is made up of peat bogs, and a further 0.2% of inland marshes.
- Forest cover in Ireland is the lowest of all European countries according to Teagasc, with national land cover of 11%. Coillte is a commercial, semi-state forestry company which owns over 445,000ha of land in Ireland (approximately 7%);
  - Total Forestry cover in the Project Study Area is 2.35% with a further 1.29% grasslands and woodland shrub; and
  - County Meath has the lowest forest cover in Ireland.
- Both forestry and peatlands are important assets to Ireland's carbon sequestration. The National Peatlands Strategy (2015) and the Forestry Programme 2014-2020 set out the approach to peatland management and forestry in Ireland.

Transport infrastructure across Ireland includes:

- 100,000km of road network and 2,400km of railway; 5.4km^2 of the Project Study Area is made up of road and rail networks and associated land.

Ireland's canals once played a significant role as a transport network. However, they are now mainly used for recreational and heritage:

- The canals within the Project Study Area are the Royal Canal and Grand Canal.

3.2.4 Landscape and Visual

The primary legislation for the protection of landscapes in Ireland is the Planning and Development Act (2000) as amended. Section 10 (2.e) requires County Development Plans to '*preserve the character of the landscape'* where the planning authority considers sustainable development of the area requires it and includes '*the preservation of views and prospects and the amenities of places and features of natural beauty or interest'*.

There is currently no published national level landscape mapping for Ireland. In accordance with the Planning and Development Act 2010, all local authorities need to identify Landscape Character Areas within their Development Plans to ensure that defining features are protected and managed. There is no national classification system for Landscape Character Areas, as these are geographically specific and have their own distinctive character based on their location and surrounding environment.

Both Kildare and Meath County Councils have formally documented their Landscape Character Areas within their County Development Plans and classified them as Low, Medium and High based on their values and sensitivities. The Development Plans also detail which Landscape Character Areas are most and least compatible certain infrastructure types, including infrastructure involving overhead lines and underground cables. This is presented in Appendix A, Map 321084AE-MAP-005.

3.2.5 Cultural Heritage

Cultural heritage can be divided loosely into the archaeological resource, covering sites and monuments from the prehistoric period to the 18th century, and built heritage resources, which encompassing standing structures and sites of cultural importance of a post-18th century date. The National Monuments Service maintains a national database of records of the Archaeological Survey of Ireland (ASI), commonly known as the Sites and Monuments Record (SMR).

The archaeological resource refers to material remains. These comprise sites and monuments, movable artefacts or environmental evidence. Archaeological resources vary greatly in form and date. In Ireland they include sites such as prehistoric burial mounds, megalithic tombs, standing stones, urban archaeological deposits and underwater features. Many archaeological sites may have no surviving visible surface features. However, archaeological deposits and features may survive beneath the surface and could potentially be disturbed or destroyed by construction works.

Archaeological sites are legally protected by the provisions of the National Monuments Acts 1930 (as amended), the National Cultural Institutions Act 1997 and the Planning and Development Acts 1963 to 1968 (the 'Planning Acts'). One of the primary sources of information for known archaeological features is the Record of Monuments and Places (RMP), an inventory of sites and areas of archaeological significance. It holds records of known upstanding archaeological monuments, the original location of destroyed monuments, and the location of possible sites. The Minister for Arts, Heritage, Gaeltacht and the Islands has specific responsibility for the protection of archaeological heritage.

Architectural Conservation Areas (ACAs) are designated under Section 81 of the Planning & Development Act 2000-2010 (as amended) for the protection of areas for their special characteristics and distinctive features. ACAs in Ireland are detailed in the various County and Local Area Development Plans (some of which are pending designation).

4. Approach to Constraints Report

4.1 Introduction

This section of the report sets out the approach to identifying the specific constraints present in the study areas for each technology, including their mapping; and describes the methodology used to create a 'Heatmap' which presents a combined map of key constraints as a single visual image.

4.2 Preparation of Constraints Report

4.2.1 Information Gathering

The constraints identified are, in general, based on a review of publicly available datasets. The following County Development Plan (CDP) and Local Area Plans and mapping were reviewed.

- Kildare County Development Plan 2017 - 2023 (http://www.kildare.ie/countycouncil/Planning/developmentplans/KildareCountyDevelopmentPlan2017-2023/); and
- Meath County Development Plan 2013 – 2019 (https://www.meath.ie/council/council-services/planning-and-building/development-plans/meath-county-development-plan).

The following online resources were also referenced between September 2019 and December 2019 to inform this report:

- Kildare County Council (https://www.kildare.ie/countycouncil/index.html);
- Meath County Council (https://www.meath.ie/);
- Myplan.ie Mapping (http://www.myplan.ie/webapp);
- Central Statistics Office, CSO (http://census.cso.ie/sapmap);
- Data.gov.ie (https://data.gov.ie/dataset);
- National Parks and Wildlife Services, NPWS (https://www.npws.ie);
- National Biodiversity Data Centre (https://maps.biodiversityireland.ie);
- Irish Ramsar Wetland Committee (http://www.irishwetlands.ie);
- Environmental Protection Agency (EPA) mapping (https://gis.epa.ie/EPAMaps/AAGeoTool);
- Geological Survey Ireland, GSI (https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx);
- National Monuments Service (https://www.archaeology.ie);
- National Inventory of Archaeological Heritage (http://www.buildingsofireland.ie);
- Heritage Mapping (https://www.heritagemaps.ie/WebApps/HeritageMaps/index.html);
- GeoHive (http://map.geohive.ie/mapviewer.html);
- Irish Wetland Bird Survey, i-WeBS (https://www.birdwatchireland.ie/?tabid=111);
- Project Related Documents http://www.eirgridgroup.com/the-grid/projects/capital-project-966/the-project/;
- The Karst of Ireland (GSI, Geological Survey Ireland, International Association of Hydrologists, Irish Association of Economic Geology, 2000, https://www.gsi.ie/enie/publications/Pages/The-Karst-of-Ireland.aspx)

All sources and references are listed at the end of this report.

4.2.2 GIS Constraints Mapping

Geographic Information System (GIS) mapping has been used to display the key datasets that inform this report. The constraints maps for key constraints are presented in Appendix A of this report.

Datasets

GIS datasets were collated from a variety of sources including direct data downloads from open source authority sites. A number of datasets were already held or gathered by Jacobs; these were checked as appropriate to ensure they were up to date and a copy was imported into the CP 966 project databases.

All data licenses were checked to ensure they were available for use. Each dataset then went through a technical check to ensure they were complete, correct and relevant. All datasets were re-projected to IRENET95 Irish Transverse Mercator projection system (EPSG:2157). Where possible, ArcGIS layer files were then used to ensure each dataset was symbolised in line with the authoritative body it was sourced from. The data sourced for constraints mapping is detailed in Table 4.1.

4.3 Heat Mapping

4.3.1 Overview of Heat Mapping Method

GIS heatmapping analysis involved two steps, initial data preparation and then a weighted overlay.

Initial preparation involved using professional judgement and EirGrid methodologies to assign each constraint a risk category (weighting) in accordance with the EirGrid colour code for options appraisal (see below). There are five risk ratings which range from ‘more significant / difficult risks to ‘less significant / difficult risks. A buffer will also be applied to each constraint and will vary depending on the nature of each constraint. However, the buffer distances applied will generally reflect the potential level of risk / significance / sensitivity associated with each constraint. These are presented alongside the risk for each constraint in Table 4.1.

A weighted overlay tool, which calculates statistics relative to weightings and the overlap of constraints, was then used to construct the Heatmap, which is presented in Appendix B, Map 321084AE-MAP-010 Cumulative Constraints Weightings.

All data was thoroughly checked by GIS specialists and converted to the appropriate co-ordinate system prior to use.

More significant/difficult/risk Less Significant/difficult/risk

This risk scale is clarified by text, as follows:

- High: dark blue;
- Moderate-high: blue;
- Moderate: dark green;
- Low-moderate: green; and
- Low: cream.

Table 4.1 Constraints used in Heat Mapping and Risk Assigned

Environmental Topic	Constraint / Designation Type	Buffer (m)	Risk
Biodiversity	SAC	200	High
	SPA	200	High
	NHA	100	Moderate-High
	pNHA	100	Moderate-High
	Ancient or Long Established Woodland	100	High
	Native Woodland	100	Moderate-High
Cultural Heritage	NIAH	100	Moderate
	SMR	100	Moderate
	National Monuments	200	High
Land use	CORINE landcover - Forestry	100	Low
	County Development Plan - Land Use Zoning - Town Centre	500	High
Surface Water	WFD Water bodies High Status	100	High
	WFD Water bodies Good Status	100	High
	WFD Water bodies Moderate Status	100	Moderate-High
	WFD Water bodies Poor Status	100	Moderate
	WFD Water bodies Bad Status	100	Low
	WFD Water bodies Unassigned Status (assume Good)	100	High
	Flood Risk Areas	100	High
Groundwater	Public & Group Supply Source Protection Area (Inner & Outer)	100	Moderate-High
	Group Water Schemes	100	Moderate-High
	Groundwater Vulnerability Karst	100	High
	Groundwater Vulnerability Extreme	100	Moderate-High
	Groundwater Vulnerability Karst (High)	100	Moderate
	Regionally Important Aquifers (RK, Rf, Rg)	100	Moderate-High
	Locally Important Aquifers (Lg, Lm, Lk, Li)	1	Moderate
Soils & Geology	Peat (subsoils)	100	Moderate-High
	Abandoned Mines	200	Moderate-High
	Quarries	100	Moderate-High
	Karst Landforms	100	Moderate-High
	Geological Heritage Sites	200	Moderate-High
	Landslide Susceptibility	100	High
Landscape and Visual	High Value Landscapes Compatibility with Infrastructure - Major Power Lines (Most Compatible)	100	Low
	High Value Landscapes Compatibility with Infrastructure - Major Power Lines (Medium Compatible)	100	Low-Moderate
	High Value Landscapes Compatibility with Infrastructure - Major Power Lines (Least Compatible)	100	Moderate-High
Material Assets	Existing overhead lines (400 and 220 kV only)	50	High
Socio-Economic	Churches, cemeteries, other social centres (i.e. sports fields, libraries, playgrounds etc.)	100	Moderate
Essential Infrastructure	Reservoir	100	Moderate-High
	Water Treatment Plant	100	High
	Wastewater Treatment Plant	100	High
	Electricity Substations (400, 220 and 110 kV)	100	High
	Major tourism sites	500	High

Environmental Topic	Constraint / Designation Type	Buffer (m)	Risk
	Regional Roads	1	Moderate
	National Roads	1	High
	Motorways	1	High
	Settlements	1	High
EPA Sites	Licenced facilities IE	100	Moderate
	Licenced facilities IPC	100	Moderate
	Licenced facilities Waste	100	Moderate

4.3.2 Heat Map Output

The resultant Heat Map is presented in Appendix B of this report.

5. Technology 1: Up-voltage of Existing 220 kV Circuits to 400 kV Circuit

5.1 Overview of Technology 1

This technological solution consists of the 'Up-voltage' of some of the existing 220 kV circuits between existing Dunstown 400 kV station and Woodland 400 kV station.

5.1.1 Up-Voltage

It is anticipated that this can be done using a new technology which would enable the existing 220 kV towers to be modified and the 220 kV conductors replaced with 400 kV conductor to create a new Dunstown – Woodland 400 kV circuit. For the purpose of this assessment it has been assumed that all towers and foundations along the existing route will be replaced with the proposed tower type shown in Figure 5.1. However, it is unlikely that all of the towers and foundations would need to be replaced; further work on this following the options appraisal will determine the extent of the replacement required. As such, this assessment is based on a worst-case scenario.

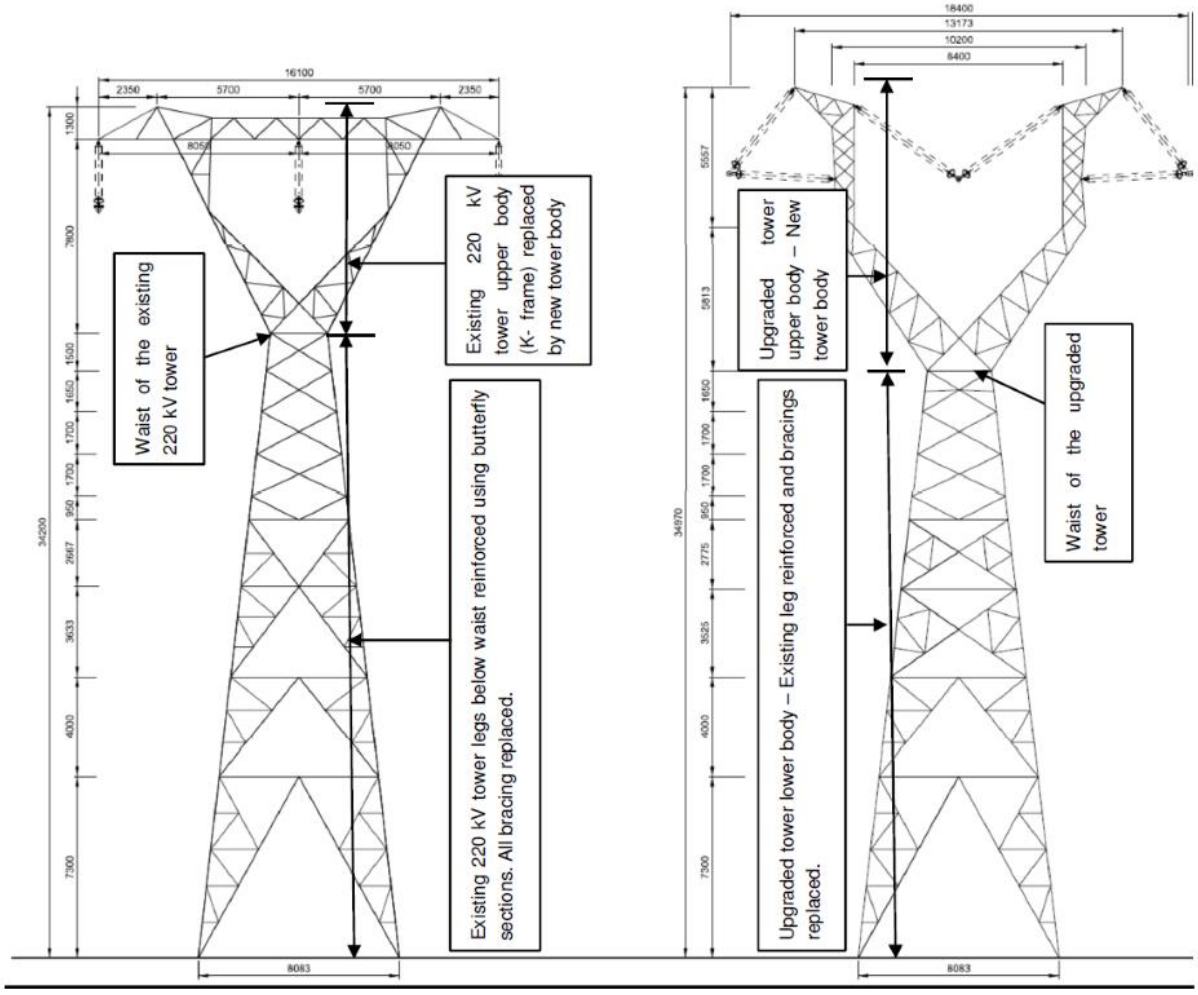


Figure 5.1 Existing and Potential new Tower Type for Technology 1.

The circuits selected to achieve this are Gorman – Maynooth 220 kV circuit and the Dunstown – Maynooth 220 kV circuit (see Figure 5.5).

5.1.2 Woodland Turn-In

A number of additional elements are required to facilitate this solution, including a 'turn-in' to Woodland substation from the Gorman – Maynooth 220 kV circuit and station work at three existing stations: Woodland, Maynooth and Dunstown.

In order to use the existing Gorman – Maynooth 220 kV circuit to create the new 400 kV circuit, it will be 'broken into' somewhere in the northern part of the Technology 1 Study Area shown in Figure 5.5. At the 'break-in point' two new connections are proposed to connect to Woodland substation. One new 220 kV circuit and one new 400 kV circuit. The connection back to Woodland station can be achieved using either overhead line or underground cable. This will create two new circuits into Woodland station, namely a Gorman – Woodland 220 kV circuit and a Woodland-Maynooth 400 kV circuit.

Potential options for the 'turn-in' to Woodland Substation have been identified and investigated; the findings are presented in 32108AE-REP-009 CP966 Woodland 'Turn-In' Feasibility Report[v].

It should be noted that the various options for the turn-in at Woodland will not be a material consideration in the decision as to which technology (or technologies) is taken forward into Step 4.

The technology alternatives for this element, for both the 220kV 'turn in' to Woodland substation and the 400kV new connection from Woodland substation, include:

- Option 1A: Single circuit OHL connections (two corridors);
- Option 1B: Single circuit UGC connections (two 12m cable swathes); and
- Option 1C: Double circuit OHL connections.

Option 1A

The objective of Option 1A is to provide two separate circuits from the existing 220kV OHL towards Woodland substation using new single circuit towers; one corridor for the 220kV OHL and one for the 400kV OHL. Alignments presented in Figure 5.2 are only an indication of the route principle. The connection could be made from various point along each alignment although this will affect the length of the new section.

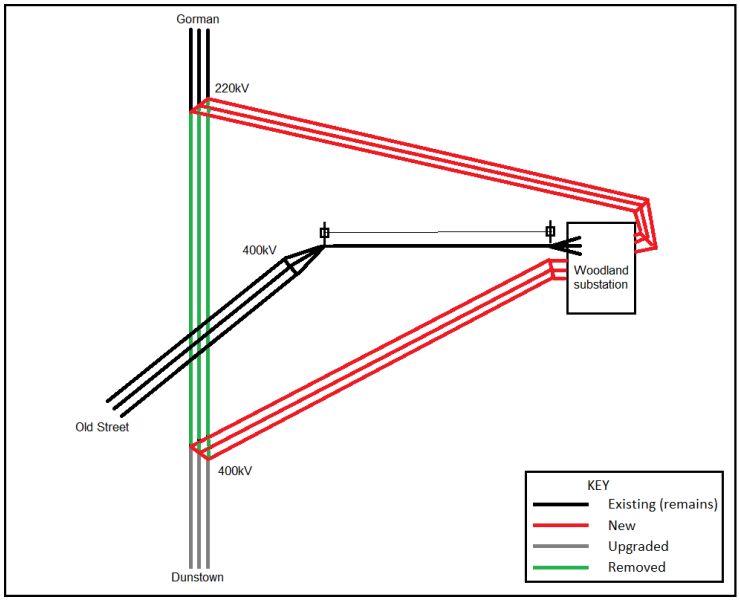


Figure 5.2 Option 1A

Option 1B

The objective of Option 1B is to provide two separate circuits from the existing 220kV OHL towards Woodland substation in a similar configuration to Option 1A but using UGCs. The interface between existing and new cable being provided by cable sealing end compounds positioned adjacent to the existing OHL alignment. Alignments presented in Figure 5.3 are only an indication of the route principle. The connection could be made from various points along each alignment although this will affect the length of the new section. The cable route would be determined in accordance with the principles and details presented in the Cable Feasibility Report (321084AE-REP-0001).

