ROUTE CONSTRAINTS REPORT

SOCIO-ECONOMIC, LANDUSE, LANDSCAPE, FLORA & FAUNA, WATER, SOILS, CULTURAL HERITAGE AND STATION LOCATION REPORT

Prepared for Eirgrid to support a Planning Application for the Cavan-Tyrone 400kV Interconnector Project

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FINAL REPORT - SEPTEMBER 2007

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Section 1 – Executive Summary

1.1 The Project

The proposed Cavan-Tyrone 400kV Interconnector Project is a joint Eirgrid-Northern Ireland Electricity project which will achieve the objective of strengthening the electricity grid in both jurisdictions.

The portion of the project in the Republic of Ireland consists of the construction of a new 400kV overhead electricity transmission line from a new 400/220kV station in the environs of Kingscourt, Co. Cavan, located in the vicinity of the existing Louth to Flagford 220kV electricity line, to a border crossing point to the north east of Clontibert, Co. Monaghan. The proposed line will then continue into Northern Ireland to a station in the vicinity of Drumkee, Co. Tyrone. The proposed line covers a distance of approximately 45km in total in the Republic and also involves the provision of a new electricity station.

1.2 Route Corridor Alternatives

The Route Corridor alternatives referred to in this report are:

- Route Option A – a western corridor
- Route Option B – a central corridor
- Route Option C – an eastern corridor

1.3 Key Findings with Regard to Impacts Arising

Following an assessment of the potential environmental impacts of each route the following key findings may be drawn at this preliminary stage:

- ***Socio-Economic***

No significant anticipated impacts.

- ***Land Use***

While there may be localised impacts arising from all options on individual farmholdings in terms of structures on lands, there is little potential for adverse effects on agriculture – the principal landuse in the area. There is some potential for localised indirect impacts on tourism resources due to visual impacts, these are addressed in more detail in other sections of this report and will be addressed in more detail in the final EIS. All options score equally in this regard.

- ***Landscape***

Route Option A – though longer than route option B, has the least potential to be visible and has the least potential for visibility from sensitivity receptors.

Route Option B – is located along the most elevated underlying topography of the three routes and will cause the most widespread visibility especially from portions of the N2 – though it appears to be the shortest route which is an advantage visually.

Route Option C – passes closest to the most significant landscape resources – i.e. Lough Muckno and the outskirts of Castleblaney and therefore, has the greatest capacity to affect sensitive landscapes and regionally significant landscape resources.

- ***Flora and Fauna***

The preferred route for the powerline, based on the preliminary assessment, is Route Option B. This is based on the least impact on fisheries and designated areas. It is also the shortest route, thereby reducing impact to the area along the N2, which is already a main infrastructural route. Route Option A is considered the second preferred option, given the avoidance of designated areas. Route Option C is considered unfeasible given the proximity to a relatively large cluster of hydrologically linked pNHAs.

- ***Water***

Based on the findings of the desk study, for the site hydrology and the hydrogeology, the most preferred option is Route Option A.

- ***Soils***

In relation to the construction phase the potential impact on the soils and geology is considered to be permanent and imperceptible. In relation to the operational phase the potential impact on the soils and geology is considered to be long term and imperceptible. All options score equally in this regard.

- ***Cultural Heritage***

None of the route options impact on any protected structure. Route Option A does pass through part of the demesne of Shantonagh House in County Monaghan; however Shantonagh House is not recorded as a protected structure and is therefore only of local interest.

1.4 Conclusion

In conclusion, it may be determined at this preliminary stage that Route Option A is emerging as the preferred option, particularly from a visual amenity perspective. Although it is slightly longer than the proposed second preference Route Option B, it appears that overall the Route option A will have the least environmental impact.

1.5 Terms of Reference

AOS Planning Limited has been commissioned by Eirgrid to prepare environmental reports for the Cavan-Tyrone 400kV Interconnector Project.

The environmental reports by AOS Planning Limited cover the areas of Socio-Economic, Landuse, Landscape/Visual and Ecology. Eirgrid separately commissioned the reports of Soils and Water from *AWN Consulting* and Cultural Heritage from *Archaeological Development Services*. Eirgrid have requested that AOS Planning include the separately commissioned reports in this overall environmental report.

The reports are required to identify the key environmental factors within the study area, on which the potential route corridors for electricity transmission lines and the location of an electricity station may have an impact. This Route Constraints Report provides a context for selecting the route and the location of the station that will be submitted for planning and which will be the subject of a full Environmental Impact Statement (EIS), which will accompany the planning application.

The reports are produced in accordance with a tender submitted to Eirgrid and having regard to the 'Specification of Environmental Consultants' as provided by Eirgrid in the tender request, and they follow the *Guidelines of Information to be included in Environmental Impact Statements* (EPA, 2002) as well as the *Guidance Notes on current EIA practice* (EPA, 2003).

This report also includes a strategic planning section in order to ensure the planning of the route is seen in the wider strategic context.

1.6 Strategic Planning Context

Having established that a high voltage electricity overhead line connection from Northern Ireland to the north eastern part of the Grid is the optimal solution, it will be necessary to describe and justify the range of options for connection points [i.e. the points of origin and destination] and to discuss the general rationale for the resultant range of routes and route options.

The planning application should include a survey of the range of 400kV conductor types and their associated insulators, supply towers, angle masts and other transmission structures, including the options available for the internal configurations, size, materials, colour and finish of each. The survey should conclude with a justification for the selected design having regard to the environmental, planning and practical consequences of each option.

1.7 Socio-Economic

It is the nature of the interconnector project to pass through a region and an area. Accordingly the project will directly affect the social, economic or enterprise status of the area. The provision of a higher quality and more secure power supply to the National Grid on both sides of the border will, however, have considerable indirect positive effects on the region and the area – because it will help to support the provision of improved economic

growth for the area. Local amenities have the potential to be impacted through visual impacts or effects on biodiversity – these impacts are considered in the relevant reports.

Impacts with a potential to affect the socio-economic status of the study area would only arise indirectly through other topics – such as effects on landscape, cultural heritage and biodiversity. The mitigation measures for these issues are dealt with in other specialist subsections. The proposed interconnector development will have a positive long term impact on the Border Region and the country as a whole. The development and improvement of the country's energy infrastructure are a prerequisite for economic development. Effective and reliable energy supply will make the country and the region a more attractive location for inward investment.

1.8 Landuse

The area comprises an almost uniform pattern of pasture based agriculture at relatively low levels of intensity. These are smaller areas where intensive stock-raising and poultry operations occur – though these are few in the context of the overall number of holdings.

While there may be localised impacts on individual farmholdings in terms of structures on lands, depending on the final route selected, there is little potential for adverse effects on agriculture – the principle landuse in the area. There is some potential for localised indirect impacts on tourism resources due to visual impacts, these are addressed in more detail in other sections of this report and will be addressed in more detail in the final EIS.

No specific mitigation measures are likely to be required to address the impacts on landuses.

1.9 Landscape

The project and route corridors lie predominately within County Monaghan with potentially the electricity station and some sections in County Cavan. It is clear that the study area consists of a remarkably uniform landscape type of drumlin landscape overlain on a very gradual north-south ridge. There are protected views and landscapes at a number of locations within the study area. These are almost all associated with lakes.

In general terms Route Option A – a western corridor has the least potential to be visible and has the least potential for visibility from sensitivity receptors.

In general terms Route Option B – a central corridor is located along the most elevated underlying topography of the three routes and will cause the most widespread visibility especially from portions of the N2 – though it appears to be the shortest route which is an advantage.

In general terms, Route Option C – an eastern corridor passes closest to the most significant landscape resources – i.e. Lough Muckno and the outskirts of Castleblaney.

Route Corridor A will cause least visibility – though it is the longest route. Route Corridor B will be the most conspicuous in the wider landscape – but it is the shortest route. Route Corridor C has the greatest capacity to affect sensitive landscapes and regionally significant landscape resources.

1.10 Flora and Fauna

The study area lies within a regionally ecologically significant area, both in terms of fisheries and nature conservation designated areas.

The study area lies within the catchments of the Rivers Glyde and Fane, which drain a significant area of Cavan, Monaghan and adjacent counties. These are significant fisheries with coarse fisheries predominantly in lakes and game fisheries along the Glyde and Fane and associated tributaries.

The power-line routes pass through an area that is sensitive to water pollution (historically through agricultural fertiliser run-off). However, the nature of the development will not have a significant impact on local water quality and/or fisheries given appropriate care is given to excavation of foundations, etc.
There is a number of rare and restricted distribution species recorded from the study area; these are located in designated areas. There are sixteen designated areas located in the study area. The areas largely comprise lakes and associated habitats and any development should aim to avoid the local catchments of these areas.

The preferred route for the powerline based on this assessment is Option B. This is based on the least impact on fisheries and designated areas. It is also the shortest route, thereby reducing impact to the area along the N2, which is already a main infrastructural route. Route A is considered the second preferred option, given the avoidance of designated areas. Route C is considered unfeasible given the proximity to a relatively large cluster of hydrologically linked pNHAs.

The Northern Regional Fisheries Board and Central Fisheries Board have expressed issues of concern in relation to construction of the power line. Eirgrid should follow the Fisheries Board guidelines to mitigate against potential run-off instances. The National Parks and Wildlife Service request that all designated areas be avoided. Also, there is some concern relating to measures to lessen any likely collisions with wildfowl and migratory species. This will require ongoing consultation with NPWS local staff pre-and during construction of the power line.

The power line will not have a significant impact on the ecology of the study area, and/or the wider area. This is given that due consideration is paid to recommendations following a more extensive ecological field survey and evaluation of habitats along the preferred route.

1.11 Water

There are a number of watercourses identified in the vicinity of the proposed route corridors. Baseline data has been collected from the aforementioned information sources in order to form a comprehensive database of the water quality in the area. This will assist in the assessment of any potential impact(s) on the hydrological and hydrogeological environment from the proposed developments.

Due to the interrelationship between the hydrology and hydrogeology at the proposed location of the development, the potential impacts and mitigation measures will be common to both.

The construction phase of the development will involve the following key activities that may have potential impacts on the local hydrology and hydrogeology:

- Watercourse crossing
- Site compound construction
- Oil, fuel and site vehicle storage
- Construction of lattice towers
- Concrete pouring
- Site cabling
- Stockpilng of material
- Surplus Material
- Borrow Pits (if required)
- Land Slippage

During the operational phase potential impacts include contamination (oil, fuels and sediment) from maintenance traffic.

All of the above potential impacts can be mitigated through standard construction and operational mitigation measures that are employed on such projects on an ongoing basis.

Based on the findings of the desk study, for the site hydrology and the hydrogeology, the most preferred option is Option A. The potential impacts in relation to the construction of the lattice towers will be identical for each route option. However Option A provides a route whereby construction within the vicinity of the river and lakes is avoided. The aforementioned mitigation measures highlighted will ameliorate the potential impact of the proposed

developments on the surrounding environment in terms of hydrology and hydrogeology.

1.12 Soils

The potential impacts of the proposal for the construction and operation phases of the development on the soil and geological environment are outlined in the following paragraphs.

Removal of the upper soil layers will occur in a development such as this. The most likely contaminant that may be found is hydrocarbon contamination, from vehicles.

As there will be large volumes of material excavated during each phase of construction, mitigation measures will be employed to ensure that there is no negative impact on the soil environment from the storage and transport of this material.

Machinery used during the construction phase will include diesel-powered trucks, excavators, bulldozers, cranes and graders. The potential impacts to the underlying soil and geology from the construction of the proposed development could derive from accidental spillage of fuels, oils, paints and solvents, which could impact soil, bedrock and groundwater quality, if allowed to infiltrate to the ground during storage and dispensing operations.

Where development occurs in deep peat, peat slides can potentially occur in areas greater than 0.5m deep. Peat depths around proposed access roads and tower locations should be confirmed prior to construction, as is normal engineering practice.

It is not expected that the importation of landscaping materials, such as topsoil will be required as part of the proposed development works. If required, details for the correct importation of soil are outlined in Section 10.7.1.

In relation to the construction phase the potential impact on the soils and geology is considered to be permanent and imperceptible.

Due to the fact that (based on the information available and the site reconnaissance) there does not appear to be significant features of geological value. The potential impact of the development on the local geology is considered to be neutral.

Due to the nature of the development, there will be machinery periodically on the site at a given time. This may lead to occasional accidental emissions, in the form of oil, petrol or diesel leaks, which could cause contamination if they enter the soil and bedrock environment.

In relation to the operational phase the potential impact on the soils and geology is considered to be long term and imperceptible.

All of the above potential impacts can be mitigated through standard construction and operational mitigation measures that are employed on such projects on an ongoing basis.

1.13 Cultural Heritage

This phase of the project consists of a route selection study for the proposed route of the electricity transmission line. Eirgrid have set out three route corridor options for the line. Route Option A, Route Option B and Route Option C.

A constraints study area for the proposed substation has also been set out. This constraint covers an area about 5.5km by 5.5km and straddles the counties of Meath and Cavan. No definitive location for the positioning of the substation is as yet available. The footprint for the proposed substation will be about 300m by 300m.

All recorded places of archaeological, architectural and cultural heritage that are potentially affected by each route corridor option have been identified. Each route corridor option has been evaluated on the basis of the nature and extent of the recorded archaeological constraint in order to identify a preferred route option.

A total of 38 known archaeological sites have been identified within the constraints circle for the substation. The west and northwest quadrant of the constraints circle has been identified as an area with a low density of recorded sites. The preferred location for the substation should avoid all known archaeological sites.

The county development plans for all three counties (Meath, Cavan and Monaghan) were consulted to establish whether any protected structures were located in the study area. There are no protected structures within the constraints circle for the substation. None of the route options impact on any protected structure. Route Option A does pass through part of the demesne of Shantonagh House in County Monaghan; however Shantonagh House is not recorded as a protected structure.

1.14 Station Location

Due to the drumlin features there will be issues of visibility. This will arise either due to the structures themselves associated with the station, or the excavations required to establish a level base. This will occur on most of the sites, a number of which have streams. Sites 2 and 4 and the cluster of 6, 7,

8 and 9 are probably the least visible sites. The general area of the site search has relatively few dwellings, which minimises the local effects of visibility. The issue of actual and potential archaeology on sites 4, 5, 10 and 3 respectively is more serious and will require further investigation. Sites 5 and 10 should clearly be avoided.

It should be noted that sites 4 and 5 traverse the county boundary between Counties Cavan and Meath. This needs to be considered in terms of administrative issues associated with the planning application.

Section 2 – Background and Terms of Reference

2.1 Terms of Reference

AOS Planning Limited has been commissioned by Eirgrid to prepare environmental reports for the Cavan-Tyrone 400kV Interconnector Project and to include environmental reports commissioned from other companies in an overall environmental report. The project is a joint Eirgrid-Northern Ireland Electricity project which will achieve the objective of strengthening the electricity grid in both jurisdictions.

This report covers the portion of the project that is located in the Republic of Ireland only. A separate report and EIS will cover that portion of the project located in Northern Ireland. However, having regard to the transboundary nature and possible transboundary environmental impacts arising from the project, this report identifies a zone where potential transboundary environmental impacts are considered. ***See Figure 2.1*** which shows the full length of the proposed project in indicative terms in its entirety South and North.

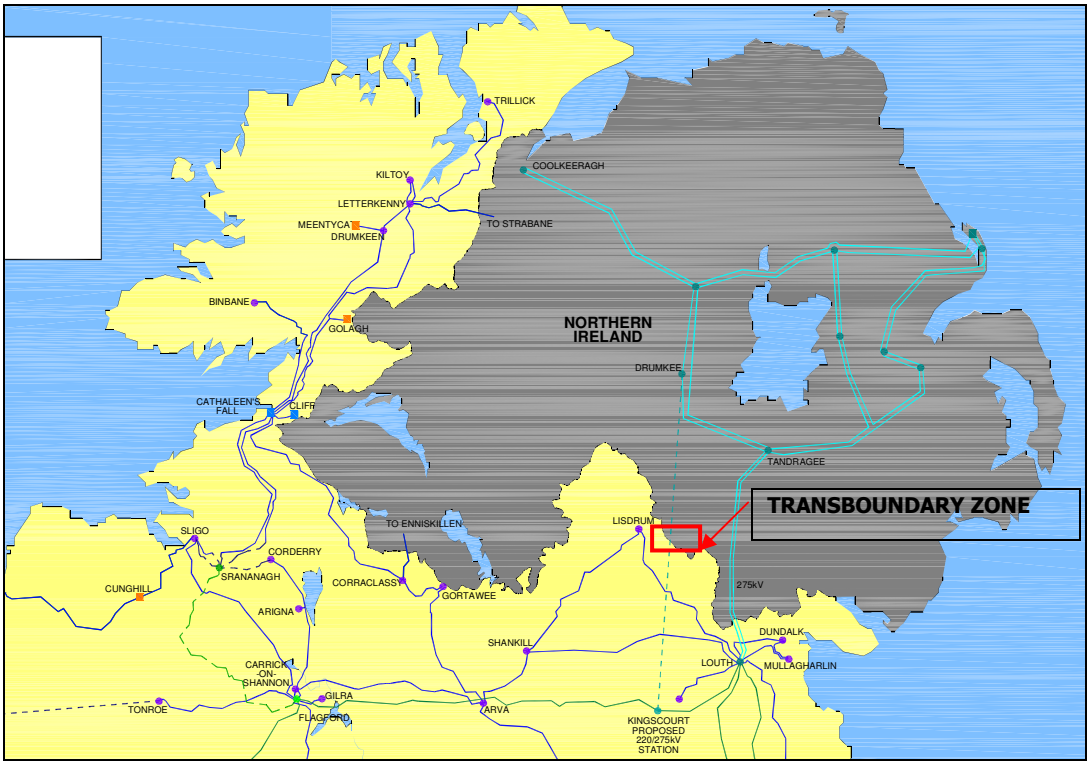


Figure 2.1 Indicative Cavan – Tyrone 400kV Interconnector Route

The portion of the project in the Republic of Ireland consists of the construction of a new 400kV overhead electricity transmission line from a new 400/220kV station in the environs of Kingscourt, Co. Cavan, located in the vicinity of the existing Louth to Flagford 220kV electricity line, to a border crossing point to the north-east of Clontibert, Co. Monaghan. The proposed

line will then continue into Northern Ireland to a station in the vicinity of Drumkee, Co. Tyrone. Planning applications will be made to the relevant authorities on both sides of the border for those parts of the line in each jurisdiction.

The proposed line covers a distance of approximately 45km in total in the Republic and also involves the provision of a new electricity station.

The environmental reports by AOS Planning Limited cover the areas of Socio-Economic, Landuse, Landscape/Visual and Ecology. Eirgrid separately commissioned the reports of *Soils and Water from AWN Consulting and Cultural Heritage from Archaeological Development Services*. Eirgrid have requested that AOS Planning include the separately commissioned reports in this overall environmental report.

The reports are required to identify the key environmental factors within the study area, on which the potential route corridors for electricity transmission lines and the location of an electricity station may have an impact. This Route Constraints Report provides a context for selecting the route and the location of the station that will be submitted for planning and which will be the subject of a full Environmental Impact Statement (EIS), which will accompany the planning application.

The reports are produced in accordance with a tender submitted to Eirgrid and having regard to the 'Specification of Environmental Consultants' as provided by Eirgrid in the tender request, and they follow the *Guidelines of Information to be included in Environmental Impact Statements* (EPA, 2002) as well as the *Guidance Notes on current EIA practice* (EPA, 2003).

This report also includes a strategic planning section in order to ensure the planning of the route is seen in the wider strategic context.

2.2 Background and Project Team

The environmental reports have been prepared by specialist consultants as follows:

- ***Socio-Economic and Landuse***
  Brendan Allen, Planning and Environmental Consultant [BComm, MRUP, MIPI] – AOS Planning Limited.

- ***Landscape/Visual and Landuse***
  Conor Skehan, Landscape Architect and Impact Assessor [MILI, MRIAI, MIEMA] – AOS Planning Limited.

- ***Flora and Fauna***
  Dr. Catherine Farrell, Consultant Ecologist [B.Sc., Ph.D., Dip. EIA Mgmt].

- ***Water and Soils***
  Brian Tiernan, Environmental Consultant – AWN Consulting.

- ***Cultural Heritage***
  Mark Moraghan, Consultant Archaeologist – Archaeological Development Services Limited.

The environmental reports have been undertaken in the following manner:

Stage 1 – Route Constraints Report [THIS REPORT]
For this reporting stage ESBI identified three general route corridors. See ***Route Corridor Alternatives Map*** for the route alternatives (see page 22).

These corridors are referred to in the report as:

- Route Option A – a western corridor
- Route Option B – a central corridor
- Route Option C – an eastern corridor

In addition to the route corridors Eirgrid have produced a site selection report for the electricity station. This identifies 10 potential locations for the station.

The purpose of this stage is for Consultants to identify key environmental issues within the study area, on which the potential route corridors for the electricity transmission line and the location of the station may have an impact. This stage involves a desk study of relevant socio-economic and ecological issues and a site visit to evaluate landscape/visual and landuse issues. Details of desk and site studies, identification of possible impacts and proposed route alternatives within the study area are evaluated.

Stage 2 – Final Report
Following from this Route Constraints and from finalisation of the preferred route corridor, a final report will provide a more detailed assessment of the likely environmental impacts of the route and station location that are being submitted for planning. This final report will be incorporated into a full Environmental Impact Statement (EIS).

Section 3 – Project Description

3.1 Site Location

The proposed electricity transmission line will run, within the identified study area. ***Route Corridor Alternatives Map (Page 22)*** indicates three potential route corridors, in general terms. These corridors are only indicative at this stage – they are designed to represent west, central and east routes. Variations and combinations of these are considered when choosing the final route that will be submitted for planning.

When the preferred route is confirmed, the planning application drawings will show the route in more detail.

The proposed new station will be located somewhere in the vicinity of the existing Louth to Flagford 220kV line within the area identified on the ***Route Corridor Alternatives Map.***

For the portion of the transmission line located in the Republic of Ireland, the majority of the route passes through Co. Monaghan and some of the potential station locations are also in Co. Monaghan. A number of the potential station locations are located in Co. Cavan and therefore potentially a very small portion of the proposed line also.

3.2 Project Description

The project is a joint Eirgrid-Northern Ireland Electricity project which will achieve the objective of strengthening the electricity grid in both jurisdictions. Planning applications will be made to the relevant authorities on both sides of the border for those parts of the line in each jurisdiction.

The interconnector project consists of a number of elements in the Republic as follows:

- Approximately 45km of 400kV overhead electricity transmission line – this is the current highest voltage currently used by Eirgrid.
- Approximately 4km of 220kV overhead electricity transmission line – this is the next highest voltage currently used by Eirgrid.

The 400kV overhead line structures will consist of lattice steel towers with a height range of 27m to 44m and with an average base area of approximately 17 square metres (***see Figure 3.1 - Typical 400kV Overhead Line Structure***) – these tower types are shown as indicative only at this time. The final design to be used has not yet been identified but a reduced visual impact design is likely to be used. This will be a modified version of that currently shown.