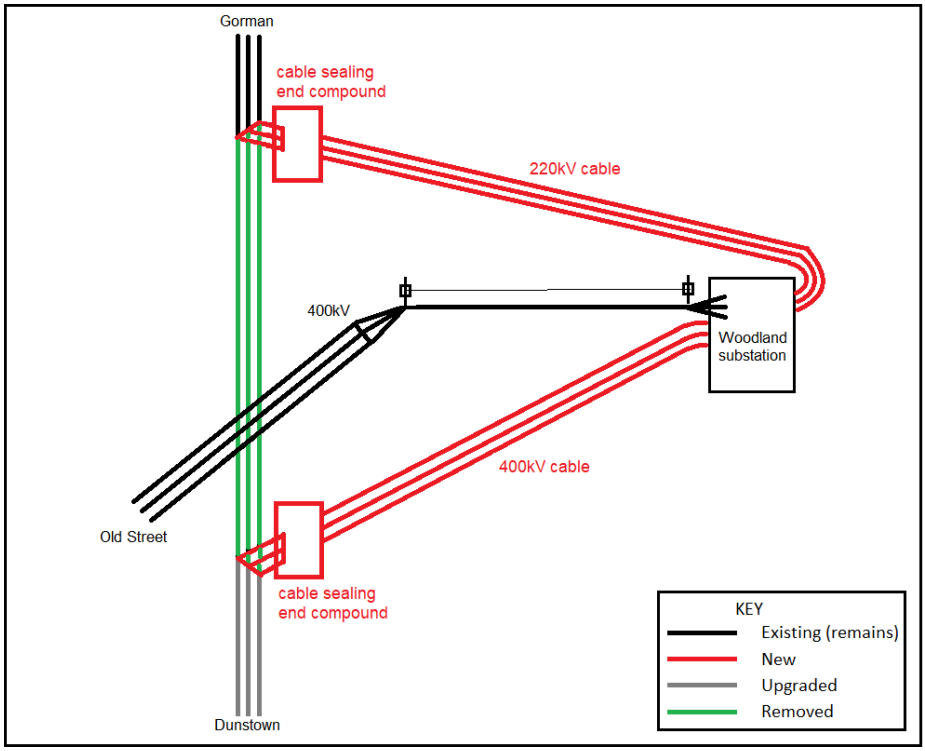
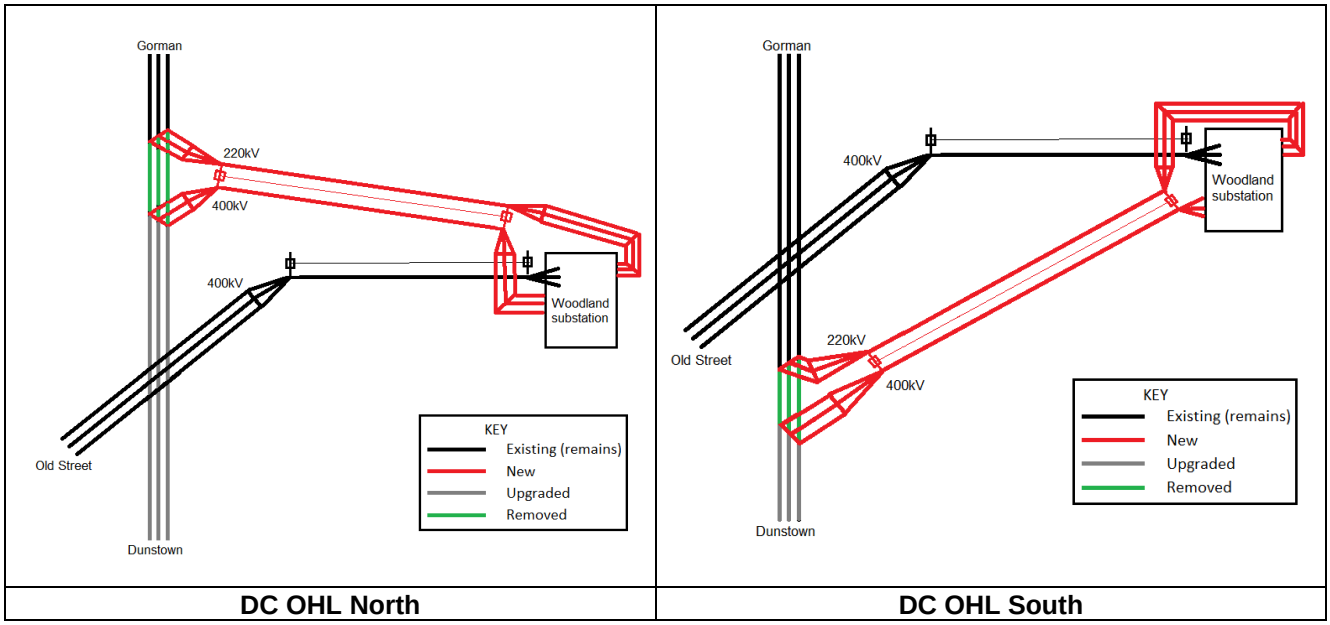


Figure 5.3 Option 1B

Option 1C

The objective of Option 1C is to achieve the required connection using one double circuit OHL between a new tower positioned on the line of, or adjacent to, the existing OHL alignment and Woodland substation, either north or south of the existing crossing point. This would carry both the 220kV OHL and the 400kV OHL. Alignments could be to the north or south of the existing crossing point as presented in Figure 5.4, which is only an indication of the route principle. The connection could be made from various points along each alignment although this will affect the lengths of new OHL and cable sections.



DC OHL North | **DC OHL South**

Figure 5.4 Option 1C

5.2 Technology 1 Study Area

The Technology 1 Study Area is, for the most part, limited to the route corridor of the existing infrastructure. In accordance with the findings of EirGrid Study 10 relating to Landscape and Visual impacts[vi], the Study Area for the existing 220 kV circuits extends to 1.6km either side of the 'centre line'. Beyond this distance, no significant visual impacts are likely to occur.

It is widened near Woodland Substation to accommodate the 'turn-in' to the substation from the Gorman – Woodland 220 kV circuit (see Figure 5.5).

Notwithstanding this, some consideration of constraints outside of this extent has been necessary for specific aspects of the environment, such as birds and for local communities. For example, where local communities are currently in very close proximity to the 220kV circuit (less than 50m), consideration has been given to the possibility that a diversion to the existing corridor may prove necessary and additional constraints identified in those areas.

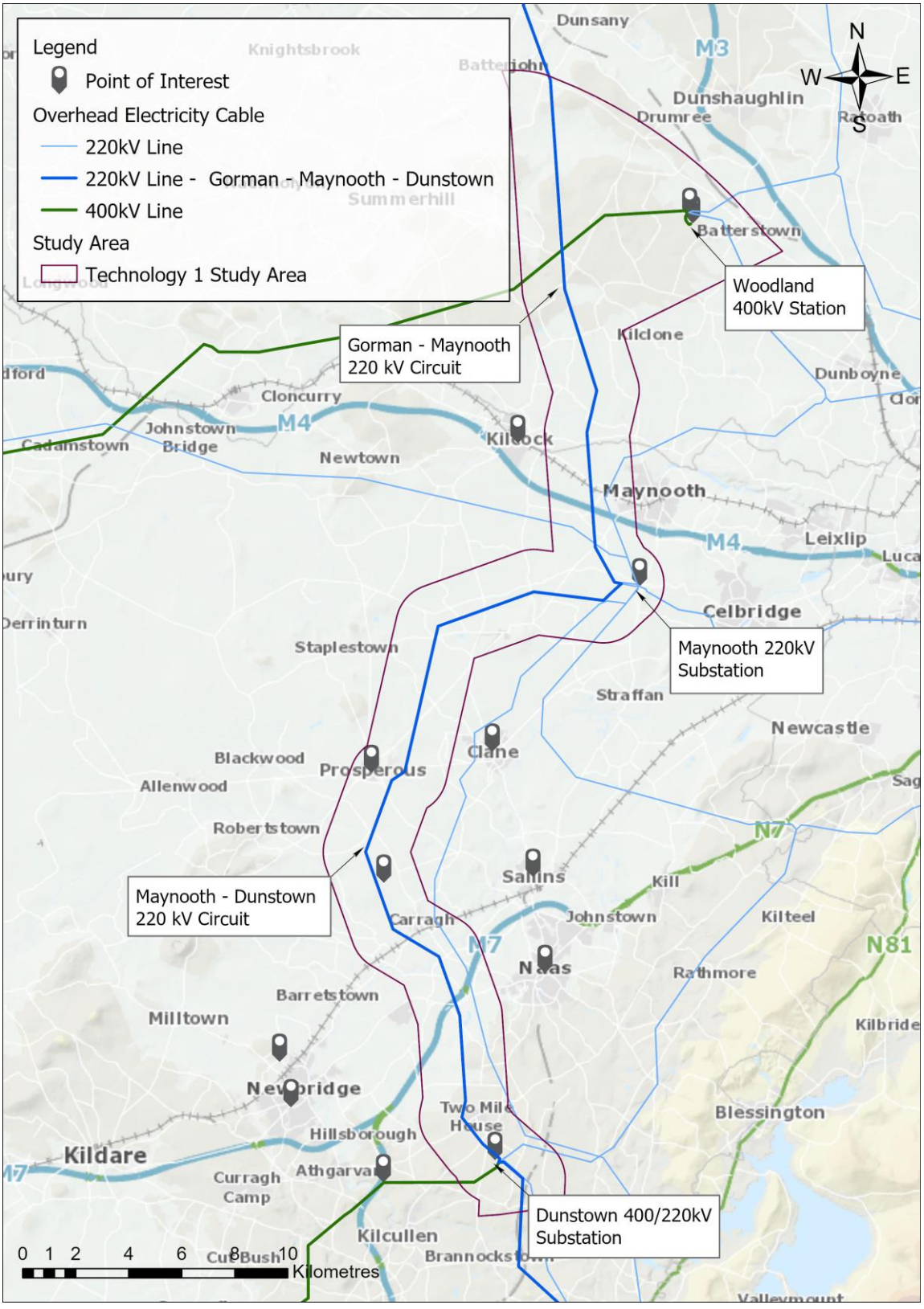


Figure 5.5 Technology 1 Study Area

5.3 Assumptions and Limitations

For this technology, the following assumptions have been made:

- The existing 220kV OHLs towers and foundations will be removed in their entirety and new towers installed on new foundations;
- It is assumed that the up-voltage will be on the same route as the existing OHL and not divert from it in any location;
- For the Woodland Turn-In, the OHL options would be constructed using access form local roads, no access track along the route corridor would be installed, and no bridges across waterbodies required; and
- For the Woodland Turn-in, the UGC option (Option 1B) will be installed across third party land as there is no capacity in the local road network to facilitate a road installation.

There are limitations to the assessment:

- For the up-voltage, it is not yet understood how the construction of this would be achieved; it could require temporary OHLs, or it may be achieved through the use of outages. As a result, this aspect has not been included in the assessment; and
- There may be a need to divert form the existing corridor of the OHL, as properties are in close proximity to the existing line. This has not been included in the assessment as it is not currently understood where, if anywhere, such diversions might occur.

5.4 Environmental Constraints

The constraints, organised under the various topics, are described in terms of baseline and potential impacts on them from the proposed solution. Following this, each topic is considered in the context of risk and EirGrid's colour scheme used to illustrate the potential risk from each constraint for this solution. The assessment combines constraints during construction and operation, assuming construction constraints are temporary.

More significant/difficult/risk Less significant/difficult/risk

This risk scale is clarified by text, as follows:

- High: dark blue;
- Moderate-high: blue;
- Moderate: dark green;
- Low-moderate: green; and
- Low: cream.

5.4.1 Biodiversity, Flora & Fauna

Baseline

There are no internationally designated sites within the Technology 1 Study Area, although Ballynafagh Bog SAC lies immediately west of the boundary (50m from the Technology 1 Study Area at the closest point), near the settlement of Prosperous. This SAC is designated for the following Habitats Directive Annex 1 habitats:

- Active raised bogs (a priority habitat listed in the Habitats Directive);
- Degraded raised bogs still capable of natural regeneration; and
- Depressions on peat substrates of the *Rhynchosporion*[2].

The SAC is also important for merlin, snipe and curlew, though these are not the reason for site designation.

Ballynafagh Lake SAC, 2km to the west of the Technology 1 Study Area, is designated for its alkaline fen and transition mire/ quaking bog habitat and its whorl snail and marsh fritillary butterfly species.

A number of SPAs are designated for wintering bird species in the south east of Ireland, including whooper swan, teal, mallard, golden plover and curlew. Several bird species are considered vulnerable to collision with electricity transmission lines. Of particular concern are species listed under Annex I of the EU Birds Directive (2009/147/EC), red listed birds of conservation concern (Colhoun et al., 2013), and migratory water birds. Such species are at particular risk when travelling between roosting/nesting and feeding sites.

Table 4 in EirGrid's Ecology Guidelines for Electricity Transmission Projects (EirGrid, 2012) identifies a number of bird species and their susceptibility to collision with powerlines. Whooper swan in particular is a species at risk of potential collision with OHLs. Whooper swan utilise several sites throughout Co. Kildare, Co. Meath and Co. Wicklow outside of SPAs for foraging, roosting and migratory stops on route to winter sites including the Wexford Harbour and Slobs SPA.

Wintering bird species including whooper swan, teal, mallard, golden plover and curlew have been recorded using Ballynafagh Lake in the past, as noted in the site synopsis and standard data form for the SAC. Although not a qualifying interest species of Poulaphouca Reservoir SPA, whooper swan have been recorded using the reservoir and therefore there is potential for swans commuting to and from this site and other sites south east of the Technology 1 Study Area to migrate over the area.

The Technology 1 Study Area also includes the following other important sites for biodiversity:

- Hodgestown Bog NHA, a raised bog with diverse microhabitats, including hummocks;
- Donadea Wood pNHA, notable for the presence of two rare species of Myxomycete fungus and also classified as an Ancient and Long-Established Woodland; it is a wet willow-alder-ash woodland; its status as a listed habitat has not been determined yet by NPWS. It therefore has the potential to be a protected habitat including Annex I status;
- Grand Canal pNHA, designated for its diverse species and for cutting across agricultural land, providing a refuge for species threatened by modern farming methods;
- Biodiversity-rich hedgerows and trees throughout the Technology 1 Study Area;
- Potential Annex 1 Molinia meadow habitat, generally south of Barretstown; and
- Semi-natural grassland habitats immediately north of Dunstown substation.

There are no designated sites in close proximity to Woodland or Dunstown Substations.

[2] Rhynchosporion is a habitat that is associated with raised bog, blanket bog and wet heath in the lowlands of central and western Ireland.

The biodiversity designations in the Technology 1 Study Area are shown in Appendix A, Map 321084AE-MAP-001.

For the up-voltage and the Woodland Turn in, potential generic effects on biodiversity during construction include:

- Temporary loss of terrestrial and aquatic habitat within the footprint of the Project to facilitate access roads and construction compounds;
- Disturbance, and temporary displacement of birds, mammals, amphibians, fish and other aquatic species from the working corridor and in close proximity to the Project;
- Temporary loss of foraging habitat for mammals such as badger and bat; and
- Pollution of surfaces waters, leading to secondary effects on aquatic species.

Potential Impacts

Specifically, for the up-voltage of the 220kV OHLs, in addition to the generic effects identified above, potential effects identified for habitats during construction include:

- Potential disruption to a large area of Ancient Long-Established Woodland and native woodland (a pNHA) on the boundary of the central part of the Technology 1 Study Area (north-east of Staplestown); and
- Semi-natural grassland habitats that could also potentially be disturbed by construction activities in the south of the Technology 1 Study Area, near Dunstown substation.

During operation of the new OHLs, there would be no significant permanent loss of habitat as the new towers for the 400kV are anticipated to be within a similar footprint as the existing 220kV OHL. The new OHL would be only slightly higher than the existing (estimated at < 1m higher) and could present a collision risk. Notwithstanding this, EirGrid's Evidence-Based Studies on birds3 conclude that collisions with power lines are generally considered to be rare events.

For the Woodland Turn-in Options, in addition to the generic effects identified above, specific effects could include:

- Option 1A: single OHL circuits, two corridors:
  - During construction, the nature of the effects of this option would be as described above, however the magnitude would be higher than for Option 1C, as there are two corridors proposed. In addition, it is likely that this would require a river crossing, which would require a temporary bridge over two separate stretches of the Tolka_020 waterbody[4]. Aquatic or riparian habitats could be disturbed by this crossing; and
  - During operation, there would be permanent loss of habitat under the footprint of the new towers as well as potential loss of trees under the new OHLs. The magnitude of these effects would, as during construction, be higher than for Option 1C, which proposes one corridor only. No migratory bird routes are identified for this part of the Technology 1 Study Area so it is unlikely that there would be significant effects on birds during operation. Any hedgerows removed during construction would be reinstated.
- Option 1B: single UGC circuits, two corridors, it is assumed the cables cannot be installed in the local road network as the local roads are not wide enough to accommodate a 12m swathe:
  - During construction, a 12m swathe across grasslands would be required; hedgerows would need to be removed and two rivers crossed. There is also the potential for a number of ditches to be crossed within the vicinity. This would lead to all of the generic effects described above; for this option the effects could be potentially significant prior to mitigation as there would be grassland and topsoil stripping along the length of each of the corridors, and a potential requirement for diversion or over pumping of local streams and ditches; and

[3] http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Evidence-Based-Environmental-Study-5-Birds.pdf

[4] "Tolka_020" is the official designation used by the Office of Public Works for this waterbody. It will be known locally by a different name but the official designation for this waterbody and other waterbodies have been used throughout this report.