3.3 Structures to be Used

The line is constructed by placing the electricity line on a series of lattice steel towers along the line of the route.

The structures used will comprise lattice steel towers and electricity lines. They are either 400kV or 220kV structures. The 400kV structures are designed to carry the lines with the highest voltage and are therefore the largest structures whilst the 220kV structures are smaller. The average distance between structures will be approximately 350 – 400 metres, so there will be approximately 110 400kV structures and 12 220kV structures.

Lattice Steel Towers – 400kV

These consist of galvanised lattice steel structures. They have a height range of 27m to 44m, the final height will depend on ground conditions and terrain. Different types of towers can be used, ***Figure 3.1*** shows a typical tower.

Figure 3.1 Typical 400kV Overhead Line Structure

Lattice Steel Towers – 220kV

These are similar in appearance to 400kV towers but are smaller structures. They have a height range of 18m to 35m, the final height will depend on ground conditions and terrain. Different types of towers can be used, ***Figure 3.2*** shows a typical tower.

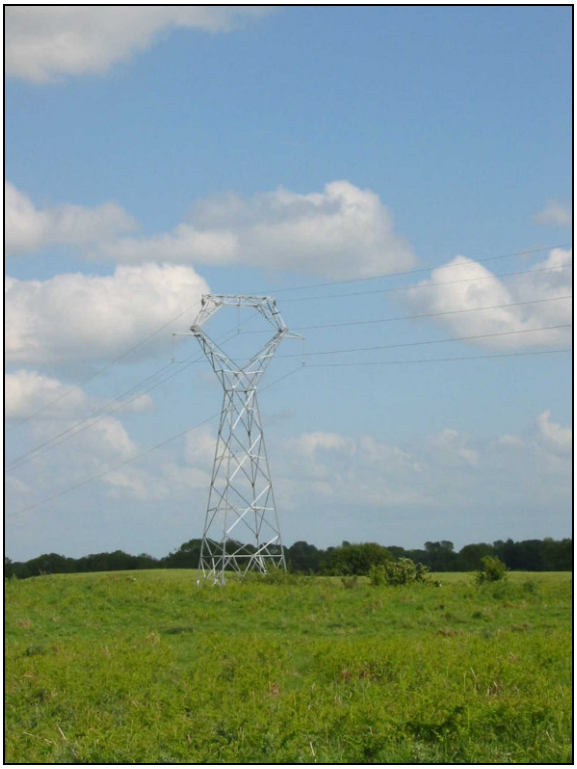


Figure 3.2 Typical 220kV Overhead Line Structure

Electricity Station

In addition to the construction of the overhead line, a new electricity station will be constructed in the vicinity of the existing Louth to Flagford 220kV overhead line, where the 400kV line will meet the 220kV line. The station is necessary to allow the high voltage electricity (400kV) to be carried into the national grid at a lower voltage (220kV).

The electricity station will have a compound area in the region of 7 hectares (270m x 260m). Within the station will be a number of electrical structures and towers with various electricity lines feeding into the station. The station will be similar in appearance to existing 400/220kV stations, which generally consist of a compound fence which surrounds various electrical installations, portal structures and a control building. ***Figure 3.3*** shows 400kV station (Oldstreet 400kV Station).

Figure 3.3 Oldstreet 400kV Station

3.4 Route Selection Process and Issues

3.4.1 General Issues

The objective of the route selection process is to identify a route corridor in which to connect the electricity grid in the Republic of Ireland to the Northern Irish electricity grid, having regard to a variety of factors such as planning, environmental, engineering, ground conditions etc.

In preparing this environmental report, the relevant planning and environmental issues are considered at all levels – National, Regional and Local, as these will form the basis for the evaluation of the planning application when it is made to the appropriate authorities.

National – Relevant considerations include the National Development Plan, the National Spatial Strategy, All Island Energy Development Market Framework, and other relevant plans and policies.

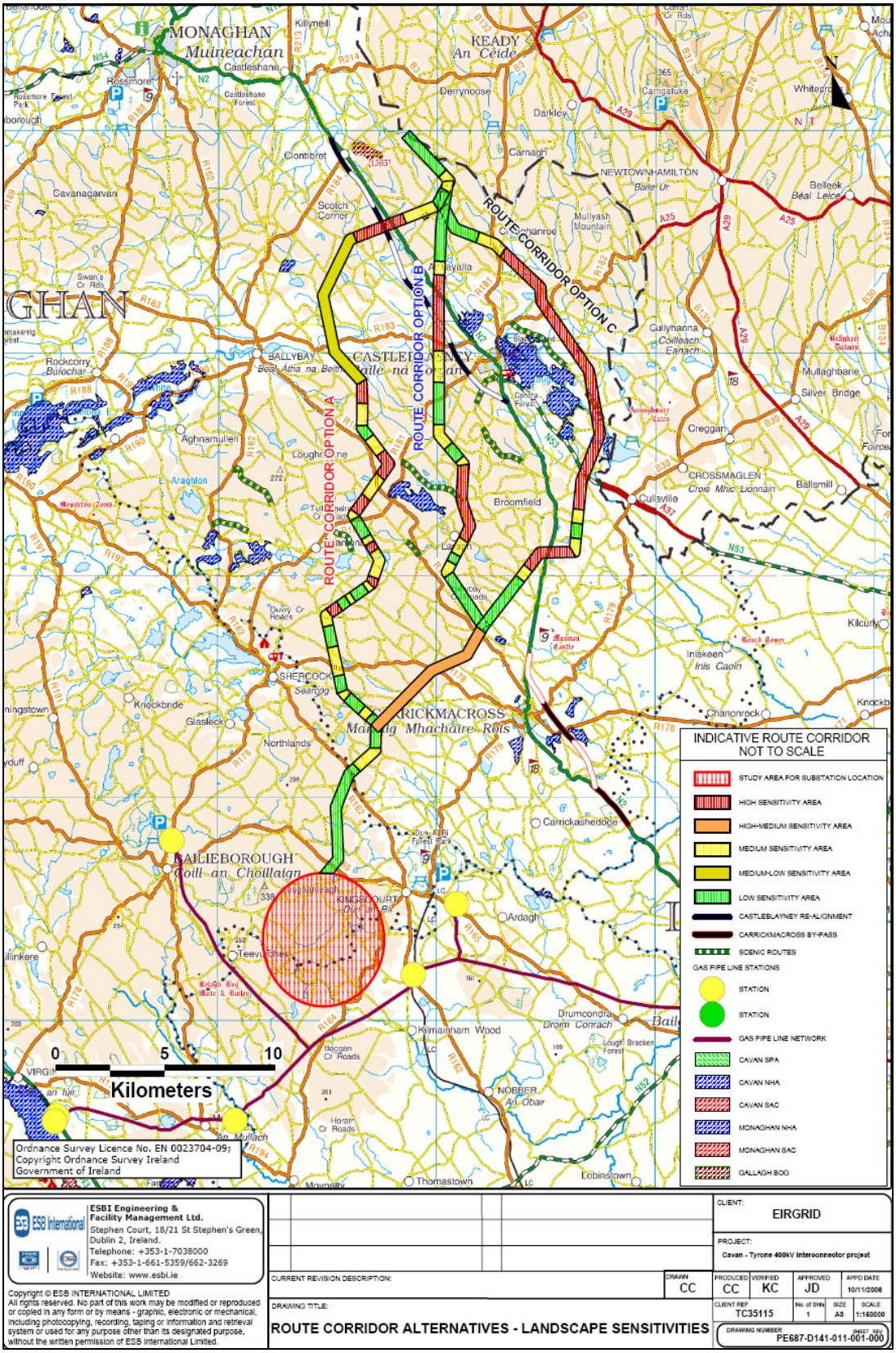
Regional – Considerations include the Regional Planning Guidelines for the Border Region and Regional Development Plan for Northern Ireland.

Local – Considerations include County Development Plans for Counties Cavan and Monaghan, the Armagh Area Plan, local amenities, tourist attractions, areas of ecological interest etc.

Section 4 describes the range of Strategic Planning Issues that will need to have been demonstrably evaluated to ensure a comprehensive defence of the Study Area and Route Corridors in a planning context.

3.5 Study Area and Route Corridors

The study area is defined as the broad geographical area within which the route corridors are located. A route corridor is defined as a corridor approximately 1km wide within which the electricity transmission line can be located. This report covers the entire study area and examines the 3 route corridors therein, and any other potential corridors that have not been considered.



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CLIENT: EIRGRID

PROJECT: Cavan - Tyrone 400kV Interconnector project

CURRENT REVISION DESCRIPTION:

DRAWN	PRODUCED	VERIFIED	APPROVED	APPD DATE
CC	CC	KC	JD	10/11/2008

CLIENT REF: TC35115 | No. of SHts: 1 | SIZE: A0 | SCALE: 1:160000

DRAWING TITLE: ROUTE CORRIDOR ALTERNATIVES - LANDSCAPE SENSITIVITIES

DRAWING NUMBER: PE687-D141-011-001-000 | SHEET REV

Section 4 – Strategic Planning Issues

4.1 Introduction

The evaluation of high level strategic considerations that gave rise to the decisions that affect the need for and the nature of the project is a very important factor when evaluating the acceptability of resultant environmental impacts.

The key issue of this high level evaluation is to ensure that from the outset, there was an evaluation of the likely environmental consequences of the key decisions about the nature and location of the proposed development from a strategic perspective.

The objective of the evaluation is to ensure that where residual impacts do occur that these have been anticipated and minimised, having regard to the widest spectrum of reasonably available options. The response to the majority of these questions are outside the scope of this report, however they are included to provide the client with an indication of the general issues that need to be fully addressed and resolved to support a successful planning application.

It is understood that the project management team for this project are considering these strategic issues and will provide appropriate documentation to support the planning application.

4.2 Project Need

It is necessary to establish, at national and regional level, what and where the level of use and increase of electricity demand will be. It would be prudent to describe this demand under a number of scenarios of demographics, economic conditions, technological developments and patterns of future landuses so that all reasonable eventualities can be shown to be considered. This is particularly important in view of the trans-boundary nature of the application.

Figure 4.1 on page 25 shows the existing transmission system in the Republic of Ireland and where the existing interconnector currently crosses the border to Northern Ireland.

4.3 Strategic Options

At the highest strategic level it is necessary to demonstrate the options available to supply the range of future needs, together with their likely environmental, planning and practical effects. This should include options for measures to:

- Control demand - such as energy conservation programmes
- Provide additional/alternative generation close to demand
- Transmit fuel [gas] rather than power

4.4 Supply Options

Having established that the transmission of electrical power at high voltages is the option that is most likely to supply future energy needs in the areas specified, it will be necessary to establish that a reasonable level of consideration has been given to the means of transmission and to evaluate the environmental, planning and practical consequences of each option.

This will include:

- Connections via a number of points at lower voltage
- Connections to different points in the National Grid
- Connections from Scotland, Wales and other parts of the UK

4.5 Connection Options

Having established that a high voltage electricity connection from Northern Ireland to the north eastern part of the Grid is the optimal solution, it will be necessary to examine the range of connection options that exist and, at a high level, to evaluate the environmental, planning and practical consequences of each option.

The comparison of connection options should include:

- connections via overhead transmission lines
- connections via underground cables
- connections via submarine cables

4.6 Route Options

Having established that a high voltage electricity overhead line connection from Northern Ireland to the north eastern part of the Grid is the optimal solution, it will be necessary to describe and justify the range of options for connection points [i.e. the points of origin and destination] and to discuss the general rationale for the resultant range of routes and route options.