- During operation, the swathe would have been reinstated back to grassland. It is likely however, that hedgerows would not be replaced over the top of the cables and so this would represent a permanent loss of habitat and disruption to any species using the hedgerows as linear connected features and flyways, e.g. bats.

- Option 1C: double circuit OHL, one corridor:
  - For this option, the nature of effects would be the same as for Option 1A, however the magnitude would be approximately half that for Option 1A, both during construction and operation.

Colour Coding for MCA

For the up-voltage of the 220kV, effects on biodiversity are considered to moderate.

BIODIVERSITY

The greatest effects on biodiversity are expected to be during construction as a result of the replacement of the OHL. There would be few significant impacts during operation, as a similar footprint is assumed for the OHL as the existing. Whilst the conductors and towers would be slightly higher, this is not expected to pose a significant increase in the risk of collision for birds, particularly in light of the evidence base suggesting that bird collisions with power lines are generally considered to be rare events.

For the Woodland turn, there were three options to consider. The colour codes for each are shown below:

OPTION 1A	OPTION 1B	OPTION 1C

The most high-risk effects on biodiversity from the Woodland Turn-in would be during construction, where two 12m wide swathes would traverse 7km of countryside each and require temporary and some permanent loss of habitat; the increased risk of pollution of watercourse from this option during construction is also potentially significant and could lead to permanent effects on aquatic ecosystems. Option 1A is moderate in terms of risk but there are two corridors of new OHL, each requiring permanent land take under each tower with associated increased magnitude in construction effects.

5.4.2 Soils and Water Impacts

Geology, Soils and Groundwater

Baseline

The Technology 1 Study Area is predominantly made up of limestones with some areas of shale and sandstones and calcareous greywacke siltstone and shale in the south east. Geological and soils constraints are shown in Appendix A, Maps 321084AE-MAP-002 and 321084AE-MAP-007.

Subsoils are predominantly made up of sandstone and limestone tills.

There are no Geological Heritage Sites within close proximity of the existing 220kV OHLs or in the widened part of the Study Area for the Woodland Turn-in.

Groundwater aquifers within the Technology 1 Study Area are predominantly Locally Important Aquifers, with one area of Regionally Important Aquifer crossing the Technology 1 Study Area between Newbridge and Sallins. There are small pockets of Karst Landforms along the existing 220kV OHL corridors; however, there is a

significant Karst Landforms to the north west of Woodland Substation, within the Technology 1 Study Area, as shown in Appendix A Map 321084AE-MAP-004 Groundwater Constraints and Figure 5.6.

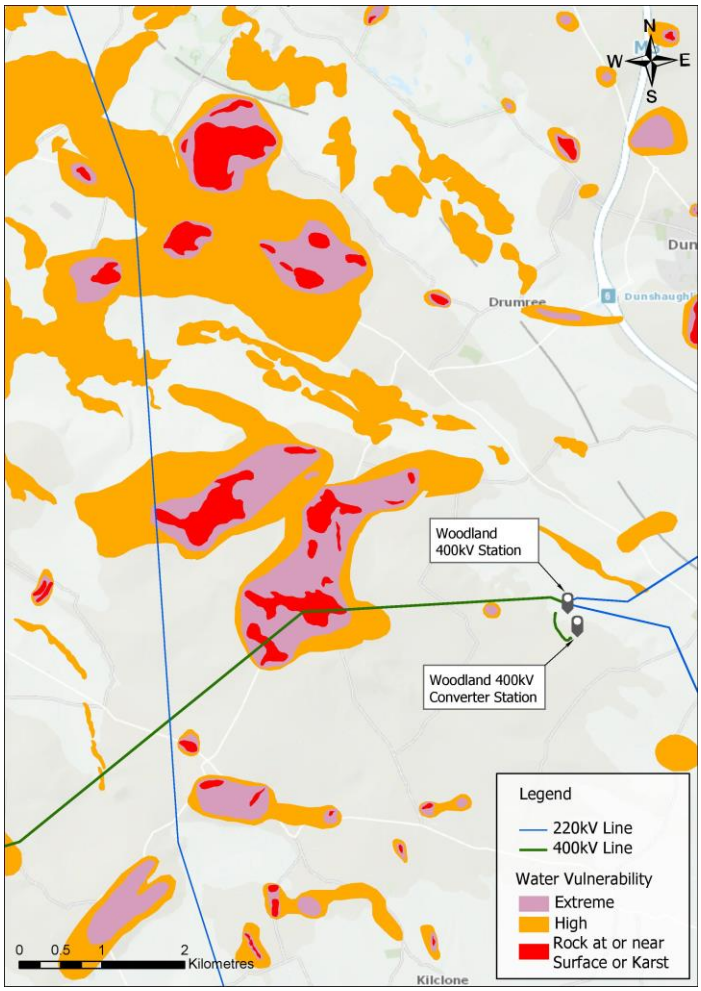


Figure 5.6 Groundwater Vulnerability close to Woodland Substation

The subsoils around Woodland substation are shale and sandstone till (Namurian) with an area of Alluvium to the north of the substation.

Potential Impacts

For the most part, it is not anticipated that the up-voltage technology would have significant effects on geology or soils, during construction; there would be no effects during operation.

For the Woodland Turn-In, the karst features to the north west of the substation could present a constraint to all options; however, Option 1B, the UGC option, would have the greatest potential effect on these features during construction and potentially during operation if new pathways to the aquifer are created by the installation of the cable.

Surface Water

Baseline

The Technology 1 Study Area is mostly within the Liffey sub-basin, with a small area within the Boyne catchment, to the south east of Staplestown. There is also a small section of the Slate_010, which forms part of the upper reaches of the Barrow catchment, within the Technology 1 Study Area, north and west of Prosperous.

Surface water constraints, in the form of water bodies and their WFD status, are shown in Appendix A, Map 321084AE-MAP-003.

The WFD Status of watercourses is varied across the Technology 1 Study Area, ranging from Poor to Good, however only one watercourse, Liffey_080 is of Good status and the remainder are mostly Moderate and Poor. There are a number of existing watercourses crossed by the existing 220kV overhead line including the Rye Water_020, Lyreen_010, Clonshanbo_010, Awillyinish Stream_010, Kilmurry_010, Liffey_130 and Liffey_100. It is likely that these watercourses will be crossed by the 400 kV up-voltaged line, however this is not certain as the line may be slightly re-routed and other watercourses impacted.

No waterbodies within the Technology 1 Study Area are designated as SACs; however, several are hydrologically connected to SACs. Specifically, these waterbodies would receive water *from* the bogs as part of the natural processes within the peatlands; there would be no movement from the waterbodies *into* the bogs. These are detailed in Table 5.1. These watercourses are considered to have greater sensitivity to changes in water quality or river characteristics and are therefore have higher importance in assessment terms. There are no salmonid watercourses within the Technology 1 Study Area. There is a hydrological connection to the Barrow and Nore SAC, which includes Freshwater Pearl Mussel as a feature of interest, from the Ballynafagh Bog and Lake SACs, however it is 28km downstream of these sites and so there would be no effect from the project on this species.

Table 5.1 Water bodies hydrologically connected to European Designated Sites

WFD Waterbody	Designated Site
Rye Water_040	Rye Water Valley/Carton SAC
Slate_010	Ballynafagh Bog SAC
Liffey_090	Mouds Bog SAC

The widened Technology 1 Study Area at Woodland Substation is mostly within Liffey and Dublin bay catchment and the Tolka WFD sub basin. The Tolka_020 runs adjacent to the north of the substation and is within the Good status Dunshaughlin groundwater body. There are some waterbodies in the north of the Technology 1 Study Area which form part of the Boyne catchment, also, although it is unlikely that these would be affected by any of the proposed works.

Potential waterbody crossings required include:

- Tolka_020 (poor status);
- Dunboyne Stream_010 (moderate status);
- Jenkinstown Stream_010 ('unassigned' status and so is assumed to be 'Good' status as a precautionary approach); and
- Knightsbrook_010 (poor status).

Each of these rivers is also identified as potentially at risk of fluvial flooding with recurring flooding highlighted on floodmaps.ie for the Tolka_020 at Culmullin Cross Roads and Merrywell.

Potential Impacts

There are a number of potential effects on surface water during construction of an OHL or UGC; there would be none during operation of the OHLs; although there may some as a result of the UGC, which is discussed below.

During construction of the OHL, both for the up-voltage and Woodland turn-in options, generic effects on surface water would include:

- Silty water run-off: surface water and dewatered groundwater containing high loads of suspended solids from construction activities. This includes the stripping of topsoil during site preparation; the construction of access roads; the dewatering of excavations and the storage of excavated material;
- Run-off being contaminated by a spillage or leakage of oils and fuels stored on site or direct from construction machinery; In the event of a spillage, there is a high likelihood of groundwater contamination. the slopes created by overbridging may increase the likelihood of surface water pollution from a spill;
- Change in the natural hydrological regime due to an increase in discharge as a result of dewatering. This may include changes to surrounding groundwater flow, or contaminated soil from previous land uses being disturbed causing pollutants such as heavy metals to enter ground and surface waters;
- Discharges of contaminated water from tunnelling and or excavations;
- High alkalinity run-off as a result of concrete works; and
- Potential for disrupting local drainage systems due to diversions required to accommodate the construction works.

Without mitigation, there is the potential for significant impacts to the affecting surface water receptors during the construction phase of the proposed project.

For the up-voltage works, these effects would be quite limited as it is anticipated that new towers would be positioned in the same place as the old towers, thereby minimizing the excavation and subsequent storage of soil; the excavation would be of existing concrete foundations which do not have the same potential for contaminating surface waters. There is potential for silty water runoff from access roads and for contamination from spillages as described above, from temporary plant, machinery and materials stored at construction compounds and laydown areas.

For the Woodland turn-in, the effects would be of the same nature as those described above, however specific effects are as follows:

- Option 1A:
  - During construction, there would be additional effects as a result of the need to excavate to build foundations for the towers; the magnitude of this would be approximately twice that of Option 1C as there are two corridors and two sets of towers to install. All other generic effects could be up to twice the magnitude for this option as for Option 1C. In addition, this option would require the oversailing of two rivers; however, with careful siting of the towers, this should not result in any effects on the watercourses; and
  - During operation there would be no effect on local surface waters.
- Option 1B:
  - During construction, this option has the potential to have a high magnitude of effect on local water bodies; the requirement to strip two 7km stretches of a 12m swathe, even if done in sections of approx. 500m at a time, has the potential to result in a significant amount of silty water runoff which could cause pollution of local water bodies. In addition, there is a requirement to cross two rivers to the north of

Woodland substation, which is likely to be achieved using 'open cut' techniques, with the rivers being either diverted or over-pumped. There is a high risk of silty water and other contaminants entering the water bodies during such an operation; and

- During operation, there would be limited effects on surface waters, however there is potential for disruption to overland and subsoil surface water flows as a result of the cable installation. The cable has the potential to act as a conduit for such flows, changing the hydrological characteristics of the local area. This effect however is not likely to be significant.

- Option 1C:
  - The nature of effects of Option 1C during construction and operation would be largely the same as Option 1A, with the exception of the river crossings. The magnitude would be approximately half that of Option 1A, as there would be only one corridor and one set of towers to construct.

Flood Risk

Baseline

There are a number of areas identified as potential at risk of fluvial flooding, these are detailed, from north to south of the Technology 1 Study Area:

- Lyreen_010 at Kilcock/Maynooth;
- Clonshanbo_010 at Painestown;
- In the Liffey catchment:
  - At Liffey_130 at Prosperous / Clane there is a large area of Medium probability flood risk; and
  - Awillyinish Stream_010, Liffey_090 and Liffey_100 at Carragh there is recurring fluvial flooding in the north west of the town on an unnamed tributary of the Liffey. Carragh is to the east of the existing 220 kV Maynooth - Dunstown circuit; the area prone to flooding is crossed by the OHL for a short stretch.
- The Tolka_020, Dunboyne Stream_010, Jenkinstown Stream_010 and Knightsbrook_010 in the northern part of the Technology 1 Study Area, all within 3km of Woodland Substation and some within 1km, are all at risk of flooding.

Potential Impacts

Potential effects on flood risk from the up-voltage would be very limited during construction and there would be none during operation. For the woodland Turn-in options, there would similarly be few or no effects on flood risk from Options 1A and 1C during construction or operation; Option 1B has the potential to effect flood risk both during construction and operation. The installation of the cables via a trench as the potential to disrupt surface water flows and provide a conduit to direct water to areas where flood risk may be increased. In addition, there is a requirement to cross a river which may be susceptible to flooding, which could cause difficulties during the construction phase and increase the risk of both flooding to and from the works, and silty water runoff.

Colour Coding for MCA – Soils and Water Impacts Combined

For the up-voltage of the 220kV, risks to soils and water are considered to be low to moderate.

Soils and Water

There would be no significant effects from this technology during the operational phase; effects could occur during construction, however it is anticipated that these would not be significant, as the proposed solution of replacing the existing 220kV OHL with towers in the same locations as those currently, minimises the excavations of soils

and subsequent impacts on soils and water. It would not be 'no effect' as there are inherent risks to soils and water with any major construction project, however it would be moderate to low risk.

For the Woodland Turn-in, there were three options to consider. The colour code for each is shown below:

OPTION 1A	OPTION 1B	OPTION 1C

The greatest impacts on soils and water from the Turn-in would be during construction for all options. There would be a relatively low risk (Cream) of impact on soil and water from Option 1C, as the uses a single OHL corridor and there are no river crossings likely and no karst landforms. Option 1A has a low to moderate risk (Green), as there are two corridors, with two river crossings and potential to construct in a karst landform area with consequential risk to groundwater. Option 1B has a predicted moderate to high risk to soils and water; this is because of the requirement for two 12m swathes, each 7km long (approximately). This would result in the stripping of sizeable area of grassland and topsoil, increasing the risk and amount of silty water runoff; the cable trenches themselves have the potential to act as a conduit for flood water and silty water from excavations; and two rivers would need to be crossed. In addition, the risk to groundwater in the karst landform area would be high during the installation of cables in this area.

5.4.3 Impact on Planning Policy and Land Use

Planning Policy

Baseline

Kildare County Development Plan (CDP)

The Kildare CDP commits to supporting and facilitating the requirements of major service providers, including EirGrid, in the enhancement and upgrading of existing infrastructure, or development of new infrastructure. The CDP caveats this, however, by stating that the siting of overhead cables should seek to minimise visual impact by avoiding areas of high landscape sensitivity and areas of nature conservation and/or archaeological interest, with preference given to undergrounding services where appropriate.

Meath County Development Plan

Much like in the Kildare CDP, it is the policy of the Council to facilitate the provision of energy networks and network extensions while promoting the undergrounding of existing overhead cables, particularly in the urban environment but also generally within areas of public open space.

Significant Planning Applications and Projects

There are a number of proposed developments and some under construction within the Technology 1 Study Area. An outline of these is provided in Table 5.2. There are a number of approved planning applications along the existing route of the 220kV line.

Table 5.2 Proposed Developments and Developments Under Construction – Kildare and Meath

County	Development Type	Description	Stage	Interaction with Technology 1
Meath	Road	M4 Maynooth to Leixlip	Project Appraisal	Partially within Technology 1 Study Area to the east of existing 220 kV line
Kildare	Road	N7 Naas Newbridge Bypass Upgrade	Construction	South of the Technology 1 Study Area. Crosses existing 220 kV line between Naas and Newbridge.
Kildare	Leisure	Proposed Tourist Village Kilcock 	Zone in County Development Plan	Within the Technology 1 Study Area to the west of the existing 220 kV line and Up-voltage Study Area.

In addition to these proposed developments, there are additional transmission network projects in the planning and development stage for connection into Woodland substation:

- CP 1021: Woodland-North Dublin Reinforcement;
- CP 0466: North-South Interconnector; and
- CP 0869: Maynooth - Woodland 220kV Line Refurbishment

Potential Impacts

The up-voltage of the existing 220kV is likely to be compliant with county and local planning policies as it is not introducing new structures into communities, landscapes or views. Similarly, there are unlikely to be any significant impacts on other major proposed developments as the 220kV is an existing line and would have been taken into account in the design of the developments. There is potential for cumulative effects during construction if projects are constructed at the same time, but this cannot be considered at this stage as timeframes for CP 966 are not yet defined. It is as yet unknown the timescales for the three transmission projects at Woodland, however there is potential for cumulative effects on land use if these occur together or in sequence.

The Woodland Turn-in has the potential to be constrained by local planning policies:

- Option 1A:
  - The proposal for two new OHL corridors in this area may be constrained by planning policies which seek to minimise new structures, especially in areas such as the Tara Skryne Hills LCA (see the Landscape and Views assessment);
- Option 1B:
  - This option is not likely to be constrained by local planning policies, as preference if given to the undergrounding of services wherever possible; there may be some concerns during the construction phase if third party lands are required to install the cables;
- Option 1C:
  - This option would be similarly constrained as Option 1A, except that only one corridor is proposed and so is likely to be less constrained as a result.

Land Use

Baseline

The land use in the area is predominantly agricultural pasture land, with more built up urban areas around the main settlements. There are a number of residential and commercial properties in close proximity to the existing Gorman to Maynooth and Maynooth to Dunstown 220 kV OHL. For the most part, the existing OHLs avoid the main settlements, coming close to residential and commercial properties mostly at the crossings of regional and local roads, along which linear settlements have arisen. Two Mile House to the west of Naas is an exception to this, however many of the residential properties here have been constructed since the OHL was built.

There are no large areas of forestry; although there are significant peatlands to the west of the Technology 1 Study Area. There a number of road crossings including two motorway crossings of the M4 and the M7; there are two railway crossings, the Dublin to Mullingar line and the Dublin to Kildare line; one crossing of the Grand Canal; and a number of river crossings, including the Liffey and several of its tributaries.

Commercial areas are largely confined to the main settlements, with an exception being Ladytown Industrial park, to the North West of Naas, at Junction 10 of the M7. There are no significant tourism sites within the Technology 1 Study Area and only two equine businesses.

The lands immediately surrounding Woodland substation are arable agricultural lands. There is no forestry or peat/bogs present. The Trim Road is about 750m from the site. There are also a number of residential properties between the existing 220 kV and the substation.

Potential Impacts

The up-voltage of the existing 220kV OHL would have no significant effect on land use during operation, and a small effect during construction as a result of temporary land take.

The Woodland Turn-in would have differing impacts for each Option as follows:

- Option 1A: the two new OHL corridors would require temporary land take during construction, and permanent land take for the new towers;
- Option 1B: this would require a significant temporary land take during construction, but limited during operation, although a permanent wayleave and some restriction of agricultural practices above the UGC is likely; and
- Option 1C: this would be similar to Option 1A but a lower impact as a result of only one corridor instead of two.