4.7 Design Options

The planning application should include a survey of the range of 400kV conductor types and their associated insulators, supply towers, angle masts and other transmission structures, including the options available for the internal configurations, size, materials, colour and finish of each. The survey should conclude with a justification for the selected design having regard to the environmental, planning and practical consequences of each option.

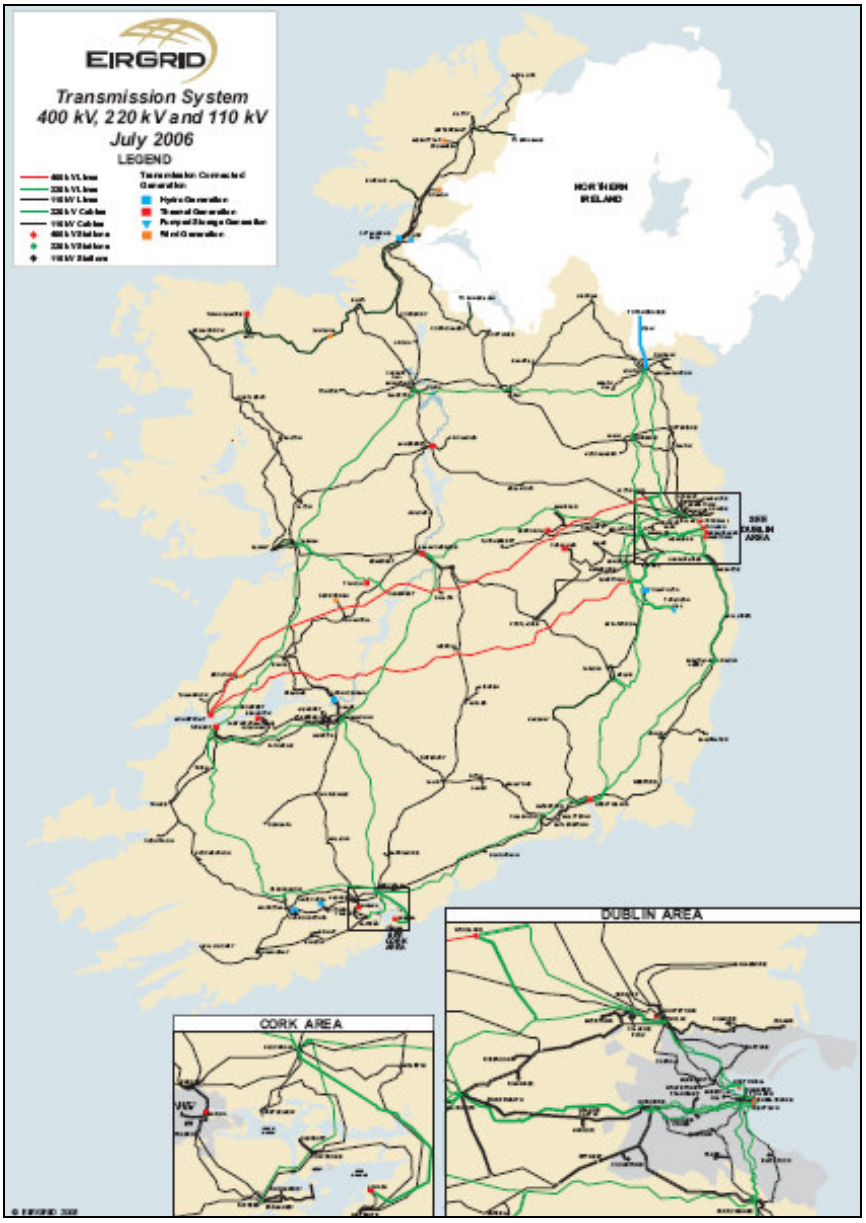


Figure 4.1 – Existing Electricity Transmission System in ROI

Section 5 – Socio Economic Report

5.1 Introduction

This chapter considers the impact of the proposed development in the context of population and settlement, employment and other impacts of a social and economic nature. In terms of human beings, the types of issues which developments such as this raise (both during construction and operation) include: impacts on population; tourism; services in the area; economic opportunities and impacts on existing land uses.

5.2 Proposed Development

The proposed interconnector project will consist of approximately 45km of 400kV overhead electricity transmission line in the Republic and approximately 37km of line to be built in the North of Ireland.

5.3 Strategic Planning Context

The following are the strategic planning documents within which the proposed interconnector project is considered.

- ***National Development Plan***

The National Development Plan 2000-2006 set out to ensure that Ireland remained competitive in the global international marketplace and that the fruits of our economic success would be shared more equally at regional level and throughout our society. It identified projects that would be funded under the plan – the interconnector project is not identified as a particular project to be funded in this plan however, this plan is currently under review and a new plan will be published in 2007.

- ***National Spatial Strategy (NSS)***

The NSS is a 20 year Spatial Planning Strategy, which is a strategic vision for the spatial development of Ireland. It outlines how a strengthened network of cities and towns together with rural communities and their resources will be mobilised and complemented by appropriate social and physical infrastructure, to create more balanced development across the country.

In relation to key infrastructure projects, the NSS identifies that 'a feature of the most mature and successful economies is that they possess highly developed, well integrated infrastructure that supports movement, i.e. public and private transport, and energy and communications networks.'

Section 3.7.2 of the NSS, which deals specifically with electricity energy states that 'a particular emphasis is being placed on the reinforcement of the grid in western counties. Accelerated growth in the Border, Midlands and West (BMW) region also suggests that in addition to the above programme, power

corridors will need to be considered to augment the capacity of the grid in Galway/Mayo/Sligo and along a corridor from Dublin to Dundalk.'

The proposed interconnector is therefore supported and planned for at a national level.

- ***'Shaping Our Future' – Regional Development Strategy for Northern Ireland 2025***

The Regional Development Strategy for Northern Ireland is a strategy to guide the future development of Northern Ireland to the year 2025 and to help to meet the needs of a fast growing region with a population fast approaching 2 million. The strategy seeks to strengthen economic and social cohesion by enhancing external linkages. An important strategic spatial planning objective is to increase links with neighbouring regions, and capitalise on trans-regional development opportunities.

In relation to social and economic development in Northern Ireland the key themes and measures of the strategy are;

- to accommodate a population growth of 105,000 persons by 2015 and about 150,000 by the year 2020.
- to facilitate the development needs of economic growth and the creation of approximately 100,000 extra jobs to cater for the expanded population expected by 2015. Contribute to the reduction of socio-economic differentials with the Region and tackle issues of employment and long-term unemployment.

The strategy emphasises making good use of past investment in physical and social infrastructure while tackling deficiencies. It is acknowledged that this will require a strategic long-term perspective on infrastructure – co-ordinating, planning, programming and setting regional priorities – not just within the region, but also in terms of national, cross-border and EU provision.

Part of this strategy is to continue to upgrade regional electricity infrastructure to meet the needs of future growth, and particularly the power demand from new housing areas, commercial areas, industry and large scale IT developments.

The proposed interconnector is not specifically identified as a project but it is compatible with the strategy as set out above.

- ***Regional Planning Guidelines for the Border Region***

The objective of the Regional Planning Guidelines is to provide a long-term strategic planning framework, for the development of the Border Region over a 20 year period. The planning framework sets the scene for the implementation of the National Spatial Strategy at a regional level, and contains strategic policy directions which will cross the boundaries of the

individual counties, and will later be incorporated into the policies of the county and other Development Plans of the Region.

The National Spatial Strategy has identified reliable and effective energy systems such as gas and electricity to power industry and services as prerequisites for effective regional development. Prime considerations relevant to the Border Region are 'the development of energy infrastructure on an all-island basis and the strengthening of energy networks in the West, North West, Border and North Eastern areas in particular.'

The proposed interconnector is therefore supported and planned for at a regional level.

- ***Monaghan County Development Plan***

There are no particular policies in the Monaghan CDP which refer to the provision of electricity infrastructure in the county. There are general references to improving infrastructure, including energy, in the County in order to facilitate economic growth throughout the County.

- ***Cavan County Development Plan***

There are no particular policies in the Cavan CDP which refer to the provision of electricity infrastructure in the county. There are general references to improving infrastructure, including energy, in the County in order to facilitate economic growth throughout the County.

- ***Armagh Area Plan 2018 [being prepared]***

The issues paper for the Armagh Area Plan 2018 sets the detailed implementation of the Regional Development Strategy for Northern Ireland. The issues paper indicates that the provision of necessary infrastructure is required to facilitate future economic growth.

5.4 Existing Environment

5.4.1 Planning and Development Context

- ***General***

  The proposed Cavan-Tyrone 400kV interconnector project will connect the grid in the Republic of Ireland with that in Northern Ireland. Sections 3 and 4 of this report set out the details and strategic planning reasons for the project.

- ***Land Use Structure within the Study Area***

  The general landuses within the study area are described in Section 6 of this report.

5.4.2 Socio-Economic Factors

The Border Region on both sides of the border is challenged by some of the most difficult socio-economic and physical barriers to development. The bulk of the region has little natural geographic or economic cohesive identity, and has always been characterised by peripherality and disadvantage. The distortion effect created by strong urban centres close to the border has been prominent. Persistent weaknesses in infrastructure have resulted in underperformance, and the inability of the Region to compete for employment on a national or international scale. The promotion of strategic and local links with Northern Ireland will provide an effective interface between the two economies.

The following socio-economic analysis concentrates on the national, regional and local impacts that are likely to arise as a result of the proposed development in terms of population, settlement patterns and levels of economic activity.

Due to the nature and scale of this project, the resulting socio-economic impacts will be primarily at national and regional level. When the line route is chosen there will be some socio-economic impacts locally along the route but these will be generally similar regardless of what route is chosen.

5.3.2 Population

Population Structure and Change

In terms of the County, Region and State, population change is strongly influenced by migration and emigration rates, rather than birth and death rates. The mid to late 1980's in Ireland was a period of heavy population outflow, mainly due to the poor economic and employment situation. The indications are that since 1990 there has been a large movement of people into the country due to the current "economic boom" in Ireland. The Border Region has experienced moderate levels of population growth in recent years.

Table 5.1 below shows the changes in population for the Island of Ireland (North and South), the Republic of Ireland Border Region (Counties Cavan, Donegal, Leitrim, Louth, Monaghan and Sligo) and locally (County Monaghan, Castleblaney and Carrickmacross). These are all hinterlands that have relevance to the proposed interconnector.

Area	1986	1996	2002	2006	1986-96 % Change	1996-2002 % Change	2002-06 % Change
Ireland (incl. NI)	Not Avail	5,203,923[1]	5,603,030[2]	5,984,925[3]	Not Avail	7.6%	6.8%
Rep of Ireland	3,540,643	3,626,087	3,917,203	4,234,925	2.4%	8.0%	8.1%
Northern Ireland	Not Avail	1,577,836[4]	1,685,827[5]	1,750,000	Not Avail	6.8%[6]	3.8%
Border Region	410,899	407,295	432,534	467,327	-0.88%	6.2%	8.0%
Co. Monaghan	52,379	51,313	52,593	55,816	-2.0%	2.5%	6.1%
Castleblaney (town and rural area)	Not Avail	10,874	11,063	11,571	NA	1.7%	4.6%
Carrickmacross (town and rural area)	Not Avail	11,575	12,174	13,289	NA	5.2%	9.2%

(Source: ROI Census of Population, 1986, and 1996, 2002 and 2006[7] and NI Census 1991 and 2001)

Table 5.1 Population Structure at National, Regional and Local Level

Table 5.1 above shows that the ROI Border Region is now a moderate population growth centre. In contrast to a falling population between 1986 and 1996, the region has experienced a significant population increase in the last decade. During the period from 1996 to 2002 the population of the region increased by 6.2%. Recent census data shows a further increase of 8% in the region's population between 2002 and 2006, which is in line with the State (Republic of Ireland) population growth rate of 7.5% in the same period.

Population projections indicate that high population growth in the Border Region is expected to remain so for the next 15 years. The Regional Planning Guidelines indicate a population increase of approximately 15% from 467,327 persons in 2006 to 550,000 persons in 2020. In addition to this, the designation of Sligo, Dundalk, Letterkenny, Cavan and Monaghan as Gateways and Hubs in the National Spatial Strategy (NSS) indicate that the area will have a strong development focus.

[1] See notes below
[2] See notes below
[3] Estimate – see notes below
[4] NI Census 1991 – Census in NI only take place every 10 years whereas in the Republic Censue are undertaken every 5 years.
[5] NI Census 2001
[6] See previous notes
[7] The 2006 census information is obtained from preliminary data, the final publication of the census data is not yet available for 2006

Gateway/Hub Population	2002 Town	NSS Target 2020+	Total of Additional Population to Gateways and Hubs
Sligo	20,000	40,000	Approx. 90,000
Dundalk	32,000	60,000	
Letterkenny	15,000	35,000	
Cavan	6,000	16,000	
Monaghan	5,000	15,000	

(Source: Regional Planning Guidelines [RPGs] for the Border Region)

Table 5.2 Gateway and Hub Population Projections

There are a number of regionally significant issues in relation to population, settlement and managing growth in the region as outlined in the Regional Planning Guidelines for the Border Region. These include:

- the consequences of the predictions for population in
  - Gateways
  - Hubs
  - Sub Regions (e.g. potential pockets of depopulation)
- future range of population settlement distribution
- the consequences for the changing composition of our population in the Border Region (i.e. high dependency, participation rates, labour force)

Towns positioned at strategic locations will drive growth and towns such as Cavan and Monaghan for example will be, to an extent, driven by the Northern Economy.

Effective infrastructure is required as a pre-condition for achieving the growth set out above. A key issue for the RPG's is the lack of connectivity in the Region and not withstanding the infrastructure provision in recent years, it is clear that the question of infrastructure deficits needs to be addressed.

5.4.3 Economic Activity

Economic activity in the Border Region and in the hinterlands of the proposed interconnector, is primarily related to agriculture, tourism and rural development. New approaches towards agri-tourism, organic farming and eco-tourism provide the basis for much of the economic development of the region. Agricultural related employment is obviously disperser throughout the hinterland of the project.

Sectoral employment as a share of total employment in the Border Region may be divided as follows:

Employment Sector	***% of total employment (2003)***
Agricultural Employment	10.0%
Industrial Employment	31.5%
Services Employment	58.4%

(source: www.border.ie)

The provision of an effective physical and social infrastructure network is essential in terms of accessibility and connectivity for the Region. In relation to Energy provision, the National Spatial Strategy and the Northern Ireland Regional Development Strategy have identified reliable and effective energy system such as gas and electricity to power industry and services as key prerequisites for effective regional development. Prime considerations relevant to the Border Region are the development of energy infrastructure on an all-island basis and the strengthening of energy networks in the West, North West, Border and North Eastern areas in particular.

Priorities include the improvement of power supply, to the North West and Border and North Eastern parts of the country, and strategic strengthening of the electricity grid.

5.4.4 Employment in Tourism/ Amenity

In addition to the towns of Castleblaney and Carrickmacross, which have buildings and features of tourism interest, local amenities within the study area include; forest parks, lakes and waymarked walking routes.

Having regard to the location of the route corridors, the main features of tourism in the study area include:

Lough Muckno and Forest Park is Monaghan's largest lake. It is located off the N2 on the eastern side of Castleblayney. This lake covers an area of 325 hectares with depths to 20m. There are a number of well established fishing locations on the lake including White Island, Black Island, Concra Wood, South Lodge and Toome Point. Lough Muckno holds large stocks of fish including bream, rudd, roach, hybrids, tench, perch and pike. Course angling, game angling and pike angling are popular tourist activities in this area.

In addition to Lough Muckno there are a number of smaller lakes with a similar angling and recreational value throughout the County of Monaghan.

Close to the border there is a waymarked walkway – the Monaghan Way.

5.5 Predicted Impacts

It is the nature of the interconnector project to pass through a region and an area. Accordingly the project will directly affect the social, economic or enterprise status of the area. The provision of a higher quality and more secure power supply to the National Grid on both sides of the border will,

however, have considerable indirect positive effects on the region and the area – because it will help to support the provision of improved economic growth for the area.

Local amenities have the potential to be impacted through visual impacts or effects on biodiversity – these impacts are considered in the relevant reports.

5.6 Mitigation Measures

5.6.1 General

Impacts with a potential to affect the socio-economic status of the study area would only arise indirectly through other topics – such as effects on landscape, cultural heritage and biodiversity. The mitigation measures for these issues are dealt with in other specialist subsections.

5.6.2 Residual Impacts

The proposed interconnector development will have a positive long term impact on the Border Region and the country as a whole. The development and improvement of the country's energy infrastructure are a prerequisite for economic development. Effective and reliable energy supply will make the country and the region a more attractive location for inward investment.

Section 6 – Landuse Report

6.1 Introduction

This section analyses the existing landuses within the study area to determine whether and how any land use would be significantly affected by the proposed development.

6.2 Methodology

The general route corridors were examined using a combination of mapping and remote sensing imagery. The CORINE landuse classification and mapping system were also used to provide a standardised reference system for the description of landuses.

The potential route corridors within the broad study area were examined during site visits[8] (July and September 2006) to facilitate confirmation of remote sensing classifications.

Landuse impacts were assessed on the basis of:

- the presence or proximity of potentially vulnerable landuses
- the presence or proximity of potentially beneficial landuses
- the potential for interactions with those landuses
- the current and likely future status of those landuses

6.3 Proposed Development

The proposed overhead line will consist of approximately 45km of 400kV overhead electricity transmission line in the Republic, with lattice steel towers used along the entire route. The electricity station will consist of a compound area of approximately 7 hectares including various electrical installations, portal structures and a control building.

6.4 Existing Environment

The study area is largely used for agriculture and associated activities that include food processing, tourism and rural settlement. A number of small villages occur within the study area. A large number of towns occur within the study area including Kingscourt, Carickmacross and Castleblaney. There is one main road, the N2, running through the area. In addition to this there is an extensive network of smaller interconnecting roads throughout the area. Rural dwellings are typically located along these smaller roads at varying densities

[8] Site visited by Conor Skehan – Landscape Consultant and by Brendan Allen – Planning and Environmental Consultant.

throughout the area. Some of these dwellings occur within the route corridor alternatives.

The following table details the number of dwellings located within a 100 meters of an indicative line route for each of the three route corridor alternatives. The number of dwellings were derived from the GeoDirectory, which was jointly developed between An Post and the Irish Ordnance Survey Ireland in order to meet the needs of Irish businesses for a standardised address and location database for the Republic of Ireland. It must be noted that the GeoDirectory is by no means definitive and is subject to erroneous data. The table gives an approximate idea of the number of dwellings that would exist within 100 meters of an indicative line route. The data is based upon a desktop study and is by do means definitive. The final number of dwellings would be subject to a final line route determination of the preferred route corridor.

	Route A Corridor	**Route B Corridor**	**Route C Corridor**
Residential Houses	34	36	40

The area comprises an almost uniform pattern of pasture based agriculture at relatively low levels of intensity. These are smaller areas where intensive stock-raising and poultry operations occur – though these are few in the context of the overall number of holdings.

The map shows that the study area lies within one of the most extensive areas of uniform landuse [pasture] in Ireland.

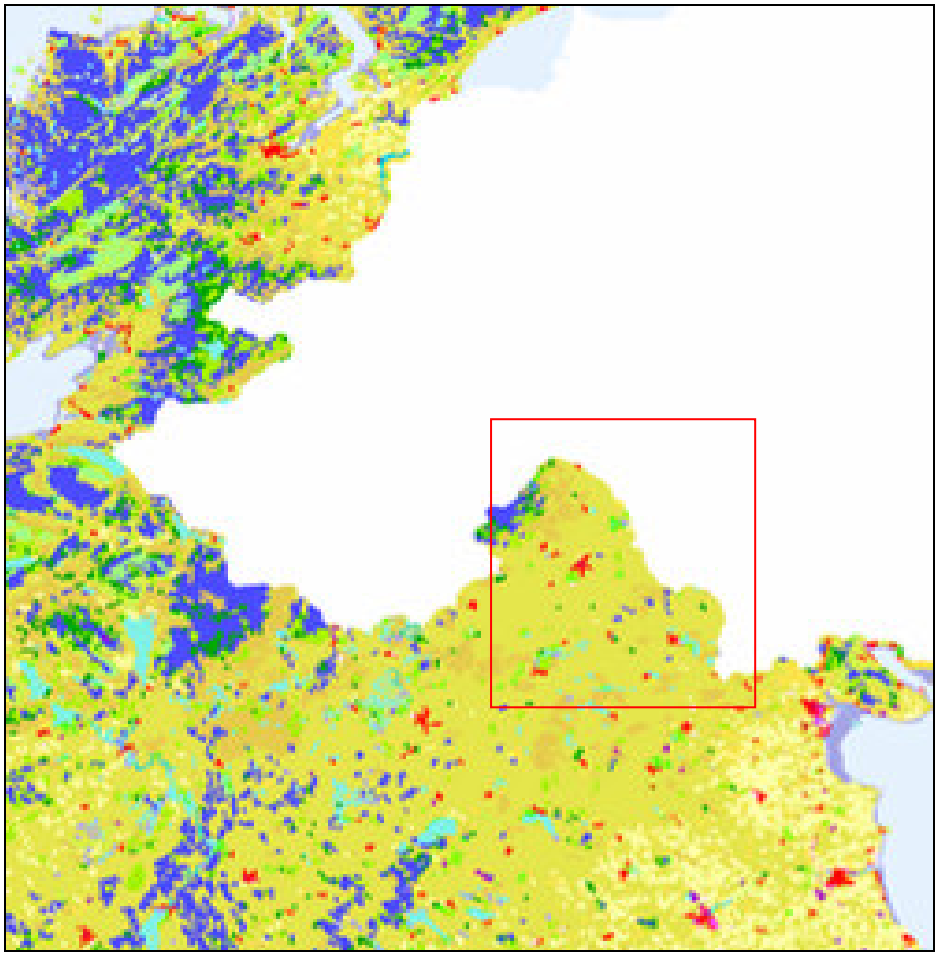


Figure 6.1 Details of study area showing the uniformity of the landuses within the study area

6.5 Predicted Impacts

While there may be localised impacts on individual farmholdings in terms of structures on lands, depending on the final route selected, there is little potential for adverse effects on agriculture – the principle landuse in the area.

There is some potential for localised indirect impacts on tourism resources due to visual impacts, these are addressed in more detail in other sections of this report and will be addressed in more detail in the final EIS.

6.6 Mitigation Measures

No specific mitigation measures are likely to be required to address the impacts on landuses.

Section 7 – Landscape Report

7.1 Introduction

This section analyses the existing landscape character and significance within the study area of the proposed transmission line and the electricity station. It also provides an evaluation of the potential for landscape and visual impacts associated with the proposed development in the study area.

The assessment is made having regard to the vulnerability of the landscape to change and to the location of the visual receptors relative to the proposed development.

7.2 Proposed Development

The proposed overhead line will consist of approximately 45km of 400kV overhead electricity transmission line in the Republic, (***see Section 3 for Photographs and Description***) with lattice steel towers used along the entire route. The electricity station will consist of a compound area of 7 hectares including various electrical installations, portal structures and a control building.