Colour Coding for MCA

For the up-voltage of the 220kV, risks to planning policy and land use are considered to be low.

Planning Policy and Land use

It is likely that this technology would accord with regional and local planning policies as no new structures are proposed. From a land use perspective, there would be no high risk effects from this technology during the operational phase; the effects would only occur during construction as a result of temporary land take. However, this would not be significant.

For the Woodland Turn-in, there were three options to consider. The colour code for each is shown below:

OPTION 1A	OPTION 1B	OPTION 1C

These codes illustrate the potential worst effects of each option, either during construction or operation and either from a planning policy perspective, land use or both where appropriate.

From a planning policy perspective, the greatest risk from Options 1A and 1C would be during operation: Option 1A would be moderate to high risk as this requires two new OHLs within a sensitive landscape; Option 1C would only require one new OHL, which, whilst still in a sensitive landscape would be a lower risk than Option 1A and would be a moderate risk. Option B would be consistent with planning policy.

In terms of land use, Option 1B would have the greatest impacts of all of the options both during construction, as a result of significant temporary land take and operation as it would also continue to have effects during operation with restrictions on land use practices likely. Options 1A and 1C impact on land use would be limited to the footprint of the pylons. That said, the greatest effects on land use from Option 1B would be temporary and most crops can be accommodated over cables. It would be a moderate effect on land use.

5.4.4 Landscape & Visual

Baseline

The majority of the existing route corridor is within the Northern Lowlands LCA in County Kildare, with a small section in the Eastern Transition, Western Boglands and River Liffey. Within County Meath area the corridor is predominantly within South East Lowlands, which is a Very High Value landscape with Moderate Sensitivity.

The County Development Plans for Meath and Kildare have identified Landscape Character Areas with low to high compatibility with certain types of infrastructure, including ‘major power lines’. A map showing these for the Technology 1 Study Area is presented in Appendix A, Map 321084AE-MAP-005. See also, Figure 5.7.

In Kildare, the Northern Lowlands is identified as being of low sensitivity and high compatibility with Major Powerline Infrastructure. Almost all other LCAs within the Technology 1 Study Area have been identified as Medium compatibility with overhead cables. Kilcock, Maynooth, Naas, and Prosperous all lie within the Northern Lowlands LCA; the CDP requires that development proposals in these areas utilise existing infrastructure where possible, taking into account absorption opportunities provided by the topography and surrounding vegetation.

There are areas of High Amenity within the Technology 1 Study Area including River Liffey.

There are also a number of other scenic viewpoints throughout the Technology 1 Study Area including several along bridges crossing the railway line from Maynooth to Kilcock and along Grand Canal which could be impacted.

The Woodland substation is within the Southeast Lowlands LCA on the edge of the Tara Skryne Hills LCA which lies to the north of the Technology 1 Study Area. The landscape of the Southeast Lowlands LCA is dominated by small fields, bounded by mature hedgerows, with clusters of woodland in the Technology 1 Study Area. The Moneypoint to Woodlands 400kV OHL crosses the Tara Skryne LCA travelling east to west into Woodland substation; the Gorman Maynooth 220kV OHL also crosses the same LCA, travelling in a north south direction. Two other 220kV OHLs connect into woodland substation from the east. In addition, the East West Interconnector Converter Station is located immediately south of Woodland substation.

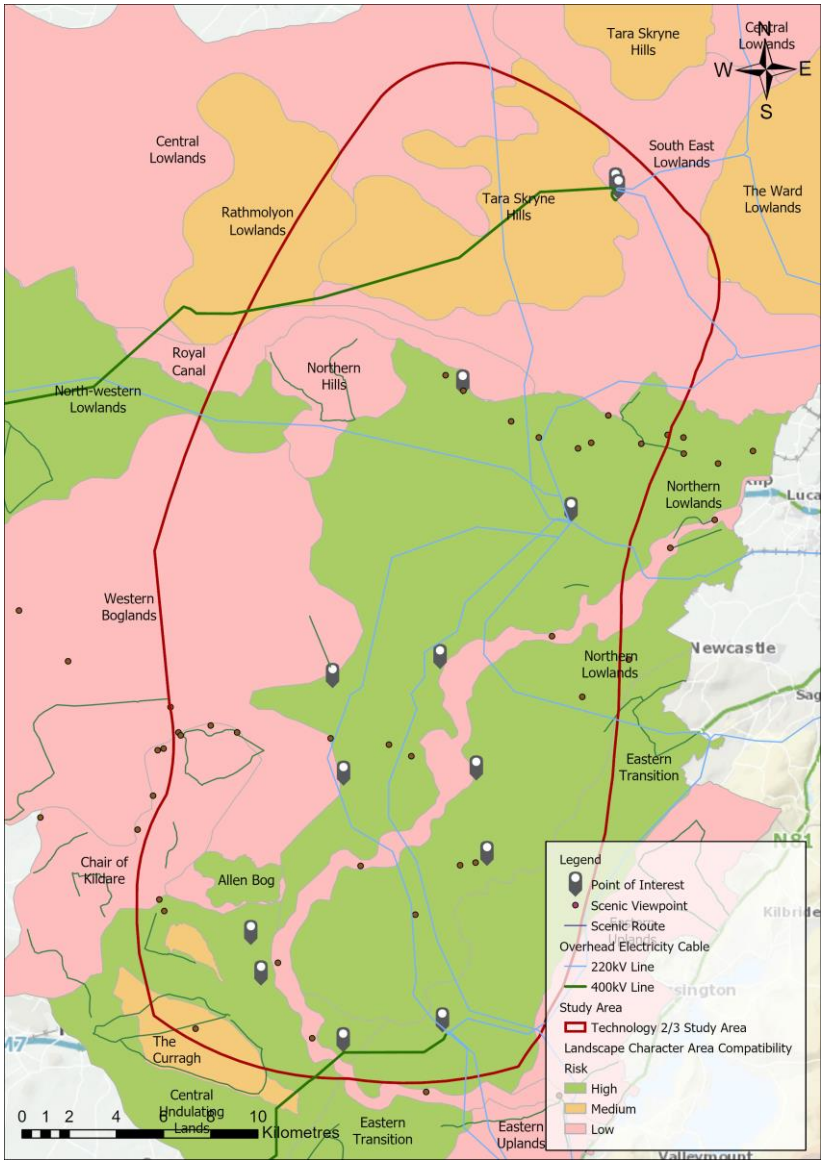


Figure 5.7 Landscape Character Areas

Potential Impacts

The up-voltage of the 220kV overhead line to a 400 kV overhead line is assumed to be on the same route as the existing 220 kV OHL; there may be some impacts on local landscapes as a result of taller towers and the increased height of the conductors, making them more likely to have visual effects over longer distances, however these are anticipated to be a relatively minor as there would be only a small change in magnitude of impact as compared to the existing OHL. Greater impacts would be likely in areas where a diversion from the existing corridor is necessary, although for the purposes of this assessment it is assumed no diversions will take place. In addition,

construction effects from the addition of a temporary OHL alongside the existing OHL have not been included as it is not yet clear that this would be the appropriate method for the up-voltage technology.

For the Woodland Turn-in, there would be differing effects on landscape and visual receptors from each of the three options:

- Option 1A: this requires two new OHLs, one to the north and one to the south of woodland substation. These would be new OHLs in a local area which currently has one OHL; the 400kV from Moneypoint. This option proposes a new corridor from the north of the substation, which most likely cross the Tara Skryne Hills LCA. This is a high sensitivity landscape and an OHL across hills would have a greater visual impact than one on a lowland plain. The second corridor, proposed to the south, is also likely to be wholly or in part within the Tara Skryne LCA;
- Option 1B: there would be some impacts from this option during construction, from temporary machinery and compounds; however, this is unlikely to be significant and would be largely screened by fencing. During operation, the UGC itself would not have any effects on landscape once reinstatement is completed and would have no effects on views. There would however be effects on both landscape and views as a result of the Sealing End Compounds required for each cable. It is not known at this stage where they would be positioned, however there would need to be one on the northern corridor and another on the southern corridor. These would be a permanent feature in the landscape and could have significant effects on the Tara Skryne LCA to the north, depending on the siting; and
- Option 1C: this option could be positioned to the north or south of the existing 400kV OHL. In either position, it could affect views and the Tara Skryne LCA. This option would have a lower magnitude of effects than Option 1A, whether positioned to the north or south as there would be only one OHL. The towers would be taller and the structures slightly more substantial to accommodate two circuits, but this would not be as high a magnitude as two OHL corridors in a sensitive landscape.

Colour Coding for MCA

For the up-voltage of the 220kV, risk to landscape and views are considered to be low to moderate.

Landscape and Views

It is likely that this would have some limited effects on landscape and views, during operation as a result of the increased height of the towers. There may be some effects during construction, but these are unlikely to be significant.

For the Woodland Turn-in, there were three options to consider. The colour code for each is shown below:

OPTION 1A	OPTION 1B	OPTION 1C

The greatest risk from Options 1A and 1C would be during operation: Option 1A would be moderate to high risk as this requires two new OHLs including one within a sensitive landscape; Option 1C would also require a new OHL but in a less sensitive landscape with medium compatibility for new electrical infrastructure. Option 1B would have the greatest impacts during construction, but these are unlikely to be significant; it would have some effects during operation as a result of the new sealing end compounds required for each corridor.

5.4.5 Cultural Heritage

Baseline

Cultural heritage designations are shown in the Constraints Plans provided in Appendix A, Map 321084AE-MAP-006. There are no World Heritage Sites in the Technology 1 Study Area but it includes the following cultural heritage assets:

- Built Heritage:
  - There are significant clusters of NIAH and RPS sites around Kilcock, Maynooth, Naas and Newbridge. To a lesser extent, there are also clusters of NIAH and RPS sites around the smaller urban areas of Phepotstown, Clane, Straffan, Sallins, Prosperous and Robertstown; and
  - The walled towns of Kildare and Naas are regarded as single recorded monuments in Kildare's County Development Plan 2017 – 2023. Kildare has its own Conservation and Management Plan.
- National Monuments:
  - National Monuments are widely distributed throughout the Technology 1 Study Area, with the more significant clusters occurring around Moynalvy, Agher, Cloncurry, Maynooth, Clane, Naas and Newbridge;
  - There are a number of National Monuments (RMP and SMR sites) scattered across the widened part of the Technology 1 Study Area close to Woodland Substation and a Moated Site immediately north west of the substation; and
  - There is also a cluster of National Monuments near Dunstown substation.
- Archaeological Resources and Areas of Archaeological Potential (AAP):
  - There have been a cluster of archaeological excavations around Maynooth town, and archaeological finds have been recorded to the west of Maynooth. A large number of archaeological finds have also been recorded around Sallins and Naas, particularly to the south east of Naas. A smaller cluster of finds is centered around Newbridge.[vii] There is a recorded excavation to the west of Woodland Substation, immediately north of the 400kV OHL; and
  - There is also a possibility of unknown, undesignated archaeological and architectural remains being discovered within the Technology 1 Study Area. AAPs have been assigned to Kildare, Silliothill, Naas, Rathmore, Kill, Oughterard, Cloncurry, Clane and Celbridge.

Potential Impacts

Further investigation and surveys are required to determine the exact nature of the heritage assets in the Technology 1 Study Area, however it is not anticipated that any of these assets would be affected either during construction or operation of the up-voltage technology for the existing 220kV OHLs.

For the Woodland Turn-in, there are differing effects from the three options:

- Option 1A:
  - During construction, there is the potential for heritage assets to be affected, especially unknown archaeology, during the excavation for the tower foundations; this is most likely to be an issue for the northern route corridor but could also occur to the south. The requirement for two corridors increases the risk to these assets; and
  - During operation, it is unlikely there would be any significant effects on heritage assets, although further work on protected and valued architectural assets is necessary to confirm this and to confirm there would be no effects on the settings of such assets. The heritage maps for Ireland do not provide details on such structures for Meath.

- Option 1B:
  - During construction, there is potential for significant effects on buried heritage assets, both known and unknown. The requirement for two corridors increases the risk to these assets from this option; and
  - During operation there would be no effects on heritage assets from this option.
- Option 1C:
  - The effects are similar to those from Option 1A, but with a lower risk as there would only be one corridor. If the corridor is to the north of the existing 400kV OHL the risks are likely to be greater than if it is routed to the south.

Colour Coding for MCA

For the up-voltage of the 220kV, risk to heritage assets are considered to be low.

Cultural Heritage

It is likely that this technology would have limited effects on heritage assets, during operation. There may be some effects during construction, but these are unlikely to be significant if the new towers are installed within the similar footprint as the existing towers.

For the Woodland Turn-in, there were three options to consider. The colour code for each is shown below:

OPTION 1A	OPTION 1B	OPTION 1C

The greatest risk from Options 1A and 1C would be during construction: Option 1A would be low to moderate risk as this requires two new OHLs and associated excavations for the tower foundations. Option 1C would also require a new OHL but there is only one OHL and associated excavations; however, Option 1C has also been assessed as low to moderate risk as a worst case, because if it is positioned north of the existing 400kV there are heritage assets in this area; if it is positioned to the south the risk would reduce to low. Option 1B has the potential for significant impacts on buried heritage assets during construction; it would have none during operation.

5.5 Key Constraints and Considerations for Technology 1

5.5.1 Biodiversity

For the up-voltage of the 220 kV, effects on biodiversity are considered to moderate. The greatest effects on biodiversity are expected to be during construction as a result of the replacement of the OHL. There would be few impacts during operation. , as a similar footprint is assumed for the OHL as the existing. Whilst the conductors and towers would be slightly higher (< 1m higher), this is not expected to pose a significant increase in collision risk for birds in the long term given the evidence base suggests that bird collisions with power lines are generally considered to be rare events.

For the Woodland turn, there were three options to consider. The most high-risk effects on biodiversity from the Woodland Turn-in would be during construction, where two 12m wide swathes would traverse 7km of countryside each and require temporary and some permanent loss of habitat; the increased risk of pollution of watercourse from this option during construction is also potentially significant and could lead to permanent effects on aquatic ecosystems. Option 1A is moderate in terms of risk but there are two corridors of new OHL, each requiring permanent land take under each tower with associated increased magnitude in construction effects.

5.5.2 Soils and Water

There would be no significant effects from this technology during the operational phase; effects could occur during construction, however it is anticipated that these would not be significant, as the proposed solution of replacing the existing 220kV OHL with towers in the same locations as those currently, minimises the excavations of soils and subsequent impacts on soils and water. It would not be 'no effect' as there are inherent risks to soils and water with any major construction project, however it would be moderate to low risk.

The greatest impacts on soils and water from the Turn-in would be during construction for all options. There would be a relatively low risk (Cream) of impact on soil and water from Option 1C, as the uses a single OHL corridor and there are no river crossings likely and no karst landforms. Option 1A has a low to moderate risk (Green), as there are two corridors, with two river crossings and potential to construct in a karst landform area with consequential risk to groundwater. Option 1B has a predicted moderate to high risk to soils and water; this is because of the requirement for two 12m swathes, each 7km long (approximately). This would result in the stripping of a sizeable area of grassland and soil, increasing the risk amount of silty water runoff; the cable trenches themselves have the potential to act as a conduit for flood water and silty water from excavations; and two rivers would need to be crossed. In addition, the risk to groundwater in the karst landform area would be high during the installation of cables in this area.

5.5.3 Planning Policy and Land Use

For the up-voltage of the 220 kV, effects on planning policy and land use are likely to be low. It is likely that this technology would accord with regional and local planning policies as no new structures are proposed. From a land use perspective, there would be no significant effects from this technology during the operational phase; the effects would only occur during construction as a result of temporary land take. However, this would not be significant.

For the Woodland Turn-in, from a planning policy perspective, the greatest risk from Options 1A and 1C would be during operation: Option 1A would be moderate-high risk as this requires two new OHLs within a sensitive landscape; Option 1C would only require one new OHL, which, whilst still in a sensitive landscape would be a lower risk than Option 1A and would be a moderate risk. Option B would be consistent with planning policy.

In terms of land use, Option 1B would have the greatest impacts of all of the options both during construction, as a result of significant temporary land take and operation as it would also continue to have effects during operation with restrictions on land use practices likely. Options 1A and 1C impact on land use would be limited to the footprint of the pylons. That said, the greatest effects on land use from Option 1B would be temporary and most crops can be accommodated over cables. It would be a moderate effect on land use.

5.5.4 Landscape and Views

For the up-voltage of the 220kV, effects on landscape and views are likely to be low to moderate. It is likely that this would have some limited effects on landscape and views, during operation as a result of the increased height of the towers. There may be some effects during construction, but these are unlikely to be significant.

For the Woodland Turn-in, the greatest risk from Options 1A and 1C would be during operation: Option 1A would be moderate to high risk as this requires two new OHLs including one within a sensitive landscape; Option 1C would also require a new OHL but in a less sensitive landscape with medium compatibility for new electrical infrastructure. Option 1B would have the greatest impacts during construction, but these are unlikely to be significant; it would have some effects during operation as a result of the new sealing end compounds required for each corridor.

5.5.5 Cultural Heritage

For the up-voltage of the 220kV, risks to heritage assets are likely to be low. It is likely that this technology would have limited effects on heritage assets, during operation. There may be some effects during construction, but these are unlikely to be significant if the new towers are installed within a similar footprint at the same location as the existing towers. For the Woodland Turn-in, the greatest risk to heritage assets from Options 1A and 1C would be during construction: Option 1A would be low to moderate risk as this requires two new OHLs and associated excavations for the tower foundations. Option 1C would also require a new OHL but there is only one OHL and associated excavations; however, Option 1C has also been assessed as low to moderate risk as a worst case, because if it is positioned north of the existing 400kV there are heritage assets in this area; if it is positioned to the south the risk would reduce to low. Option 1B has the potential for significant impacts on buried heritage assets during construction; it would have none during operation.

5.6 Summary Environmental Multi-Criteria Assessment for Technology 1

More significant/difficult/risk Less significant/difficult/risk

Table 5.3 Technology 1 Constraints Risk Assessment

Topic	Technology 1
	Up-voltage
Biodiversity	
Soil & Water	
Planning Policy and Land Use	
Landscape & Visual	
Cultural Heritage	
Summary	

Table 5.4 Technology 1 Woodland Turn In Constraints Risk Assessment

Topic	Options for Turn In		
	1A	1B	1C
Biodiversity			
Soil & Water			
Planning Policy and Land Use			
Landscape & Visual			
Cultural Heritage			
Summary			

6. Technology 2: New 400 kV Overhead Line

6.1 Overview of Technology 2

This technological solution consists of the construction of a new 400 kV overhead line (OHL) linking Woodland 400 kV station to Dunstown 400 kV station. No routes are proposed at this stage; however, it is anticipated that the new circuit would not be more than 50km in length.