7.3 Methodology

The potential route corridors within the broad study area were examined during site visits[9] (July and September 2006) during which the main landscape features and landscape character areas were identified. This visit was carried out to assess the general potential for visual impact from local roads and sensitive receptors.

Topography and landform were also evaluated to assess the potential zone of visual impact from route corridors. The County Development Plans for Cavan and Monaghan were consulted to identify Landscape Character Areas and significant landscape features.

Landscape impacts were assessed on the basis of:

- The capacity of the existing landscape to absorb the proposed development
- Effects on landscape character and features (e.g. removal or alteration)
- Proximity of sensitive viewpoints (e.g. scenic routes) and visual receptors
- The heights and locations of the proposed structures

[9] Site visited by Conor Skehan – Landscape Consultant and by Brendan Allen – Planning and Environmental Consultant.

Visual impacts are evaluated taking account of:

- The sensitivity of the receiving environment
- The visual contrast between the existing environment and the proposed development
- The extent of the areas over which these effects will be discernible

Photomontages illustrating the likely visual impacts from the proposed development, will be prepared to form part of the final Landscape Report when the final route is selected.

7.4 Receiving Environment

The project and route corridors lie predominately within County Monaghan with potentially the electricity station and some sections in County Cavan.

The County Development Plans (CDP) of both Planning Authorities have been consulted for relevant policies in relation to landscape. Whilst the plans have different policies which are referred to in this report, the impacts are analysed jointly as the landscape policies are generally similar.

County Monaghan Draft Development Plan 2006-2012

The following are the relevant landscape policies in the Monaghan Draft CDP. The numbering used below is that used in the Monaghan Draft CDP.

4.1 Landscape background

The unique character of the Monaghan landscape is its intimate quality with drumlins, interspersed with lakes, trees and woodlands. This landscape of small enclosed fields with foreshortened horizons is different and indeed unique from that of the more open landscape found in many other parts of Ireland. It is a landscape that has evolved over the centuries and has traditionally been moulded and protected by agricultural practices.

Today the demands being placed on our environment to satisfy the needs of farming, forestry, industry, housing, transport, leisure and urban growth are ever-changing and increasing. The unregulated spread of urban-generated housing with inappropriate siting, design and landscaping in rural areas represent a significant threat to our landscape.

Monaghan's Drumlin Landscape

In recognition of the increasing appreciation of the value of landscape, the European Landscape Convention has been ratified by Ireland. The rationale behind the Convention recognises that "the landscape is a key element of individual and social well-being and that its protection, management and planning, entail rights and responsibilities for everyone". The purpose of the convention is to encourage public authorities to adopt policies and measures at all levels for protecting, managing and planning landscapes so as to maintain and improve landscape quality and enable recognition of the value and importance of landscape.

The Convention requires that each party "integrate landscape into its regional and town planning policies and in its cultural, environmental, agricultural, social and economic policies, as well as in any other polices with possible direct or indirect impact on landscape".

It is important to note that the European Landscape Convention applies to ordinary landscapes no less than to outstanding ones. Whilst there is significant potential to accommodate sensitively designed development which respects the existing landform, one of the principal roles of the Planning Authority is to protect the most sensitive landscapes from intrusive and unsympathetic development which would irreversibly damage County Monaghan's environment and heritage. In order to conserve and preserve the county's landscape the Planning Authority shall co-operate with the appropriate bodies and individuals.

4.1.1 Landscape Character Assessment

The draft Guidelines for Planning Authorities for Landscape and Landscape Assessment, DOELG, June 2000, prescribe a new approach to the assessment and protection of rural landscapes. It proposes assessing and categorising landscapes by their character and capacity to accommodate development types. The Guidelines provide for the categorisation of landscape into five sensitivity classes: Low Sensitivity, Moderate sensitivity, High sensitivity, Special, and Unique. Under the draft guidelines it is intended that the county's landscape be identified and characterised. Each character area will be subjected to a value and sensitivity assessment to:

(a) Preserve identified sensitive landscapes
(b) Identify appropriate levels of development potential.

These guidelines recognise that all landscapes need to be evaluated by reference to their own character and the value that society places on them, as opposed to the characterisation of earlier approaches that only identified outstanding landscapes. The Planning Authority proposes that a County Landscape Character Assessment be prepared and adopted in order to provide clarity and direction to those seeking to develop in sensitive rural areas.

Landscape Policies

ENV 1. *Prepare a County Landscape Character Assessment in accordance with the requirements of Landscape and Landscape Assessment Consultation Draft Guidelines for Planning Authorities, DOELG, June 2000.*

ENV 2. *Protect the landscapes and natural environments of the county by ensuring that any new developments in designated sensitive rural landscapes do not detrimentally impact on the character, integrity, distinctiveness or scenic value of the area.*

ENV 3. *Sustain, conserve, manage and enhance the landscape diversity, character and quality of the County for the benefits of current and future generations.*

ENV 4. *Zone important landscape features and elevated lands within settlements as Local Landscape Policy Areas (LLPAs), to ensure that developments do not detrimentally impact on the amenity of the landscape nor on the natural setting of settlements.*

In the interim, pending the publication of the Landscape Character Assessment, the Council proposes to apply controls on outstanding landscape quality areas, within the county, which require protection from insensitive or inappropriate development and to ensure as far as possible that all landscapes are respected and valued.

There are no CDP maps accompanying this text, however the Areas of Scenic Importance listed in Appendices 1 and 2 of the Draft CDP have been transposed by ESBI onto ***Route Corridor Alternatives Map.***

It is clear that the study area consists of a remarkably uniform landscape type of drumlin landscape overlain on a very gradual north-south ridge.

There are protected views and landscapes at a number of locations within the study area. These are almost all associated with lakes - they are indicated on ***Route Corridor Alternatives Map.***

County Cavan Development Plan 2003
The following are the relevant landscape policies in the Cavan CDP.

Extensive Areas of High Landscape Value
It is the policy of the Planning Authority to maintain the scenic and recreational value of these areas by restricting all adverse uses and negative visual impacts. It is the intention of the Planning Authority to have these areas examined, reviewed and refined within the plan period. Where development has to take place in such an area, due to unavailable alternative location for such development, the developer will be required to carry out such studies to establish base line parameters and to take such measures as are deemed appropriate to protect the local environment.

THE ENVIRONMENT
The survey revealed a range of environmental assets in the county which, because of their outstanding importance in terms of amenity, require special consideration in terms of conservation and protection. These assets include:

- *Scenic Views;*
- *Parks;*
- *Riverside Amenity Areas;*
- *Lakeside Amenity Areas;*
- *Archaeological, Historical, Scientific, Architectural and Cultural items;*
- *Areas of High Landscape Value including waterways;*

- *Walking Routes;*
- *Major Lakes and Lake Environs; and*
- *Scenic Routes*

The Development Plan includes policies to ensure that these assets are conserved and protected, both because of their intrinsic value and because they present opportunities for economic development in tourism and other areas. The Planning Authority has an important role to play in the protection of the environment, and will continue to use all the means at its disposal to maintain the environmental quality of County Cavan.

There are no areas of scenic importance in the Cavan County Council area that are relevant to this project.

7.5 Potential Impacts

This section describes how the proposed development is likely to impinge on the character and appearance of the landscape.

There are two types of potential landscape and visual impact - those that arise from the location of individual towers and those arising from the general location of the route. The latter is the concern of this route constraints report.

In general terms Route Option A – a western corridor has the least potential to be visible and has the least potential for visibility from sensitivity receptors.

In general terms Route Option B – a central corridor is located along the most elevated underlying topography of the three routes and will cause the most widespread visibility especially from portions of the N2 – though it appears to be the shortest route which is an advantage.

In general terms, Route Option C – an eastern corridor passes closest to the most significant landscape resources – i.e. Lough Muckno and the outskirts of Castleblaney.

7.6 Evaluation of Route Corridors and Conclusion

Route Corridor A will cause least visibility – though it is the longest route.

Route Corridor B will be the most conspicuous in the wider landscape – but it is the shortest route.

Route Corridor C has the greatest capacity to affect sensitive landscapes and regionally significant landscape resources.

Section 8 – Ecology Report

8.1 Introduction

This section provides a preliminary ecological evaluation of the potential route corridors. The aim of this preliminary desk study are to assess the ecological value of the study area based on local site designations, consultations and other information available.

8.2 Study Area

The proposed routes for the 400 kV power line and the electricity station passes through an area that is largely comprised of rolling drumlins and associated valleys. The character of the area is largely rural agricultural with a number of small villages occurring within the study area. A number of large towns occur within the study area including Kingscourt, Carrickmacross and Castleblayney. There is an extensive network of interconnecting roads through the area.

The study area lies within a number of river catchments that are described in detail in the following sections. All of the proposed options are located in either the River Glyde or River Fane catchments. Both of these main channels hold Salmon and Trout stocks and the majority of the tributaries contain salmonid spawning and nursery habitats. A number of lakes are also present in the study area and these lakes contain stocks of coarse fish.

8.3 Preliminary Ecological Evaluation

This report details a desk study that considers the proposed powerline in the context of the existing ecology of the study area and the adjacent areas, and the potential impacts of the development on these features. Areas of scientific and/or conservation interest, as well as the presence of protected plant and animal species within the vicinity of the study area were investigated. National Parks and Wildlife Service (NPWS) were consulted for relevant ecological information relating to the site and surrounding areas (Local ranger: Denis O'Higgins, Deputy Regional Mgr: Padraig O'Donnell). The Central and Northern Regional Fisheries Boards (CFB & NRFB) were also consulted with reference to water quality and significant fisheries (Fisheries Environmental Officers: Michaela Kirrane & Tracy McPhelim).

8.3.1 Rare Species

There are records for rare plants and animals, and species of restricted distribution along the proposed route corridors and/or within the study area. These are located within designated sites (see Appendix II) and rivers (lamprey, salmon and white-clawed crayfish). There are also species listed in

Annex II of the Habitats Directive which utilise the wider area. These include otter, *Lutra lutra*, and hare, *Lepus timidus hibernicus*.

8.3.2 Fisheries

The study area covers parts of the jurisdictions of the Northern and Eastern Regional Fisheries Boards.

The main river catchments are the River Fane and River Glyde. In both regions, the watercourses are significant fishery areas holding Salmon and Trout stocks while the majority of the tributaries contain salmonid spawning and nursery habitats. The Dromore and Glyde rivers also contain two protected species under the EU Habitats Directive, white-clawed crayfish and lamprey. The lakes contain stocks of coarse fish. The proposed routes of the power line are located in proximity to a number of areas as outlined below.

- *Proposed station in the vicinity of Kingscourt*

The area highlighted contains a number of watercourses, which are important from a fisheries perspective: Breakey Lough and Ervey Lough, which are located in the area, both hold stocks of coarse fish and pike. The out flowing streams from both lakes contain salmonid habitats and flow into Newcastle Lake and onwards to the River Dee.