Figure 6.1 illustrates a potential tower type for use in this solution. At 35m in height and 18.4m in width (conductor to conductor), it is smaller and more compact than the existing 400kV circuits.

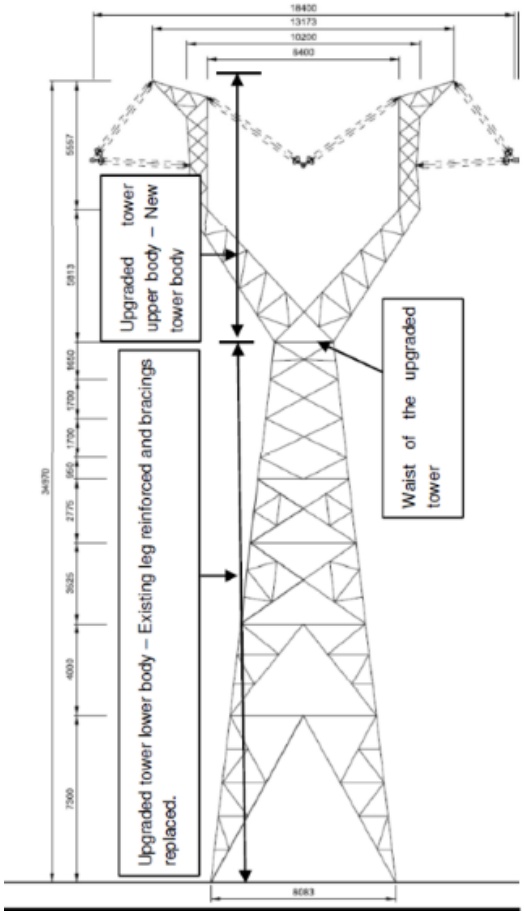


Figure 6.1 Potential Tower Type

6.2 Technology 2 Study Area

The Technology 2 Study Area has been influenced by EirGrid's policies and guidance on routing and infrastructure. Whilst a 'straight line' between Woodland and Dunstown would present the shortest route with the fewest turns and need for larger tension (angle) towers at the line deviation points, it would also encounter a significant number of constraints, including settlements, designated sites and important tourist amenities.

The Technology 2 Study Area has therefore been set wide enough to allow for the avoidance of environmental and social constraints. See Figure 6.2. In addition, for certain constraints, consideration is given to areas outside

of the Technology 2 Study Area; for example, in the case of birds which may migrate across the area from breeding grounds elsewhere.

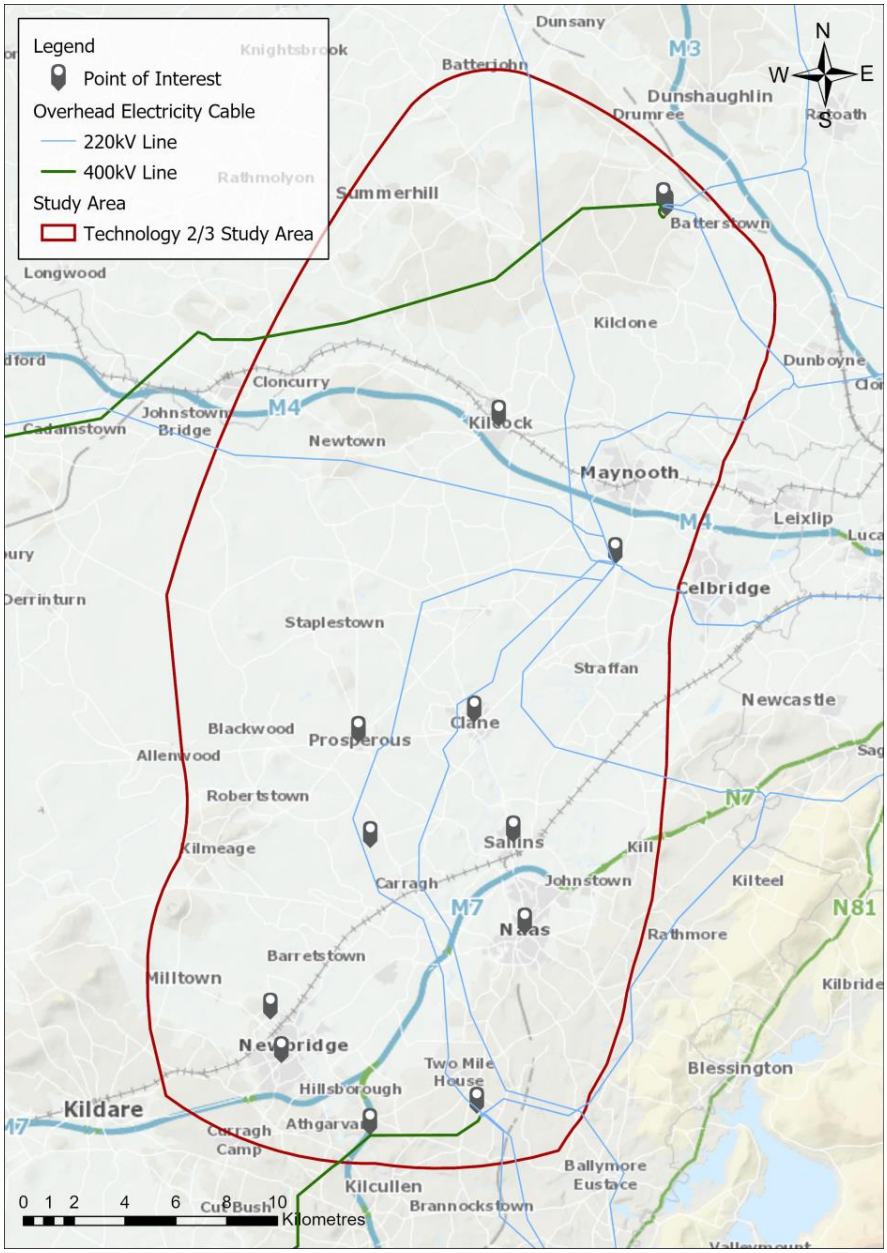


Figure 6.2 Technology 2 Study Area

6.3 Assumptions and Limitations

For this technology, the following assumptions have been made:

- The OHL options would be constructed using access from local roads, no access track along the route corridor would be installed, and no bridges across waterbodies required; and

- This assumption may not prevail for larger waterbodies such as the Liffey, where a temporary bridge or other means may be used to over sail it.

There are limitations to the assessment:

- There are currently no defined routes for the OHL; as such this assessment considers a reasonable worst-case scenario whereby settlements and protected sites are generally avoided but thereafter the greatest potential impacts on environmental constraints are identified.

6.4 Environmental Constraints

The constraints, organised under the various topics, are described in terms of baseline and potential impacts on them from the proposed solution. Following this, each topic is considered in the context of risk and EirGrid's colour scheme used to illustrate the potential risk from each constraint for this solution. The assessment combines constraints during construction and operation, assuming construction constraints are temporary.

More significant/difficult/risk Less significant/difficult/risk

This risk scale is clarified by text, as follows:

- High: dark blue;
- Moderate-high: blue;
- Moderate: dark green;
- Low-moderate: green; and
- Low: cream.

6.4.1 Biodiversity, Flora & Fauna

Baseline

There are five internationally designated sites within the Study Area, as shown in Table 6.1.

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Table 6.1 Designated Sites

Designated Site	Reasons for designation	Flora
Ballynafagh Bog SAC (also NHA)	Raised bog and depressions on peat substrates.	A high percentage cover of Sphagnum bog moss, with other bog mosses *(S. capillifolium, S. magellanicum, and S. cuspidatum*) in the wet active areas. Also, home to white and brown beak-sedge, bog asphodel, sundews, deergrass, bog rosemary, cranberry, bog asphodel, cross-leaved heath, hare's-tail cottongrass, downy birch, gorse, rushes, common cottongrass and carnation sedge.
Ballynafagh Lake SAC (also NHA)	Alkaline fen habitat, whorl snail and marsh fritillary butterfly species.	Blunt-flowered rush, black bog-rush dominate, with frequent sedges. other flora includes marsh-marigold, marsh lousewort, marsh arrowgrass, water mint and bulrush. extensive stands of common reed and bulrush occur around the open water, with a stand of great fen-sedge in the western corner.
Mouds Bog SAC (also NHA)	Raised bog and depressions on peat substrates	High percentage cover of Sphagnum bog moss with *S. magellanicum S. capillifolium, and S. tenellumin* in small pools. Other vegetation includes white and brown beak-sedge, bog asphodel, sundews, deergrass, carnation sedge, downy birch, heather, bog rosemary, cranberry, bog-myrtle, crowberry, tall common cottongrass purple moorgrass, soft rush and gorse.
Pollardstown Fen SAC/ Ramsar/Nature Reserve (also NHA)	Cladium fens, alkaline fens, petrifying springs, and three whorl snail species.	Narrow-leaved marsh-orchid, fly orchid, broad-leaved cottongrass, and the rare moss, *homalothecium nitens.*
Rye Water Valley/ Carton SAC (Also NHA)	Petrifying springs and two whorl snail species	*Lakes* - reed sweet-grass, yellow iris, reed canary-grass, bulrush, water forget-me-not, marsh-marigold and starworts are frequent around the lakes. *NW of carton bridge* - willows, dogwood, alder, ash and elder occurs. Ground flora includes golden saxifrage, meadowsweet, common valerian, wavy bitter-cress and bittersweet. Woods on Carton Estate conifers, including some yew, beech, oak, sycamore, ash and hazel. Ground flora dominated by ivy, with hedge, woundwort, wood speedwell, woodruff, wood avens, common dog-violet, wild angelica, ramsons, ground-ivy and ivy broomrape also found. Protected species hairy St. John's-Wort and hairy violet also occur. Rye Water - green figwort, a rare myxomycete fungus *diderma deplanatum.* Louisa bridge- stoneworts, marsh arrowgrass, purple moor-grass, sedges, common butterwort, marsh lousewort, grass-of parnassus, cuckooflower and blue fleabane.

A number of SPAs are designated for wintering bird species in the south east of Ireland, including whooper swan, teal, mallard, golden plover and curlew. Several bird species are considered vulnerable to collision with electricity transmission lines. Of particular concern are species listed under Annex I of the EU Bird Directive (2009/147/EC), red listed birds of conservation concern (Colhoun et al., 2013), and migratory water birds. Such species are at particular risk when using flight-lines on migration routes, travelling between molting and breeding grounds or to and from roosting sites and foraging beyond breeding grounds.

Table 4 in EirGrid's Ecology Guidelines for Electricity Transmission Projects (EirGrid, 2012) identifies a number of bird species and their susceptibility to collision with powerlines. Whooper swan in particular is a species at risk of potential collision with OHLs. Whooper swan utilise several sites throughout Co. Kildare, Co. Meath and Co. Wicklow outside of SPAs for foraging, roosting and migratory stops on route to winter sites including Wexford Harbour ad Slobs SPA.. Wintering bird species including whooper swan, teal, mallard, golden plover and curlew have been recorded using Ballynafagh Lake in the past, as noted in the site synopsis and standard data form for the SAC. Although not a qualifying interest species of Poulaphouca Reservoir SPA, whooper swan have been recorded using the reservoir and therefore there is potential for swans commuting to and from this site and other sites south east of the Technology 2 Study Area to migrate over the area.

There is a high number of wetland sites across the study area, including bogs (undesignated), wet grasslands, swamps, and alkaline fens. There are also some springs, such as the Rathcor Spring which feeds into the Grand Canal at Herbertsown.

The Technology 2 Study Area also includes the following important biodiversity sites:

- Hodgestown Bog NHA;
- pNHAs for:
    - Carton Demesne
    - Curragh
    - Donadea Wood (ancient woodland)
    - Grand Canal
    - Liffey Bank, above Athgarvan
    - Rahinstown woodland
    - Royal Canal
- Various pockets of native woodland throughout the Technology 2 Study Area;
- Biodiversity-rich hedgerows and trees throughout the Technology 2 Study Area;
- A *Margaritifera* (freshwater pearl mussel) Sensitive Area to the west of Prosperous; and
- Molinia meadow habitat, generally south of Barretstown.

Potential Impacts

Potential effects on biodiversity during construction include:

- Temporary loss of terrestrial and aquatic habitat within the footprint of the Project to facilitate access roads and construction compounds, particularly hedgerows and ditches;
- Disturbance, and temporary displacement of birds, mammals, amphibians, fish and other aquatic species from the working corridor and in close proximity to the Project;

- Temporary loss of foraging habitat for mammals such as badger and bat; and
- Pollution of surfaces waters, leading to secondary effects on aquatic species.

Whilst disturbance to hedgerows, ditches and their associated species during construction may be significant, it is likely to be a temporary impact only as it would occur to accommodate temporary works including access roads; it is possible for some permanent effects to occur as a result of construction activities, especially if a pollution event occurs in a watercourse, however it is assumed in this assessment that such effects would only be temporary. Trees and hedgerows also present further constraints in relation to birds: there is a risk of disturbing breeding birds in these habitats if removal were to take place in the summer months. This then places a seasonal constraint on this solution.

During construction, there is potential for significant impacts on designated sites to the west of the Technology 2 Study Area: there are peatlands here, in particular, Ballynafagh Bog and Ballynafagh Lake SACs/NHAs, to the north west of Prosperous. The lake is important for rare butterflies and snails, Eurasian teal, mallard, whooper swan, curlew and northern lapwing. Other SACs to the west include Mouds Bog SAC near Barretstown and Pollardstown Fen SAC, north of Newbridge. All of these SACs represent a constraint for any construction to the west of the Technology 2 Study Area. Construction of foundations for towers in these areas could also create pathways from the bogs to watercourses, leading to a draining of the bog and degradation of the habitat which supports the SAC features. There could therefore be permanent hydrological and ecological impacts that could undermine the conservation objectives of these SACs.

Potential effects on biodiversity during operation include:

- Permanent loss of habitat;
- Continued disturbance to habitats; and
- Collision risks for birds.

There would be permanent habitat loss within the footprint of the pylons, however this is unlikely to be significant apart from within designated habitats.

There is only one NHA in the Technology 2 Study Area; Hodgestown Bog, to the west, amidst the other peatlands. In the south west of the Technology 2 Study Area. The Curragh pNHA, in the south west of the Technology 2 Study Area, is one of a just a few pNHAs in the Technology 2 Study Area, including the Grand Canal and Donadea Wood. These sites are identified on a non-statutory basis, proposed in 1995, but have not since been statutorily proposed or designated. They are of significance for wildlife and habitats and are subject to limited protection, including recognition of their ecological value by Planning and Licensing Authorities. As such they are likely to place a constraint on the location of a new OHL.

There is potential for swans utilising these sites south east of the Technology 2 Study Area to migrate over the area. In addition to collision risk other potential effects of transmission infrastructure development on birds include the potential for temporary and/or permanent habitat disturbance/loss and/or fragmentation during the construction stage leading to potential impacts on roosting and/or nesting sites, as well as foraging habitat.

As described above, there could be some disturbance to whooper swans and other bird species from human presence during operation. Additionally, a new OHL presents a potential collision risk, however EirGrid's Evidence-Based Studies on birds[5] concludes that collisions with power lines were generally considered to be rare events.

Potential impacts on trees would be permanent; there are likely to be a number of veteran trees within the Technology 2 Study Area and there is one ancient woodland (Donadea Wood pNHA) which could be affected by a new OHL. Trees with the potential to interfere with the OHL (e.g. under or in close proximity to one) may need

[5] http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Evidence-Based-Environmental-Study-5-Birds.pdf

to be removed or trimmed. The biodiversity designations in the Technology 2 Study Area are shown in the constraints plans of Appendix A, Map 321084AE-MAP-001.

Colour Coding for MCA

For the new OHL, risk to biodiversity are considered to be low to moderate.

Biodiversity

Effects on biodiversity are expected to be of a similar level of risk, but of a different nature, during construction and operation: during construction there would be a temporary loss of habitats, including biodiversity rich hedgerows and ditches; during operation there may be a small loss of land within the footprint of the pylons and a loss of mature trees. There is some potential for disturbance and collision risk to whooper swans and other bird species from the new OHL, albeit the evidence base suggests that bird collisions with power lines are generally considered to be rare events.

6.4.2 Soils and Water Impacts

Geology, Soils and Groundwater

Baseline

The Technology 2 Study Area is predominantly made up of limestones with some areas of shale and sandstones in the north west and calcareous greywacke siltstone and shale in the south east.

Subsoils are predominantly made up of sandstone and limestone tills, with a large area of peatlands to the west.

There are 12 Geological Heritage Sites within the Technology 2 Study Area including:

- St. Peter's Well;
- Rathcore Spring;
- Pollardstown Fen and springs;
- Trim Esker;
- Liffey Oxbow;
- The Curragh;
- Galtrim Moraine;
- Liffey Valley;
- Kilbrook Spring;
- St. Patrick's Well 1;
- St. Patrick's Well 2; and
- Hill of Allen.

There are a number of Karst Landforms including two caves at Carton Demesne, two boreholes at Summerhill Demesne and Clonmahon, two springs at Kilbrook and at Tara Hills to the north of Woodland substation in the north of the Technology 2 Study Area, as shown in Appendix A Map 321084AE-MAP-004 Groundwater Constraints.

There is one area of landslide susceptibility at the western boundary of the Technology 2 Study Area at Derrymullen along the Grand Canal embankment.

There are 22 Groundwater bodies within the Technology 2 Study Area, the largest being the Dublin Groundwater body. Groundwater in the area is generally Good status with the exception of the areas at Silliot Hill Landfill and PDM Ltd (part of Saint Gobain) Industrial Facilities which are of Poor Groundwater Status.

- There are areas of Highly Vulnerable Groundwater to the south west of the Technology 2 Study Area at Newbridge and the central eastern side at Naas, Sallins, Clane, Straffan, Newbridge and Maynooth as well as in the west at Newtown and the north west at Summerhill.

There are two Public and Group Supply Source Protection Areas within the Technology 2 Study Area at Johnstown PWS and Robertstown PWS.

Potential Impacts

There would be limited impacts on soils and geology for most of the Technology 2 Study Area; if the OHL is routed across bogs or karst landforms then there could be significant impacts.