- Overhead line structures

Route Option A

The majority of watercourses along this route are located in the Northern Regional Fisheries Board jurisdiction. The main river catchments in this region are the Knappagh and Dromore Rivers. From south to north:

- the line will cross a tributary stream of the Knappagh River which links Lough Egish and Boraghy Lough
- it will pass near to Crinkill Lough
- it will cross a number of tributaries of the Dromore River, a tributary of the Annalee in the Erne catchment
- the line then runs adjacent to Drumgristin Lough and Tassan Lough

The watercourses crossed in the Eastern Board jurisdiction are:

- the upper reaches of the River Lagan, north west of Kingscourt (River Glyde catchment)
- the upper reaches of the River Fane, north-west of Castleblaney

Route Option B

The watercourses along this route include the following:

- inflow to Lough Fea at Tirnadrel (River Glyde catchment)
- inflow to Lough Apuca at Lisnaguiveragh (River Glyde catchment)
- inflow to Creevy Lough at Cornasleeve (River Glyde catchment)
- upper reaches of the River Fane, north-west of Castleblayney

Route Option C

The watercourses along this route are located in the River Fane catchment and include the following:

- outflow from Drumillard Lough at Drumaconvern
- outflow from un-named lake at Knockreagh Upper
- tribuatry of River Fane at Tullacrunat
- clarebane River at Clarebane Bridge
- County Water at Drumleek South
- gentle Owens Stream at Erryroe and Creghanroe
- upper reaches of the River Fane, north-west of Castleblayney

Based on this overview, Route options A and B are viewed as preferable options to have least impact on fisheries.

8.3.3 Designated Areas

There are sixteen designated areas of conservation value within the study area (***Table 8.1***). While none of the proposed routes pass directly through these designated areas, there are instances where the routes pass directly adjacent to the sites. Most of the designated areas are lakes and associated fringing habitats, and are sensitive to activities in the local catchments.

Table 8.1 Designated conservation areas within the study area and greater Cavan area

Code	Site	Designation	Distance from Route A	Distance from Route B
001666	Tassan Lough	pNHA	0.5km	1km
001607	Lough Smiley	pNHA	7km	2km
001268	Cordoo Lough	pNHA	2km	7km
000563	Muckno Lough	pNHA	8km	4km
001605	Lough Egish	pNHA	1km	1km
001596	Black Lough	pNHA	5km	12km
	Derrygoney Lough		5km	12km
	Bawn Lough		5km	12km
001599	Creevey Lough	pNHA	8km	1km
002077	Nafarty Fen	pNHA	8km	4km
000560	Lough Fea Demesne	pNHA	5km	5km
001670	Spring & Corcin Loughs	pNHA	6km	6km
000561	Lough Naglack	pNHA	6km	6km
001608	Moynalty Lough	pNHA	7km	7km
001495	Lough Ross	pNHA	10km	10km
001600	Drumakill Lough	pNHA	6km	6km

The area south of Carrickmacross and west of Route option C are the densest areas of conservation sites. Route options A and B largely avoid designated areas.

8.4 Issues of Concern

8.4.1 Fisheries

Avoidance of lakes, streams and rivers is the main issue raised by the Fisheries Boards. Given the overview provided in the previous section, Route B has the least river crossings and impacts on water bodies.

The main concerns of the CFB and NRFB relating to the proposed power line are during construction and installation of structures along the power line route. The main impacts would arise from fuels, oils and other pollutants and run-off through soil disturbance. The Fisheries Boards have published guidelines relating to construction works along rivers entitled *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites, (available at www.fishingireland.net/erfb/protect.htm).* The aim of the guidance notes is to identify the likely impact on fisheries habitat in the course of construction and development work, and to outline practical measures for the avoidance and mitigation of damage.

Given that there will be no in-stream works the guidelines relating to run-off from machine service and concrete mixing are the most relevant. This will require facilities to buffer/treat discharges generated on-site.

In all salmonid catchments, works should be carried out during the period May to September.

8.4.2 Designations

There are sixteen areas of conservation value highlighted by the *NPWS.*

Areas designated for nature conservation should be avoided. This includes avoidance of catchments of designated lakes and rivers where possible. Routes A and B largely avoid designated areas, while Route C is located adjacent to a cluster of NHAs in the Lough Muckno area.

The NPWS highlighted the issue of mitigating against impacts on over-flying wildfowl and migratory species. However, all three routes lie between the main destinations of Lough Muckno, Lough Bawn and Lough Egish. There are no mitigation measures outlined by the NPWS in correspondence (see Appendix 8.1). Again, construction activity should be carried out in consultation with NPWS to identify best times for construction and site-specific restrictions.

8.5 Conclusions and Recommendations

- The study area lies within a regionally ecologically significant area, both in terms of fisheries and nature conservation designated areas.

- The study area lies within the catchments of the Rivers Glyde and Fane, which drain a significant area of Cavan, Monaghan and adjacent counties. These are significant fisheries with coarse fisheries predominantly in lakes and game fisheries along the Glyde and Fane and associated tributaries.

- The power-line corridors pass through an area that is sensitive to water pollution (historically through agricultural fertiliser run-off). However, the nature of the development will not have a significant impact on local water quality and/or fisheries given appropriate care is given to excavation of foundations, etc.

- There is a number of rare and restricted distribution species recorded from the study area; these are located in designated areas. There are sixteen designated areas located in the study area. The areas largely comprise lakes and associated habitats and any development should aim to avoid the local catchments of these areas.

- The preferred corridor for the powerline based on this assessment is Option B. This is based on the least impact on fisheries and designated areas. It is also the shortest route, thereby reducing impact to the area along the N2, which is already a main infrastructural route. Route A is considered the second preferred option, given the avoidance of designated areas. Route C is considered unfeasible given the proximity to a relatively large cluster of hydrologically linked pNHAs.

- The NRFB and CFB have expressed issues of concern in relation to construction of the power line. Eirgrid should follow the FB guidelines to mitigate against potential run-off instances. The NPWS request that all designated areas be avoided. Also, there is some concern relating to measures to lessen any likely collisions with wildfowl and migratory species. This will require ongoing consultation with NPWS local staff pre-and during construction of the power line.

- The power line will not have a significant impact on the ecology of the study area, and/or the wider area. This is given that due consideration is paid to recommendations following a more extensive ecological field survey and evaluation of habitats along the preferred route.

Appendix 8.1 – Communication with Consultees

Dr. Catherine Farrell,
18 Colliers Brook,
Tullamore,
Co. Offaly.

Our Ref: MK

3rd July, 2006

Re: Proposed power line between Kingscourt, Co. Cavan and Clontibret, Co. Monaghan.

Dear Dr. Farrell,

We refer to your letter dated 6th June last in relation to the above mentioned proposal.

Our comments in relation to the proposal are as follows:

Compound Area
The area highlighted contains a number of watercourses, which are important from a fisheries perspective.
Breakey Lough and Ervey Lough, which are located in the area, both hold stocks of coarse fish and pike. The outflowing streams from both lakes contain salmonid habitats and flow into Newcastle Lake and onwards to the River Dee.

Overhead line structures
Route Option A
The majority of watercourses along this route are located in the Northern Regional Fisheries Board jurisdiction. I copied the relevant details to their sub-office in Corlesmore, Ballinagh, Co. Cavan on Friday last.
The watercourses crossed in the Eastern Board jurisdiction are

- the upper reaches of the River Lagan, north west of Kingscourt (River Glyde catchment)
- the upper reaches of the River Fane, north-west of Castleblayney

Route Option B
The watercourses along this route include the following

- Inflow to Lough Fea at Tirnadrel (River Glyde catchment)
- Inflow to Lough Apuca at Lisnaguiveragh (River Glyde catchment)
- Inflow to Creevy Lough at Cornasleeve (River Glyde catchment)
- Upper reaches of the River Fane, north-west of Castleblayney

Route Option C
The watercourses along this route are located in the River Fane catchment and include the following

- Outflow from Drumillard Lough at Drumaconvern
- Outflow from un-named lake at Knockreagh Upper
- Tribuatry of River Fane at Tullacrunat
- Clarebane River at Clarebane Bridge

- County Water at Drumleek South
- Gentle Owens Stream at Erryroe and Creghanroe
- Upper reaches of the River Fane, north-west of Castleblayney

All of the watercourses are located in either the River Glyde or River Fane catchments. Both of these main channels hold Salmon and Trout stocks and the majority of the tributaries contain salmonid spawning and nursery habitats. The lakes contain stocks of coarse fish.

Without any details of the possible locations of the towers and associated works along the routes or the exact location of the compound it is difficult to predict the potential impacts of the proposal on fisheries. In the event that there will be works in or near watercourses we direct your attention to our Guidelines entitled *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites,* which are available on our website at the following address http://www.fishingireland.net/erfb/protect.htm. The aim of the guidance notes is to identify the likely impact on fisheries habitat in the course of construction and development work, and to outline practical measures for the avoidance and mitigation of damage. We trust they will be of assistance to you.

Please keep us informed of progress with the proposal as we would welcome the opportunity to comment further when more details are available.

Yours faithfully,

Michaela Kirrane
Senior Fisheries Environmental Officer

Eastern Regional Fisheries Board, 15a Main Street, Blackrock, Co. Dublin. **T**: (01) **2787022 F**: (01) **2787025 E**: info@erfb.ie

28 August 2006

Our Ref: G2006/380

Dr. Catherine A. Farrell,
18 Colliers Brook,
Tullamore,
Co. Offaly

Re: Proposed 400 kV power line between Kingscourt, Co. Cavan and Clontibret, Co. Monaghan

Dear Dr. Farrell,

We refer to your letter of 31 May 2006 regarding the above-proposed development and apologise for the delay in responding. Outlined below are the nature conservation recommendations of the Department of the Environment, Heritage and Local Government.

It is noted that the following proposed Natural Heritage Areas (pNHA's) lie within the ESB study area (see attached site synopses):

1. Tassan Lough site code no. 001666
2. Lough Smily site code no. 001607
3. Cordoo Lough site code no. 001268
4. Muckno Lake site code no. 000563
5. Lough Egish site code no. 001605

6, 7 & 8 Black, Derrygooney and Bawn Loughs site code no. 001596
9. Creevey Lough site code no. 001599
10. Nafarty Fenn site code no. 002077
11. Lough Fea Demesne site code no. 000560
12. Spring and Corcrin Loughs site code no. 001671
13. Lough Naglack site code no. 000561
14. Moynalty Lough site code no. 001608
15. Lough Ross site code no. 001495
16. Drumakill Lough site code no. 001600

It is recommended that impacts to the habitats or species found in these sites may need to be taken into consideration in the event of any works taking place in or directly adjacent to these sites.

It is also our opinion that the ESB may wish to consider mitigating measures to lessen any likely collisions from wildfowl, in particular Whooper Swans, in the area between Loughs Muckno, Lough Egish and Black/Derrygooney/Bawn Loughs. Whooper Swans are protected under Annex I of the EU Birds Directive (Council Directive 79/409/EEC on the conservation of wild birds).

This recommendation is based on papers submitted to this Department on a pre-planning basis and is made without prejudice to any decision the Minister may take upon sight of a formal planning application.

Yours sincerely,

_____

Aoife O'Shea
Development Applications Unit DOEHLG

Encls.

Section 9 – Water Report

9.1 Introduction

This report was written on behalf of ESBI Engineering & Facility Management Ltd. (hereafter referred to as ESBI) for the proposed 400kV overhead transmission line from a new 400/220kV substation in the vicinity of Kingscourt Co. Cavan to a border crossing point north east of Clontribret, Co. Monghan for approximately 45km. Three preliminary route options have been chosen, the final route option will be decided following the results of the desk study into the potential environmental impacts in the area. The purpose of this study is to assist in the selection of the most suitable route.

A proposal exists to construct a new 400/220kV substation in the environs of Kingscourt, located in the vicinity of the existing Louth-Flagford 220kV line. The 400kV overhead transmission line will require the use of support structures which will consist of steel lattice towers ranging in height from 27m-44m. The interval spacing between each tower is typically 350m but can be up to 500m.

AWN Consulting Limited have prepared a desk study to assess the impact of the proposed developments on the surrounding environment in terms of water and hydrology.