Surface Water

Baseline

There are 44 WFD river waterbodies within the Technology 2 Study Area; these are presented in Appendix A, Map 321084AE-MAP-003.

The main WFD River Basins are the Boyne, Liffey, Tolka and Barrow. The WFD Status is varied across the Technology 2 Study Area, ranging from Poor to Good. The majority of Good status waterbodies with the exception of Morell_010 are sections of the River Liffey which is located to the centre and south of the Technology 2 Study Area flowing north eastwards from Kilcullen to Newbridge and Naas and Clane to Celbridge.

No waterbodies are designated as SACs; however, several are hydrologically connected to SACs, as detailed in Table 6.2. These watercourses will be considered to have greater sensitivity to changes in water quality or river characteristics.

Table 6.2 Water bodies hydrologically connected to European Designated Sites

WFD Waterbody	Designated Site
Rye Water_040	Rye Water Valley/Carton SAC
Slate_010	Ballynafagh Bog SAC
Slate_020	Ballynafagh Bog SAC
Liffey_090	Mouds Bog SAC
Cloncumber Stream_010	Pollardstown Fen SAC

Potential Impacts

There are a number of potential effects on surface water during construction of an OHL; there would be none during operation of the OHLs.

During construction of the OHL, generic effects on surface water would include:

- Silty water run-off: surface water and dewatered groundwater containing high loads of suspended solids from construction activities. This includes the stripping of topsoil during site preparation; the construction of access roads; the dewatering of excavations and the storage of excavated material.
- Run-off being contaminated by a spillage or leakage of oils and fuels stored on site or direct from construction machinery; In the event of a spillage, there is a high likelihood of groundwater contamination. the slopes created by overbridging may increase the likelihood of surface water pollution from a spill.
- Change in the natural hydrological regime due to an increase in discharge as a result of dewatering. This may include changes to surrounding groundwater flow, or contaminated soil from previous land uses being disturbed causing pollutants such as heavy metals to enter ground and surface waters;
- Discharges of contaminated water from excavations;
- High alkalinity run-off as a result of concrete works; and
- Potential for disrupting local drainage systems due to diversions required to accommodate the construction works.

Without mitigation there is the potential for significant impacts to the affecting surface water receptors during the Construction phase of the proposed project.

Notwithstanding these potential impacts, with careful siting of the towers, construction work would not necessarily be close to water bodies apart from at crossing points, although it is assumed there would be no bridges required and that stringing could take place using other techniques across waterbodies. It is understood that this may prove difficult with more substantial water bodies such as the Liffey.

Flood Risk

Baseline

Fluvial flooding may be an issue in some areas of the Technology 2 Study Area:

- Rye Water sub basin through Kilcock and the north of Maynooth;
- Lyreen_010 south west of Maynooth;
- Clonshanbo_010 at Painestown;
- Stretches of the Liffey sub basin, incorporating a number of settlements such as Newbridge, Clane and Straffan;
- In the Liffey catchment;
    - At Liffey_130 at Prosperous / Clane there is a large area of Medium probability flood risk; and
    - Awillyinish Stream_010, Liffey_090 and Liffey_100 at Carragh there is recurring fluvial flooding in the north west of the town on an unnamed tributary of the Liffey. Carragh is to the east of the existing 220 kV Maynooth - Dunstown circuit; the area prone to flooding is crossed by the OHL for a short stretch.
- The Tolka_020, Dunboyne Stream_010, Jenkinstown Stream_010 and Knightsbrook_010 in the northern part of the Technology 2 Study Area, all within 3km of Woodland Substation and some within 1km, are all at risk of flooding.

Potential Impacts

Potential effects on flood risk from the new OHL would be very limited during construction and there would be none during operation. There is potential for flooding to affect the construction of the OHL however, depending on its route. A route across a flood plain could prove difficult or even unsafe at certain times of the year for construction.

Colour Coding for MCA – Soils and Water Impacts Combined

For the new OHL, risk to soils and water are considered to be low to moderate.

Soils and Water

There would be no significant effects from this technology during the operational phase; effects could occur during construction, however it is unlikely these would be significant as the proposed solution would avoid designated water bodies; 'fly over' others; excavations would be limited to the tower foundations; and access tracks from local roads likely to require minimal soil strip in site preparation. The significant karst feature to the north of Woodland substation would not be affected as any new connection would come from the south.

6.4.3 Planning Policy and Land Use

Planning Policy

Baseline

The CDPs for Kildare and Meath are outlined under Technology 1 and apply equally for this technology. Of particular note is Kildare's policy for electrical infrastructure which support the reinforcement of the network with the caveat that services are undergrounded wherever appropriate to do so.

Kilcock, Maynooth, Naas, and Prosperous all lie within the Northern Lowlands Landscape Character area in the Kildare CDP, which is classified as being of low sensitivity. The CDP does however state that proposals should, however, utilise existing infrastructure where possible, taking into account absorption opportunities provided by the topography and surrounding vegetation. Newbridge, Clane and Sallins all fall within the River Liffey Landscape Character Area, considered to be 'Class 4- Special' sensitivity, meaning it has low capacity to accommodate uses without significant adverse effects on the character of the landscape.

The following provides a brief overview of the key constraints identified within the Local Area Plans, including major constraining zonings for settlements within the Technology 2 Study Area:

- **Naas -** Designated a 'Large Growth Town I', Naas lies in the south-east of the Technology 2 Study Area. The town has good connectivity with major road and rail linkages. Potential constraints identified include the western area zoned for enterprise and employment which includes a newly-built interchange to the north west. The Grand Canal comes down from the north through the Oldtown Demesne, and a large area surrounding the can has been zoned as a 'Future park/green wedge' in order to secure the future recreational needs of the town. The equine industry is cited in the Local Area Plan as being of importance to the area, with the Naas Racecourse lying to the east of the town and various equine agricultural enterprises in the vicinity;
- **Maynooth -** A university town to the north-east of the Technology 2 Study Area, as a 'Large Growth Town II'. It lies in close proximity to the Kildare-Meath border and the town centre lies within Kildare while part of the wider 'Maynooth environs' lies within Meath to the north-east. Potential constraints centre on the education and tech-employment emphasis for the town. Land in the Moygaddy area to the north-east of the town has been zoned as 'Strategic Employment Zones (High Technology Uses)' aimed at providing a quality

campus-style environment for high technology and bio-tech. The University itself is located to the west of the town and lies within Technology 2 Study Area. It includes community and educational zonings as well as further zonings for research and technology aimed at attracting tech employment and University start-ups;

- **Newbridge -** Newbridge designated a 'Large Growth Town II' and lies to the south-west of the Technology 2 Study Area. The Pollardstown and Mouds Bog SACs lie to the north, while the river Liffey, described in the LAP as the 'green lung' of the town, flows through the centre. Large areas on either side of the river are zoned as 'open space and amenity' to facilitate a linear park aimed at intensifying the recreational use of greenspace for the purposes of walking, cycling, water-sports etc. To the south-west of the town lies The Curragh, a large open plain important to the local equine industry which also houses the Curragh Racecourse and Curragh Golf Course. The centre of the town contains the Whitewater Shopping Centre, an important retail hub servicing the local area;
- **Kilcock -** The town is designated a 'Moderate Sustained Growth Town'. It is afforded good transport linkages through the M4 Motorway to the south west and the railway running through the town. The areas around the motorway are designated open space, with the River Rye running along the north and the Royal Canal running through the centre, respectively;
- **Sallins -** Sallins is designated a 'Small Town' and lies just to the north of Naas. The River Liffey flows to the north west of the town, with the Grand Canal flowing through the centre to the south. Therefore, green infrastructure and the river economy is particularly important to the town, with large areas of open space and amenity being zoned around the river and canal;
- **Clane -** Clane is located in the central area of the Technology 2 Study Area. Designated a 'Small Town', Clane provides good connectivity through its location between the M4 and M7 motorways. As with Sallins, a key focus is green infrastructure through opportunities provided by the River Liffey to the south east, with areas surrounding the river zoned as 'strategic open space'; and
- **Prosperous -** Lying to the west of Clane, Prosperous is a designated 'Small Town' lying within the Technology 2 Study Area, at the intersection between the R403 and R408. It is mostly residential with educational uses to the south east and is surrounded by land zoned for agricultural use.

Potential Impacts

The introduction of a new OHL is may be compliant with county and local planning policies, depending on where it is sited. However, as the preference is for undergrounding of services where appropriate, a new OHL may be seen as non-compliant in some circumstances as it is introducing new structures into communities, landscapes and views.

It is uncertain whether there would be any significant impacts on other major proposed developments as no route corridor has been defined; such major developments would be taken into account in the design of the route, however. There is potential for cumulative effects during construction if projects are constructed at the same time, but this cannot be considered at this stage as timeframes for CP 966 are not yet defined.

Land Use

Baseline

The land use in the area is predominantly agricultural with more built up urban areas around the towns and villages. There are large areas of peatland and small areas of forestry to the west of the Technology 2 Study Area, as well as some smaller scattered areas of forestry further north and south.

There a number of road crossings including two motorway crossings of the M4 and the M7; there are two railway crossings, the Dublin to Mullingar line and the Dublin to Kildare line; one crossing of the Grand Canal; and a number of river crossings, including the Liffey and several of its tributaries.

As with Technology 1, there are a number of proposed developments and some under construction within the Technology 2 Study Area. An outline of these is provided in Table 5.2.

. They include two road improvement projects: the M4 from Maynooth to Leixlip and the N7 upgrade between Naas and Newbridge; and a proposed tourist village immediately south of Kilcock.

Potential Impacts

There would be limited impacts on land use as a result of this technology; the permanent land take would be limited to the footprint of the towers. It is acknowledged, however that there may be restrictions on land use going forwards as a result of the OHL crossing certain types of land. Depending on the route, it could lead to sterilisation of development land, concerns relating to different agricultural practices, or property values. The land take during construction would be limited and temporary, with access tracks from local roads being used.

Colour Coding for MCA

For the new OHL, risk to planning policy and land use are considered to be moderate.

Planning Policy and Land Use

As a worst case, it is possible that this technology would not fully accord with county planning policies as new structures are proposed and the route is not yet defined, however it is assumed that protected areas would not be crossed, main settlements avoided, and the more sensitive landscape also avoided where possible. From a land use perspective, there may a small number of significant effects on particular parcels of land during the operational phase. In combination therefore the risk is considered to be moderate.

6.4.4 Landscape and Visual

Baseline

The County Development Plans for Meath and Kildare have identified Landscape Character Areas with low to high compatibility with certain types of infrastructure, including ‘major power lines’. A map showing these for the Project Study Area is presented in Appendix A, Map 321084AE-MAP-005.

Within County Meath there are four Landscape Character Areas: south East Lowlands, Tara Skryne Hills, Rathmoylan Lowlands and Royal Canal.

Both South East Lowlands and Royal Canal are identified as Medium sensitivity LCAs with Regional Importance; Royal Canal is High Value landscape and South East Lowlands a Very High landscape. Tara Skryne Hills and Rathmoylan Lowlands are identified as High Sensitivity landscapes with Rathmoylan Lowlands High Value and National Importance and Tara Skryne Hills has Exceptional Value and National / International Importance. Tara Skryne Hills and Rathmoylan Lowlands are therefore deemed to be of Low compatibility with overhead cables; South East Lowlands and Royal Canal are Medium compatibility.

There are 12 Landscape Character Areas within the Kildare area of the Technology 2 Study Area: Chair of Kildare, Northern Lowlands; North-western Lowlands; Western Boglands; Northern Hills; Allen Bog; Pollardstown Fen; The Curragh; Central Undulating Lands; Eastern Transition; River Liffey; and Eastern Uplands. North-western Lowlands, Allen Bog, and Northern Lowlands have been identified as highly compatible with Major Powerline Infrastructure. Pollardstown Fen and The Curragh are high value landscapes and have therefore been identified as low compatibility. Newbridge, Clane and Sallins all fall within the River Liffey Landscape Character Area, considered to be ‘Class 4- Special’ sensitivity, meaning it has low capacity to accommodate uses without significant adverse effects on the character of the landscape.

There are also a number of Areas of High Amenity within the Technology 2 Study Area including River Liffey, Pollardstown Fen, the Curragh and Eastern Uplands. Only a small area of Eastern Uplands is within the Technology 2 Study Area, however potential long distant views from this area are also considered.

There are a number of scenic routes and viewpoints across the Technology 2 Study Area including routes providing views of Ballynafagh Lake in the centre of the Technology 2 Study Area, the Western Boglands in the north west, and of the Curragh in the south west and several viewpoints along bridges crossing the railway line from Maynooth to Kilcock and river views along the Rye Water north of Maynooth. There is also a scenic view point in the Tara Skryne Hills, to the west of the existing 220kV OHL.

Notwithstanding this, transmission infrastructure has been part of the Irish landscape for many decades; there is an extensive network of physical infrastructure across the country. The Technology 2 Study Area is highly populated, although not densely so, and is to the west of the Dublin conurbation. It has a number of OHLs already, with several 220kV OHLs converging on Maynooth substation in the centre of the Technology 2 Study Area; two 400kV OHLs entering into Woodland and Dunstown substations in the north and south of the Technology 2 Study Area respectively; and many 110kV and lower transmission lines crisscrossing the Technology 2 Study Area.

In addition, as has been stated under the land use section, the Technology 2 Study Area is crossed by two motorways and two major rail lines.

Potential Impacts

A new 400 kV OHL is likely to have an impact on the local landscape and views. Effects on landscape occur when there is considered to be a significant change in the landscape as a result of the introduction of a new structure; this significance depends upon the sensitivity of the landscape and the size or magnitude of the structure; the routing of a new OHL through a sensitive landscape is likely to have a significant impact on the landscape. IN terms of views, the sensitivity is that if the 'viewer' and the magnitude of the effect is determined by how prominent the structure is within certain views. A very large magnitude, for example, would command a view; a very small magnitude would be where the structure was not obvious or indistinct in views. In this regard, scenic routes and viewpoints are important or sensitive receptors, as are local communities, in particular residential dwellings. Some tourism sites may also depend upon views and would be considered sensitive receptors. The assumptions of the assessment are that the new OHL would avoid protected sites, main settlements and highly sensitive landscapes wherever possible. There is still the potential for effects on other landscapes and on views, both from designated view points and from residential properties, particularly the smaller, linear communities that are present throughout the Technology 2 Study Area.

Colour Coding for MCA

For the new OHL, risk to landscape and views are considered to be moderate to high.

Landscape and Visual

As set out above, there is potential for effects on landscapes and views across the Technology 2 Study Area, and the new OHL could be up to 40km in length, however with the more sensitive landscapes, viewpoints and main settlements largely avoided, this effect would be moderate to high. This would be an effect during the operation of the OHL, effects on landscape and views would be limited and not likely to be significant during construction.

6.4.5 Cultural Heritage

Baseline

There are no World Heritage Sites in the Technology 2 Study Area, but it includes the following cultural heritage assets:

- Built Heritage:
  - there are significant clusters of NIAH and RPS sites around Kilcock, Maynooth, Naas and Newbridge. To a lesser extent, there are also clusters of NIAH and RPS sites around the smaller urban areas of Phepotstown, Clane, Straffan, Sallins, Prosperous and Robertstown.; and
  - The walled towns of Kildare and Naas are regarded as single recorded monuments in Kildare's County Development Plan 2017 – 2023. Kildare has its own Conservation and Management Plan.
- National Monuments:
  - These are widely distributed throughout the Technology 2 Study Area, with the more significant clusters occurring around Moynalvy, Agher, Cloncurry, Maynooth, Clane, Naas and Newbridge. There are also a cluster of National Monuments around Dunstown substation.
- Archaeological resources:
  - There has been a cluster of archaeological excavations around Maynooth town, and archaeological finds have been recorded to the west of Maynooth. A large number of archaeological finds have also been recorded around Sallins and Naas, particularly to the south east of Naas. A smaller cluster of finds is centred around Newbridge;[viii]
  - There is also a possibility of unknown, undesignated archaeological and architectural remains being discovered within the Technology 2 Study Area; and
  - AAPs have been assigned to Kildare, Silliothill, Naas, Rathmore, Kill, Oughterard, Cloncurry, Clane and Celbridge.

All cultural heritage designations are shown in the Constraints Plans provided in Appendix A, Map321084AE-MAP-006.

Potential Impacts

During construction, there is the potential for heritage assets to be affected, especially unknown archaeology, during the excavation for the tower foundations.

During operation, there is potential for the new OHL to affect the setting of heritage assets throughout the Technology 2 Study Area.

Colour Coding for MCA

For the new OHL, risk to heritage assets are considered to be moderate.

Cultural Heritage

There is a combined effect of the potential for harm to unknown archaeological assets during construction and to the setting of built heritage assets during operation. Of these two potential effects, however, it is during operation that there are moderate effects.

6.5 Key Constraints and Considerations for Technology 2

6.5.1 Summary

Biodiversity, Flora & Fauna

Effects on biodiversity are expected to be of a similar level of risk, but of a different nature, during construction and operation: during construction there would be a temporary loss of habitats, including biodiversity rich hedgerows and ditches; during operation there may be a small loss of land within the footprint of the pylons and a loss of mature trees. There is some potential for disturbance and collision risk to whooper swans and other bird species from the new OHL, albeit the evidence base suggests that bird collisions with power lines are generally considered to be rare events.

Soils and Water

There would be no significant effects from this technology during the operational phase; effects could occur during construction, however it is unlikely these would be significant as the proposed solution would avoid designated water bodies; 'fly over' others; excavations would be limited to the tower foundations; and access tracks from local roads likely to require minimal soil strip in site preparation. The significant karst feature to the north of Woodland substation would not be affected as any new connection would come from the south.

Planning Policy & Land Use

For the new OHL, effects on planning policy and land use are considered to be moderate. As a worst case, it is possible that this technology would not fully accord with county planning policies as new structures are proposed and the route is not yet defined, however it is assumed that protected areas would not be crossed, main settlements avoided and the more sensitive landscape also avoided where possible. From a land use perspective, there may a small number of significant effects on particular parcels of land during the operational phase. In combination therefore the risk is considered to be moderate.

Landscape & Visual

For the new OHL, effects on landscape and views are considered to be moderate to high. As set out above, there is potential for effects on landscapes and views across the Technology 2 Study Area, and the new OHL could be up to 40km in length, however with the more sensitive landscapes, viewpoints and main settlements largely avoided, this effect would be moderate to high. This would be an effect during the operation of the OHL, effects on landscape and views would be limited and not likely to be significant during construction.

Cultural Heritage

For the new OHL, effects on heritage assets are considered to be moderate risk. There is a combined effect of the potential for harm to unknown archaeological assets during construction and to the setting of built heritage assets during operation. Of these two potential effects, however, it is during operation that the more significant effects are likely to arise.

6.5.2 Assessment of Technology 2

The constraints have been considered in the context of risk and EirGrid's colour scheme used to illustrate the potential risk from each constraint for this solution. This is presented in Table 6.3.

More significant/difficult/risk Less significant/difficult/risk

Table 6.3 Technology 2 Constraints Risk Assessment

Topic	Technology 2 New OHL
Biodiversity	
Soil & Water	
Planning Policy & Land Use	
Landscape & Visual	
Cultural Heritage	
Summary	

7. Technology 3: New Underground Cable Circuit

7.1 Technical Background to the Technology

The cable route is to connect the existing Dunstown 400 kV substation and Woodland 400 kV substation (a route length of approximately 50km). Three potential solutions were identified, investigated and presented in the CP966 Cable Feasibility Report [ix].

- Option 3A: 220kV UGC (12m cable swathe);
- Option 3B: 400kV UGC (one conductor per phase; single 12m cable swathe); and
- Option 3C: 400kV UGC (two conductors per phase in two separate 12m swathes).

An important aspect of this technology from an environmental constraint and impacts perspective is the method employed to install the cables. There are three different methods that could be employed to install the cables, depending on the nature of ground and local constraints:

- Trenched (sometimes called 'Open Cut':
  - Direct buried cables; and
  - Ducted cables.
- Trenchless:
  - HDD;
  - Deep bore tunnel; and
  - Pipe Jacking/micro tunnels.
- Bespoke cable bridges.

For the majority of the route, the cables would be installed using 'Open Cut'; however, at significant constraints such as rail, major roads, and large rivers or canals, trenchless or bridging techniques may be employed.

In order to install the cables using the 'Open Cut' technique, a temporary working strip or 'swathe' is required to facilitate the construction. This is defined as the area of land required, a cable corridor, for the construction of high voltage UGC. This is far larger than the width of the trench alone as there will be various ongoing construction activities within the temporary working strip, such as:

- Storage of equipment, and materials;
- Storage of the excavated topsoil and subsoil;
- Delivery of cable drums to site
- Excavation of the cable trench;
- Cable drums and accessories deliveries;
- Excavation equipment deliveries;
- Jointing equipment and wellbeing facilities deliveries and removal;
- Specialised backfills deliveries;
- Waste removal; and
- Staff ingress/egress from site.

For the purpose of this study, it is estimated that the swathe would be 12m, both for the 220kV option and the 400kV options.

7.2 Technology 3 Study Area

The Technology 3 Study Area is the same as for Technology 2 (See Figure 6.2). Within this review of the Study Area, particular attention is given to constraints associated with the highway network because EirGrid's preferred approach to the UGC solutions is to use the existing road network and bury the cables in the roads.

The CP966 Cable Feasibility Report (321084AE-REP-001) identifies a number of typical constraints for underground cables:

- Bridges;
- Canals;
- Rivers;
- Railways;
- Other underground utilities; and
- Third party land.

This section of the Environmental Constraints report considers the river and canal crossings, and also roadside constraints such as ditches, hedgerows and buried or built heritage. The other constraints are addressed in the Cable Feasibility Report.

7.3 Assumptions and Limitations

For this technology, the following assumptions have been made:

- Options 3A and 3B both require a 12m swathe and so will be assessed together; there would be no difference in effects between the two;
- Option 3C, the 400kV two core phase will be laid in two separate 12m swathes. As such it is assumed that the effects could be up to twice that of Options 1A and 1B;
- The cable will be installed in sections equal to the length of cable on drum (700m). Welfare facilities and storage area to be provided at the end of each section;
- The cables will be laid using the local road network and will not cross third-party land, except close to the connection at Woodland where it is likely it would have to cross third party lands as the local road network is not large enough to accommodate the 12m swathe;
- It is anticipated that in smaller roads the working strip will only be used where there are hedges or fences either side of the road which can be reinstated;
- There are points along the routes with trees either side where the swathe will be reduced and limited to road surface, the verge either side and storage compounds would be positioned at either end of the section;
- It is not known if the cables can be laid in bridges crossing rivers; it is assumed that this would be utilized wherever possible;
- The cables would be connected into the substation as cables and there would be no requirement for OHL connections and the associated Sealing End Compounds at either end of the route; and

- The rate of installation for the cables is assumed to be 150 to 200m per day; this means, to install 50km it would take up to three years to install a single phase of UGC.

There are limitations to the assessment:

- The routes of the cables are not yet known, although it is assumed, as above that regional roads would be used within the Technology 3 Study Area; and
- The technology that would be deployed to cross constraints such as rivers is not known; it is assumed crossings of large rivers would be trenchless and smaller rivers and ditches by 'open cut' requiring a need for diversions or over-pumping.

7.4 Environmental Constraints

The constraints, organised under the various topics, are described in terms of baseline and potential impacts on them from the proposed solution. Following this, each topic is considered in the context of risk and EirGrid's colour scheme used to illustrate the potential risk from each constraint for this solution. The assessment combines constraints during construction and operation, assuming construction constraints are temporary.

More significant/difficult/risk Less significant/difficult/risk

This risk scale is clarified by text, as follows:

- High: dark blue;
- Moderate-high: blue;
- Moderate: dark green;
- Low-moderate: green; and
- Low: cream.

7.4.1 Biodiversity, Flora & Fauna

Baseline

There are five internationally designated sites within the Technology 3 Study Area, see Table 7.1. The biodiversity designations in the Technology 3 Study Area are shown in the constraints plans of Appendix A, Map 321084AE-MAP-001.

Table 7.1 Biodiversity Designations

Designated Site	Reasons for designation	Flora
Ballynafagh Bog SAC (also NHA)	Raised bog and depressions on peat substrates.	A high percentage cover of Sphagnum bog moss, with other bog mosses *(S. capillifolium, S. magellanicum, and S. cuspidatum*) in the wet active areas. Also, home to white and brown beak-sedge, bog asphodel, sundews, deergrass, bog rosemary, cranberry, bog asphodel, cross-leaved heath, hare's-tail cottongrass, downy birch, gorse, rushes, common cottongrass and carnation sedge.
Ballynafagh Lake SAC (also NHA)	Alkaline fen habitat, whorl snail and marsh fritillary butterfly species.	Blunt-flowered rush, black bog-rush dominate, with frequent sedges. other flora includes marsh-marigold, marsh lousewort, marsh arrowgrass, water mint and bulrush. extensive stands of common reed and bulrush occur around the open water, with a stand of great fen-sedge in the western corner.
Mouds Bog SAC (also NHA)	Raised bog and depressions on peat substrates	High percentage cover of Sphagnum bog moss with *S. magellanicum S. capillifolium, and S. tenellumin* in small pools. Other vegetation includes white and brown beak-sedge, bog asphodel, sundews, deergrass, carnation sedge, downy birch, heather, bog rosemary, cranberry, bog-myrtle, crowberry, tall common cottongrass purple moorgrass, soft rush and gorse.
Pollardstown Fen SAC/ Ramsar/Nature Reserve (also NHA)	Cladium fens, alkaline fens, petrifying springs, and three whorl snail species.	Narrow-leaved marsh-orchid, fly orchid, broad-leaved cottongrass, and the rare moss, *homalothecium nitens.*
Rye Water Valley/ Carton SAC (Also NHA)	Petrifying springs and two whorl snail species	*Lakes* - reed sweet-grass, yellow iris, reed canary-grass, bulrush, water forget-me-not, marsh-marigold and starworts are frequent around the lakes. *NW of carton bridge* - willows, dogwood, alder, ash and elder occurs. Ground flora includes golden saxifrage, meadowsweet, common valerian, wavy bitter-cress and bittersweet. Woods on Carton Estate conifers, including some yew, beech, oak, sycamore, ash and hazel. Ground flora dominated by ivy, with hedge, woundwort, wood speedwell, woodruff, wood avens, common dog-violet, wild angelica, ramsons, ground-ivy and ivy broomrape also found. Protected species hairy St. John's-Wort and hairy violet also occur. Rye Water - green figwort, a rare myxomycete fungus *diderma deplanatum.* Louisa bridge- stoneworts, marsh arrowgrass, purple moor-grass, sedges, common butterwort, marsh lousewort, grass-of parnassus, cuckooflower and blue fleabane.

The bogs drain into the Slate water body; approximately 20km downstream of the bogs, the Slate outfalls to the Figile, which outfalls to the Barrow a further 4k downstream of that. The Barrow at this point is part of the River Barrow and Nore SAC. Amongst the features it is listed for are *Margaritifera* (Freshwater Pearl Mussels).

There is a high number of wetland sites across the study area, including bogs (undesignated), wet grasslands, swamps, and alkaline fens. There are also some springs, such as the Rathcor Spring which feeds into the Grand Canal at Herbertsown.

The Technology 3 Study Area also includes the following important biodiversity sites:

- Hodgestown Bog NHA;
- pNHAs for:
  - Carton Demesne;
  - Curragh;
  - Donadea Wood;
  - Grand Canal;
  - Liffey Bank, above Athgarvan;
  - Rahinstown woodland;
  - Royal Canal.
- Various pockets of native woodland throughout the Technology 3 Study Area;
- Biodiversity-rich hedgerows and trees throughout the Technology 3 Study Area;
- A *Margaritifera* (freshwater pearl mussel) Sensitive Area to the west of Prosperous; and
- Molinia meadow habitat, generally south of Barretstown.

Potential Impacts

Potential generic effects on biodiversity during construction include:

- Temporary loss of terrestrial and aquatic habitat within the footprint of the Project to facilitate access roads and construction compounds, particularly hedgerows and ditches;
- Disturbance, and temporary displacement of birds, mammals, amphibians, fish and other aquatic species from the working corridor and in close proximity to the Project;
- Temporary loss of foraging habitat for mammals such as badger and bat; and
- Pollution of surfaces waters, leading to secondary effects on aquatic species.

Whilst disturbance to hedgerows, ditches and their associated species during construction may be significant, it is likely to be a temporary impact, although it is possible for some permanent effects to occur as a result of construction activities, especially if a pollution event occurs in a watercourse. These tree and hedgerow constraints also present further constraints in relation to birds: there is a risk of disturbing breeding birds in these habitats if removal were to take place in the summer months. This then places a seasonal constraint on this solution. It would be possible to plant new hedgerows without a risk of interference with the operation of the UGC. However, it would not be possible to plant tree species as the roots of mature trees could potentially interfere with the cables.

During construction, there is potential for significant impacts on designated sites to the west of the Technology 3 Study Area: there are peatlands here, in particular, Ballynafagh Bog and Ballynafagh Lake SACs/NHAs, to the north west of Prosperous. The lake is important for rare butterflies and snails, Eurasian teal, mallard, whooper swan, curlew and northern lapwing. Other SACs to the west include Mouds Bog SAC near Barretstown and

Pollardstown Fen SAC, north of Newbridge. All of these SACs present a constraint for any construction to the west of the Technology 3 Study Area. Whilst it is assumed the UGC routes would not cross the bogs, as the cables are being installed in roads, bogs are sometimes in close proximity to the roads and may be indirectly impacted. There could be direct construction footprint impacts on these sites. Excavation in these areas could also create pathways from the bogs to watercourses leading to a draining of the bog and degradation of the habitat which supports the SAC features. These could lead to permanent hydrological and ecological impacts.

Any cable routes that are required to cross watercourses could potentially disturb or damage aquatic or riparian habitat in the construction footprint. Trenchless crossing techniques for the larger rivers would have lower likelihood of impacts but there are still risks associated with this technique. It is unlikely, however that there would be any impact on Freshwater Pearl Mussels in the Barrow as a result of construction activity in the Technology 3 Study Area as the Barrow is approximately 24km downstream of the most western edge of the Technology 3 Study Area.

In the south west of the Technology 3 Study Area, is the Curragh pNHA; it is one of a just a few pNHAs in the Technology 3 Study Area, including the Grand Canal and Donadea Wood. These sites are identified on a non-statutory basis, proposed in 1995, but have not since been statutorily proposed or designated. They are of significance for wildlife and habitats and are subject to limited protection including recognition of their ecological value by Planning and Licensing Authorities. A such they are likely to place a constraint on the location of the construction works.

There are fewer biodiversity constraints within this Technology 3 Study Area than for Technology 2 as there would be a smaller surface-level footprint. However, the working strip could potentially require the removal of biodiversity-rich hedgerows alongside roads and/or on third party land. There could also be impacts on nesting birds, bats and other species in these wildlife corridors.

Colour Coding for MCA

For the UGC options, effects on biodiversity are considered to be as follows:

OPTION 3A	OPTION 3B	OPTION 3C

The greatest effects on biodiversity would be during construction, where despite cables primarily being laid in public roads, there is potential for impacts on hedgerows and aquatic ecosystems in particular; other habitats may also be disturbed or fragmented during the construction phase and effects could be permanent in some cases. Options 3A and 3B would have the same effects (moderate risk); Option 3C would have a greater magnitude of effects, depending on the route chosen, assessed to be moderate-high risk.

7.4.2 Soils and Water Impacts

Geology, Soils and Groundwater

Baseline

The Technology 3 Study Area is predominantly made up of limestones with some areas of shale and sandstones in the north west and calcareous greywacke siltstone and shale in the south east.

Subsoils are predominantly made up of sandstone and limestone tills, with a large area of peatlands to the west.

There are 12 Geological Heritage Sites within the Technology 3 Study Area including:

- St. Peter's Well;
- Rathcore Spring;
- Pollardstown Fen and springs;
- Trim Esker;
- Liffey Oxbow;
- The Curragh;
- Galtrim Moraine;
- Liffey Valley;
- Kilbrook Spring;
- St. Patrick's Well 1;
- St. Patrick's Well 2; and
- Hill of Allen.

There are six Karst Landforms including two caves at Carton Demesne, two boreholes at Summerhill Demesne and Clonmahon two springs at Kilbrook and at Tara Hills to the north of Woodland substation in the north of the Technology 3 Study Area as shown in Appendix A Map 321084AE-MAP-004 Groundwater Constraints.

There is one area of landslide susceptibility at the western boundary of the Technology 3 Study Area at Derrymullen along the Grand Canal embankment.

There are 22 Groundwater bodies within the Technology 3 Study Area, the largest being the Dublin Groundwater body. Groundwater in the area is generally Good status with the exception of the areas at Silliot Hill Landfill and PDM Ltd (part of Saint Gobain) Industrial Facilities which are of Poor Groundwater Status.

There are areas of Highly Vulnerable Groundwater to the south west of the Technology 3 Study Area at Newbridge and the central eastern side at Naas, Sallins, Clane, Straffan, Newbridge and Maynooth as well as in the west at Newtown and the north west at Summerhill.

There are two Public and Group Supply Source Protection Areas within the Technology 3 Study Area at Johnstown PWS and Robertstown PWS.

Potential Impacts

Given the assumption that the UGC routes would be within public roads, and roads large enough to accommodate a 12m swathe, it is not anticipated that there would be significant effects on geology, soils or groundwater during construction. The only potential risk area would be at the northern connection into Woodland substation where the UGC would have to cross third-party land. However, karst landforms are to the north of the substation and so should not be at risk during construction.

Surface Water

Baseline

There are 44 WFD river waterbodies within the Technology 3 Study Area illustrated Appendix A, Map321084AE-MAP-003.

The main WFD River Basins are the Boyne, Liffey, Tolka and Barrow. The water quality is varied across the study are, ranging from Poor to Good. The majority of Good status waterbodies with the exception of Morell_010 are sections of the River Liffey which is located to the centre and south of the Technology 3 Study Area flowing north eastwards from Kilcullen to Newbridge and Naas and Clane to Celbridge.

No waterbodies are designed as SACs; however, several are hydrologically connected to SACs, detailed in Table 7.2. Specifically, these waterbodies would receive water *from* the bogs as part of the natural processes within the peatlands; there would be no movement from the waterbodies *into* the bogs. These watercourses are considered to have greater sensitivity to changes in water quality or river characteristics and are therefore have higher importance in assessment terms. There are no salmonid watercourses within the Technology 3 Study Area. There is a hydrological connection to the Barrow and Nore SAC, which includes Freshwater Pearl Mussel as a feature of interest, from the Ballynafagh Bog and Lake SACs, however it is 28km downstream of these sites and so there would be no effect from the project on this species.

Table 7.2 WFD Waterbodies which connect to SACs

WFD Waterbody	Designated Site
Rye Water_040	Rye Water Valley/Carton SAC
Slate_010	Ballynafagh Bog SAC
Slate_020	Ballynafagh Bog SAC
Liffey_090	Mouds Bog SAC
Cloncumber Stream_010	Pollardstown Fen SAC

Potential Impacts

There are a number of potential effects on surface water during construction of an UGC; there would be none during operation of the UGCs.

During construction, generic effects on surface water would include:

- Silty water run-off: surface water and dewatered groundwater containing high loads of suspended solids from construction activities. This includes the stripping of topsoil during site preparation; the construction of access roads; the dewatering of excavations and the storage of excavated material.
- Run-off being contaminated by a spillage or leakage of oils and fuels stored on site or direct from construction machinery; In the event of a spillage, there is a high likelihood of groundwater contamination. the slopes created by overbridging may increase the likelihood of surface water pollution from a spill.
- Change in the natural hydrological regime due to an increase in discharge as a result of dewatering. This may include changes to surrounding groundwater flow, or contaminated soil from previous land uses being disturbed causing pollutants such as heavy metals to enter ground and surface waters;
- Discharges of contaminated water from excavations;
- High alkalinity run-off as a result of concrete works; and

- Potential for disrupting local drainage systems due to diversions required to accommodate the construction works.

Without mitigation there is the potential for significant impacts to the affecting surface water receptors during the Construction phase of the proposed project.

Specifically, for the UGCs, the crossing of watercourses, especially those connected to the SACs, presents a significant constraint for all of the UGC options. Various techniques could be deployed: for larger rivers and canals it is expected that crossings would be trenchless, possibly through the use of directional drilling; for smaller rivers and ditches, open-cut techniques are more likely and these present the potential for greater impacts on the water bodies as a result of impacts on riverbanks and the potential during construction for the cable trench to act as a conduit for silty water runoff into local rivers and streams.

In addition, many of the local roads in the Technology 3 Study Area have open drainage ditches alongside them, which are hydrologically connected to larger water bodies, some of which are connected to SACs. These then present an important constraint on the ability to install UGC in the road network within the Technology 3 Study Area.

Flood Risk

Baseline

Fluvial flooding may be an issue in some areas of the Technology 3 Study Area:

- Rye Water sub basin through Kilcock and the north of Maynooth;
- Lyreen_010 south west of Maynooth;
- Clonshanbo_010 at Painestown;
- Stretches of the Liffey sub basin, incorporating a number of settlements such as Newbridge, Clane and Straffan.
- In the Liffey catchment;
    - At Liffey_130 at Prosperous / Clane there is a large area of Medium probability flood risk;
    - Awillyinish Stream_010, Liffey_090 and Liffey_100 at Carragh there is recurring fluvial flooding in the north west of the town on an unnamed tributary of the Liffey. Carragh is to the east of the existing 220 kV Maynooth - Dunstown circuit; the area prone to flooding is crossed by the OHL for a short stretch; and
- The Tolka_020, Dunboyne Stream_010, Jenkinstown Stream_010 and Knightsbrook_010 in the northern part of the Technology 3 Study Area, all within 3km of Woodland Substation and some within 1km, are all at risk of flooding.

Potential Impacts

The installation of the cables via a trench as the potential to disrupt surface water flows and provide a conduit to direct water to areas where flood risk may be increased. In addition, there is a requirement to cross several rivers and streams which may be susceptible to flooding, which could cause difficulties during the construction phase and increase the risk of both flooding to and from the works, in addition to increasing the likelihood of silty water runoff.

The stockpiling of excavated material alongside the trench may also act as a ‘bund’ and cause either localised pooling of surface waters on land or a diversion into rivers and streams with insufficient capacity to receive it causing localised flooding.

It is not anticipated that there would be impacts on flood risk during operation as the cables will be installed in the road network; the crossing of rivers by 'cable bridge' technique could pose a flood risk; however, it is assumed at this stage that the crossings would be trenchless. Colour Coding for MCA – Soils and Water Impacts Combined

For the UGC options, effects on soils and water are considered to be as follows:

OPTION 3A	OPTION 3B	OPTION 3C

The greatest impacts on soils and water would be during construction for all options. The risk to watercourses from silt and spillages during the construction process is moderate for Options 3A and 3B as there would be a high number of water bodies crossed by the cables and there is potential for effects on roadside ditches during construction, and moderate-high for Option 3C, which would require twice the route length of Options 3A and 3B. If the cables were to be installed in third party lands, the risks would be higher for all options.

7.4.3 Planning Policy and Land Use

Baseline

The CDPs for Kildare and Meath are outlined under Technology 1 and apply equally for this technology. Of particular note is Kildare's policy for electrical infrastructure which support the reinforcement of the network with the caveat that services are undergrounded wherever appropriate to do so.

Kilcock, Maynooth, Naas, and Prosperous all lie within the Northern Lowlands Landscape Character area in the Kildare CDP, which is classified as being of low sensitivity. The CDP does however state that proposals should, however, utilise existing infrastructure where possible, taking into account absorption opportunities provided by the topography and surrounding vegetation. Newbridge, Clane and Sallins all fall within the River Liffey Landscape Character Area, considered to be 'Class 4- Special' sensitivity, meaning it has low capacity to accommodate uses without significant adverse effects on the character of the landscape.

Key constraints were identified within the Local Area Plans for Technology 2; these apply equally to this Technology and so will not be repeated here.

Potential Impacts

The preference in planning policy is for undergrounding of services where appropriate, and as such, this technology would accord with those policies.

It is uncertain whether there would be any significant impacts on other major proposed developments as no route corridor(s) has been defined; such major developments would be taken into account in the design of the route, however. There is potential for cumulative effects during construction if projects are constructed at the same time, but this cannot be considered at this stage as timeframes for f are not yet defined.

Land Use

Baseline

The land use in the area is predominantly agricultural with more built up urban areas around the towns and villages. There are large areas of peatland and small areas of forestry to the west of the Technology 3 Study Area, as well as some smaller scattered areas of forestry further north and south.

There a number of road crossings including two motorway crossings of the M4 and the M7; there are two railway crossings, the Dublin to Mullingar line and the Dublin to Kildare line; one crossing of the Grand Canal; and a number of river crossings, including the Liffey and several of its tributaries.

As with Technology 1, there are a number of proposed developments and some under construction within the Technology 3 Study Area. An outline of these is provided in Table 5.2. They include two road improvement projects: the M4 from Maynooth to Leixlip and the N7 upgrade between Naas and Newbridge; and a proposed tourist village immediately south of Kilcock.

Potential Impacts

There would be temporary impacts on the regional road network during construction; however full reinstatement of all roads upon installation would ensure these were not permanent effects. At the connection into Woodland, it is likely that the cable would have to be installed across third party land. This would require a significant temporary land take during construction, but limited during operation, although a permanent wayleave and some restriction of agricultural practices above the UGC is likely.

Colour Coding for MCA

For the UGC options, effects on planning policy and land use are considered to be as follows:

OPTION 3A	OPTION 3B	OPTION 3C

The UGC would accord with the ambitions of county development plans to install new services underground wherever possible. There would be temporary disruption to the road network; the use of regional roads reduces this risk as any routes chosen would be ones large enough for the swathe to be within one carriageway only, however carriageway closures could be for a prolonged period of time. As such, it is anticipated that there would be no third-party land take except for the connection into Woodland. At the connection into Woodland, it is likely that the cable would have to be installed across third party land. This would require a significant temporary land take during construction, but limited during operation, although a permanent wayleave and some restriction of agricultural practices above the UGC is likely. Option 3C is moderate risk, as the route is twice as long as for Options 3A and 3B (low-moderate risk).

7.4.4 Landscape and Visual

Baseline

The County Development Plans for Meath and Kildare have identified Landscape Character Areas with low to high compatibility with certain types of infrastructure, including ‘major power lines’. A map showing these for the Project Study Area is presented in Appendix A, Map 321084AE-MAP-005.

Within County Meath there are four Landscape Character Areas: south East Lowlands, Tara Skryne Hills, Rathmoylan Lowlands and Royal Canal.

Both South East Lowlands and Royal Canal are identified as Medium sensitivity LCAs with Regional Importance; Royal Canal is High Value landscape and South East Lowlands a Very High landscape. Tara Skryne Hills and Rathmoylan Lowlands are identified as High Sensitivity landscapes with Rathmoylan Lowlands High Value and National Importance and Tara Skryne Hills has Exceptional Value and National / International Importance. Tara Skryne Hills and Rathmoylan Lowlands are therefore deemed to be of Low compatibility with overhead cables; South East Lowlands and Royal Canal are Medium compatibility.

There are 12 Landscape Character Areas within the Kildare area of the Technology 3 Study Area: Chair of Kildare, Northern Lowlands; North-western Lowlands; Western Boglands; Northern Hills; Allen Bog; Pollardstown Fen; The Curragh; Central Undulating Lands; Eastern Transition; River Liffey; and Eastern Uplands. North-western Lowlands, Allen Bog, and Northern Lowlands have been identified as highly compatible with Major Powerline Infrastructure. Pollardstown Fen and The Curragh are high value landscapes and have therefore been identified as low compatibility. Newbridge, Clane and Sallins all fall within the River Liffey Landscape Character Area, considered to be 'Class 4- Special' sensitivity, meaning it has low capacity to accommodate uses without significant adverse effects on the character of the landscape.

There are also a number of Areas of High Amenity within the Technology 3 Study Area including River Liffey, Pollardstown Fen, the Curragh and Eastern Uplands. Only a small area of Eastern Uplands is within the Technology 3 Study Area, however potential long distant views from this area are also considered.

There are a number of scenic routes and viewpoints across the Technology 3 Study Area including routes providing views of Ballynafagh Lake in the centre of the Technology 3 Study Area, the Western Boglands in the north west, and of the Curragh in the south west and several viewpoints along bridges crossing the railway line from Maynooth to Kilcock and river views along the Rye Water north of Maynooth. There is also a scenic view point in the Tara Skryne Hills, to the west of the existing 220kV OHL.

The Technology 3 Study Area is highly populated, although not densely so, and is to the west of the Dublin conurbation. It has a number of OHLs already, with several 220kV OHLs converging on Maynooth substation in the centre of the Technology 3 Study Area; two 400kV OHLs entering into Woodland and Dunstown substations in the north and south of the Technology 3 Study Area respectively; and many 110kV and lower transmission lines crisscrossing the Technology 3 Study Area.

In addition, as has been stated under the land use section, the Technology 3 Study Area is crossed by two motorways and two major rail lines.

The more rural parts of the Technology 3 Study Area are characterised by hedgerow and ditch lined roads.

Potential Impacts

There would be some, but limited, impacts on landscape and views during construction of the UGC from temporary machinery and compounds; however, this is unlikely to be significant and would be largely screened by fencing. The use of the regional road network without requirement for third party land for most of the route means the impacts would not be significant for the majority of the route.

The likely routing across third party land for the Woodland substation connection would result in the loss of some hedgerows; these effects could be permanent as it is EirGrid and ESB policy to not plant such vegetation over cables.

During operation, the UGC itself would have limited effects on landscape and views once reinstatement is completed; there would be joint boxes along the route which would affect both but these effects are not expected to be significant.

Colour Coding for MCA

For the UGC options, effects on landscape and views are considered to be as follows:

OPTION 3A	OPTION 3B	OPTION 3C

For all three options, the effects on landscape and views from the UGC would be greatest during construction; although this would be temporary, it may take three years or more to install the UGC for Options 3A and 3B (one

conductor per phase). Option 3C could also take three years if both phases were constructed at the same time, however the effects on landscape and for views would be greatest for Option 3C (moderate risk) as this has twice the footprint compared to Options 3A and 3B (low to moderate).

During operation, the effects would be limited: there would be visible joint boxes periodically along the cable, although these would be quite small; and some loss of hedgerows at Woodland substation. These effects would be greatest for Option 3C as it is twice as long and would have twice the number of joint boxes and a higher loss of hedgerows.

7.4.5 Cultural Heritage

Baseline

There are no World Heritage Sites in the Technology 3 Study Area, but it includes the following cultural heritage assets:

- Built Heritage:
  - there are significant clusters of NIAH and RPS sites around Kilcock, Maynooth, Naas and Newbridge. To a lesser extent, there are also clusters of NIAH and RPS sites around the smaller urban areas of Phepotstown, Clane, Straffan, Sallins, Prosperous and Robertstown; and
  - The walled towns of Kildare and Naas are regarded as single recorded monuments in Kildare's County Development Plan 2017 – 2023. Kildare has its own Conservation and Management Plan.
- National Monuments:
  - These are widely distributed throughout the Technology 3 Study Area, with the more significant clusters occurring around Moynalvy, Agher, Cloncurry, Maynooth, Clane, Naas and Newbridge. There are also a cluster of National Monuments around Dunstown substation.
- Archaeological resources:
  - There has been a cluster of archaeological excavations around Maynooth town, and archaeological finds have been recorded to the west of Maynooth. A large number of archaeological finds have also been recorded around Sallins and Naas, particularly to the south east of Naas. A smaller cluster of finds is centred around Newbridge;[x]
  - There is also a possibility of unknown, undesignated archaeological and architectural remains being discovered within the Technology 3 Study Area; and
  - AAPs have been assigned to Kildare, Silliothill, Naas, Rathmore, Kill, Oughterard, Cloncurry, Clane and Celbridge.

All cultural heritage designations are shown in the Constraints Plans provided in Appendix A, Map321084AE-MAP-006.

Potential Impacts

In general terms, the UGC options have a greater risk of effects on unknown archaeology than the OHL solutions because of the greater extent of ground disturbance by the creation of a working strip and excavation of trenches. The greatest effects would be during construction and in particular the installation of the cables at Woodland substation where there is a requirement to cross third-party land. This presents a greater risk to heritage assets, especially unknown archaeological assets, than the installation in the regional road network, despite being only 5 to 7 km in length. If any Horizontal Directional Drilling (HDD) is undertaken, sub-surface archaeological remains

could be damaged or destroyed. If HDD is used, it is likely to be where there are significant physical constraints, such as roads, railways or waterways.

There would be limited effects on heritage assets during operation; the joint bays may affect the setting of some valued assets, however in general terms the UGC would not have a significant impact on heritage.

Colour Coding for MCA

For the UGC options, effects on cultural heritage are considered to be as follows:

OPTION 3A	OPTION 3B	OPTION 3C

The effects on cultural heritage from the UGC would be greatest during construction, both in terms of ground disturbance and effects on the settings of heritage assets. The risk is identified as low to moderate for Options 3A and 3B, acknowledging there may be some effects given the length of the route. Option 3C would be more significant in terms of risks to heritage assets and is identified as moderate risk. During operation, there is some potential for effects the setting of heritage assets from the joint boxes; these effects would be greatest for Option 3C as it is twice as long and would have twice the number of joint boxes.

7.5 Key Constraints and Considerations for Technology 3

7.5.1 Summary

Biodiversity, Flora & Fauna

The greatest effects on biodiversity would be during construction, where despite cables being laid in public roads, there is potential for impacts on hedgerows and aquatic ecosystems in particular; other habitats may also be disturbed or fragmented during the construction phase and effects could be permanent in some cases. Options 3A and 3B would have the same effects (moderate risk); Option 3C would have a greater magnitude of effects, depending on the route chosen, assessed to be moderate-high risk.

Soils and Water

The greatest impacts on soils and water would be during construction for all options. The risk to watercourses from silt and spillages during the construction process is moderate for Options 3A and 3B as there would be a high number of water bodies crossed by the cables and there is potential for effects on roadside ditches during construction, and moderate-high for Option 3C, which would require twice the route length of Options 3A and 3B. If the cables were to be installed in third party lands, the risks would be higher for all options.

Planning Policy and Land Use

The UGC would accord with the ambitions of county development plans to install new services underground wherever possible. There would be temporary disruption to the road network; the use of regional roads reduces this risk as any routes chosen would be ones large enough for the swathe to be within one carriageway only, however carriageway closures could be for a prolonged period of time. As such, it is anticipated that there would be no third-party land take except for the connection into Woodland. At the connection into Woodland, it is likely that the cable would have to be installed across third party land. This would require a significant temporary land take during construction, but limited during operation, although a permanent wayleave and some restriction of agricultural practices above the UGC is likely. Option 3C is moderate risk, as the route is twice as long as for Options 3A and 3B (low-moderate risk).

Landscape and Visual

For all three options, the effects on landscape and views from the UGC would be greatest during construction; although this would be temporary, it may take three years or more to install the UGC for Options 3A and 3B (one conductor per phase). Option 3C could also take three years if both phases were constructed at the same time, however the effects on landscape and for views would be greatest for Option 3C (moderate risk) as this has twice the footprint compared to Options 3A and 3B (low to moderate).

During operation, the effects would be limited: there would be visible joint boxes periodically along the cable, although these would be quite small; and some loss of hedgerows at Woodland substation. These effects would be greatest for Option 3C as it is twice as long and would have twice the number of joint boxes and a higher loss of hedgerows.

Cultural Heritage

The effects on cultural heritage from the UGC would be greatest during construction, both in terms of ground disturbance and effects on the settings of heritage assets. The risk is identified as low to moderate for Options 3A and 3B, acknowledging there may be some effects given the length of the route. Option 3C would be more significant in terms of risks to heritage assets and is identified as moderate risk. During operation, there is some potential for effects the setting of heritage assets from the joint boxes; these effects would be greatest for Option 3C as it is twice as long and would have twice the number of joint boxes.

7.5.2 Assessment of Technology 3

The constraints have been considered in the context of risk and EirGrid's colour scheme used to illustrate the potential risk from each constraint for this solution. This is presented in Table 7.3.

More significant/difficult/risk Less significant/difficult/risk

Table 7.3 Technology 3 Constraints Risk Assessment

Constraint	Option 3A: 220 kV 1 Conductor per phase	Option 3B: 400 kV 1 Conductor per phase	Option 3C: 400 kV 2 Conductors per phase
Biodiversity			
Soil & Water			
Planning Policy & Land Use			

Constraint	Option 3A: 220 kV 1 Conductor per phase	Option 3B: 400 kV 1 Conductor per phase	Option 3C: 400 kV 2 Conductors per phase
Landscape & Visual			
Cultural Heritage			
Summary			

8. Summary of Technologies Evaluation

8.1 Evaluation of Options

The appraisal of each of the technologies is summarised in Table 8.1. From an environmental perspective, the highest risk technology is Technology 3, the UGC; specifically, Option 3C, the 400kV two conductors per phase option. This presents the highest risk to the greatest number of environmental aspects. Technology 2, the new OHL has the highest risk rating for the landscape and visual constraint. The up-voltage option represents the lowest risk to the environment.

Table 8.1 Options Assessment Summary

Topic	Technology 1					Technology 2		Technology 3		
	Up-voltage	1A	1B	1C		New OHL		3A	3B	3C
Biodiversity										
Soil & Water										
Planning Policy & Land Use										
Landscape & Visual										
Cultural Heritage										
Summary										

Appendix A. Constraints Maps

Map Number	Title
321084AE-MAP-001	Biodiversity Constraints
321084AE-MAP-002	Geology Constraints
321084AE-MAP-003	Surface Water Constraints
321084AE-MAP-004	Groundwater Constraints
321084AE-MAP-005	Landscape and Visual Constraints
321084AE-MAP-006	Cultural Heritage Constraints
321084AE-MAP-007	Subsoil Constraints
321084AE-MAP-010	Cumulative Constraints Weightings (Heatmap)

Appendix B. Heat Mapping

Appendix C. Additional Information

[i] Source: https://www.npws.ie/protected-sites/nha, accessed 10/12/2019.
[ii] Source: https://www.npws.ie/protected-sites/nha, accessed 10/12/2019.
[iii] Source: https://www.npws.ie/nature-reserves, accessed 10/12/2019.
[iv] RBMP 2018-2021, Department of Housing, Planning & Local Government, 2018
[v] 321084AE-REP-005 Overhead Line Feasibility Report, Jacobs January 2020
[vi] EirGrid Evidence Based Environmental Studies. Study 10: Landscape & Visual. EirGrid. June 2016.
[vii] Source: https://www.heritagemaps.ie/WebApps/HeritageMaps/index.html, accessed 06/12/2019.
[viii] Source: https://www.heritagemaps.ie/WebApps/HeritageMaps/index.html, accessed 06/12/2019.
[ix] 321084AE-REP-001 CP 966 Cable Feasibility Report, Jacobs, December 2019.
[x] Source: https://www.heritagemaps.ie/WebApps/HeritageMaps/index.html, accessed 06/12/2019.