9.2 Assessment Methodology

The assessment was carried out in accordance with the methodology specified by the Environmental Protection Agency (EPA). The impacts of the proposed development on the hydrology and hydrogeology of the site have been assessed using the following methodology:

- Desktop study of publications relevant to the study area
- A reconnaissance exercise of the proposed routes
- Reporting of findings

The reconnaissance exercise was carried out on the 23rd and the 26th May 2006, by AWN Consulting Ltd, in order to assess the baseline hydrological environment along the proposed route corridor options and the proposed substation location study area.

9.3 Information Sources

This assessment is based on the review of a wide range of data and information from published material, in addition to consultations with statutory bodies, relating to the hydrological environment. The data and other sources of information are referred in Table 9.1.

Discipline	Sources of Information
Topography	Ordnance Survey of Ireland Discovery Series 1:50, 000 Map Series, No. 28A Ordnance Survey of Ireland Discovery Series 1:50, 000 Map Series, No. 28B Ordnance Survey of Ireland Discovery Series 1:50, 000 Map Series, No. 35
Surface Waters	Route Reconnaissance EPA website Office of Public Works (OPW) Watercourses Database The National Freshwater Quality Database Monaghan County Council Water Database Cavan County Council Database
Groundwater	Geological Survey of Ireland, Geology of Monaghan-Carlingford, Geological Survey of Ireland, Online map database

Table 9.1 Sources of Information

9.4 Receiving Environment

The receiving environment in terms of hydrology and hydrogeology will be discussed in the following sections.

9.4.1 Hydrology

There are a number of watercourses identified in the vicinity of the proposed route corridors. Baseline data has been collected from the aforementioned information sources in order to form a comprehensive database of the water quality in the area. This will assist in the assessment of any potential impact(s) on the hydrological and hydrogeological environment from the proposed developments.

The major lakes and rivers (including their tributaries) contained in the scope of this document are listed below;

Major Rivers

- River Dee (and tributiries)
- River Glyde
- River Proules (tributary of the Glyde)
- River Fane
- Ballykelly River (tributary of the Fane)
- Annalee River
- Knappagh (tributary of the Annalee River)
- Dromore River

Major Lakes

- Lough Eglish
- Lough Ross
- Lough Muchno
- Drumillard Lough

The water quality of the major rivers in Ireland is monitored continuously by the EPA. The monitoring programme was established under the Environmental Protection Act 1992. The objectives of the programme are the following:

a) to establish the ongoing quality status of our rivers and streams
b) to monitor quality changes and trends over time
c) to assess the performance of pollution control and abatement measures
d) to provide feedback to the responsible control agencies and
e) to inform the general public.

Q Values are used by the EPA to express biological water quality, based on changes in the macro invertebrate communities of riffle areas brought about by organic pollution. See Table 9.2 for an explanation of the ratings. Q1 indicates a seriously polluted water body; Q5 indicates unpolluted water of high quality. ***Appendix 9.1*** shows a more detailed description of the Biological Quality Classes.

Quality Ratings	**Quality Class**	**Pollution Status**	**Condition**
Q5, Q4-5, Q4	Class A	Unpolluted	Satisfactory
Q3-4	Class B	Slightly Polluted	Unsatisfactory
Q3, Q2-3	Class C	Moderately Polluted	Unsatisfactory
Q2, Q1-2, Q1	Class D	Seriously Polluted	Unsatisfactory

Table 9.2 EPA Biological Q Ratings

The EPA database was used to identify the biological water quality for the major rivers within the study area. These are provided in the following subsections.

River Glyde

The River Glyde rises in Co. Monaghan as two separate rivers namely the River Lagan and the Kilanny River. The two rivers meet at Tully, Co. Louth and flows 35km. eastwards towards the sea, entering tidal water between Murlough Upper and the Haven, Co. Louth. The surface catchment is drained by the Rivers Newry, Fane, and Dee and by all streams within the catchment.

Biological water quality ratings for the River Glyde are provided in Table 9.3.

Station No.	Biological Water Quality Ratings (Q) Year											
	1971	77	78	79	81	83	85	90	94	97	2000	03
0100	-	-	3	-	4-5	4	5	4-5	4-5	4-5	4-5	4
0400	-	-	4	-	4	4	3-4	4	4	3	4	4
0500	4	4	-	3-4	4	3-4	3-4	3	3	-	4	4

Table 9.3 Biological Water Quality Data for the River Glyde

0100 - Cormey Bridge, grid reference 280537 297971
0400 - Lagan Bridge, grid reference 287438 296456
0500 - Aclint Bridge, grid reference 289375 298093

At the most recent monitoring period (2003) all monitoring stations on the River Glyde were classified as "unpolluted".

River Dee (tributary of the Glyde)

The River Dee is a tributary of the River Glyde; it is within the surface catchment drained by the Rivers Newry, Fane, and Dee and by all streams entering tidal water between Murlough Upper and the Haven, Co. Louth.

Biological water quality ratings for the River Dee are provided in Table 9.4.

Station No.	Biological Water Quality Ratings (Q) Year				
	90	94	97	2000	03
0016	4-5	4	4	3-4	4
0025	5	4	4	4	4
0035	4-5	3	3	3-4	3

Table 9.4 Biological Water Quality Data for the River Dee

0016 – Bridge u/s Ervy Lough, grid reference 276240 294830
0025 – Bridge to North of Every Crossroads, grid reference 277250 292710
0035 – Tom's Bridge, grid reference 279580 289130

At the most recent monitoring period (2003) monitoring stations 0016 and 0025 were classified as "unpolluted" with monitoring station 0035 classified as "moderately polluted".

River Proules (tributary of the Glyde)

Biological water quality ratings for the River Proules are provided in Table 9.5.

Station No.	Biological Water Quality Ratings (Q) Year												
	1971	74	76	78	80	82	84	90	91	94	97	2000	03
0100	5	-	5	5	5	4	4-5	5	-	4	4-5	-	-
0110	-	-	-	-	-	-	-	3	-	-	-	4-5	4-5
0300	1	1	1	3	1	3	3-4	1-2	1-2	2-3	2	2-3	2-3
0400	2	2	2-3	2-3	2	3-4	3	2	2	2	2	2-3	3
0600	4	-	4	3-4	4	4	4	3-4	-	3	3	3-4	3

Table 9.5 Biological Water Quality Data for the River Proules

0100 – Dry Bridge, grid reference 283385 304013
0110 – 500m d/s Dry Bridge, grid reference 283385 304013

0300 – Just u/s Lough Naglack, grid reference 284961 302669
0400 – Broken Bridge, grid reference 285669 302902
0600 – Bridge at Killanny, grid reference 289348 301043

At their most recent monitoring periods monitoring stations 0100 and 0110 were classified as "unpolluted" with monitoring stations 0300, 0400 and 0600 classified as "moderately polluted".

River Fane

Biological water quality ratings for the River Fane are provided in Table 9.6.

Station No.	Biological Water Quality Ratings (Q) Year										
	1971	74	76	80	82	86	90	94	97	2000	03
0115	-	-	-	-	-	-	4	4	3-4	4	3
0155	-	-	-	-	-	-	-	2-3	2-3	2-3	2-3
0180	-	-	-	-	-	-	-	3	3	3	3
0200	4	-	3-4	4	3-4	3-4	3-4	3	3-4	3	3
0300	3	-	3-4	3-4	3-4	3-4	3-4	3	3	3	3
0400	-	-	-	3	3	3	3-4	3	3	3-4	3
0500	5	-	5	5	4-5	4	4-5	4	4	4	4
0650	-	-	-	-	-	-	5	3-4	4	4	3-4

Table 9.6 Biological Water Quality Data for the River Fane

0115 – Br u/s Carrickaslane L, grid reference 280540 324500
0155 – South Bridge Dunfelimy, grid reference 276630 324080
0180 – 2nd Bridge u/s Laragh L (Malin Road), grid reference 279200 322360
0200 – Derrycreevy Bridge, grid reference 282770 320680
0300 – Clarebane Bridge, grid reference 287357 316783
0400 – Ballynacarry Bridge, grid reference 287460 314120
0500 – Magoney Bridge, grid reference 290853 309669
0650 – Innishkeen Bridge, grid reference 293175 307040

At their most recent monitoring period (2003) monitoring station 0500 was classified as "unpolluted", monitoring station 0650 classified as "slightly polluted" and monitoring stations 0115, 0155, 0180, 0200, 0300 and 0400 classified as "moderately polluted".

Ballykelly River (tributary of the Fane)

Biological water quality ratings for the Ballykelly River are provided in Table 9.7.

Station No.	Biological Water Quality Ratings (Q) Year			
	94	97	2000	03
0500	3	3	3	-
0700	3	3	-	3

Table 9.7 Biological Water Quality Data for the Ballykelly River

0500 – Bridge E of Ballykelly Cross roads, grid reference 294623 303285
0700 – Bridge u/s Fane River Confluence, grid reference 296730 303492
At their most recent monitoring periods both monitoring stations were classified as "moderately polluted".

Annalee River

Biological water quality ratings for the Annalee River are provided in Table 9.8.

Station No.	Biological Water Quality Ratings (Q) Year											
	1971	77	79	80	82	86	89	93	97	98	2001	04
0080	-	-	-	-	-	-	3-4	3-4	3-4	4-5	3-4	4
0150	-	-	-	-	-	-	-	3-4	3	3	3	3
0200	4-5	4	4	3	3-4	3-4	-	-	-	-	-	-
0250	-	-	-	-	-	-	3-4	3-4	4	3-4	3-4	3-4

Table 9.8 Biological Water Quality Data for the Annalee River

0080 – 2nd bridge u/s L Sillan, gird reference 272660 306124
0150 – Annafarney Bridge, grid reference 268391 306322
0200 – Bridge u/s L Tacker, grid reference 268046 307553
0250 – 1st Bridge d/s l Tacker, grid reference 268196 308876

At their most recent monitoring periods monitoring station 0080 was classified as "unpolluted", monitoring station 0150 was classified as "moderately polluted" and monitoring stations 0200 and 0250 were classified as "slightly polluted".

Knappagh (tributary of the Annalee River)

Biological water quality ratings for the River Knappagh are provided in Table 9.9.

Station No.	Biological Water Quality Ratings (Q) Year								
	1977	81	85	89	93	97	98	2001	04
0200	-	4	3-4	3-4	3	3	3	3	4
0400	4	4	3-4	3	3-4	3	3	3-4	3-4
0700	-	4-5	4	3	3-4	3-4	3	3-4	4

Table 9.9 Biological Water Quality Data for the River Knappagh

0200 – Bridge u/s Bellatrain L, grid reference 274468 310701
0400 – Lackan Bridge, grid reference 270618 311430
0700 – Br u/s Annalee River Confluence, grid reference 267974 310045

At their most recent monitoring periods monitoring stations 0200 and 0700 were classified as "unpolluted" with monitoring station 0400 classified as "slightly polluted".

Dromore River

Biological water quality ratings for the Dromore River are provided in Table 9.10.

Station No.	Biological Water Quality Ratings (Q) Year											
	1971	77	80	82	84	86	89	93	97	98	2001	04
0015	-	-	-	-	-	-	-	4	4-5	4	4	4-5
0036	-	-	-	-	-	-	3-4	4	3-4	3-4	3-4	3-4
0075	-	-	-	-	-	-	-	-	3	3	3	4
0090	-	-	-	-	-	-	1	3-4	3-4	3-4	3	3-4
0150	-	-	2	2	2	3	2	3	3-4	3-4	-	3
0200	4	4	3-4	3-4	-	3-4	2-3	3	2-3	3	3	3-4
0300	4	2	3-4	3-4	3-4	3-4	3	3-4	3	3	3	3
0500	-	-	4	4	3-4	3	3	3	3	3	3-4	3-4
0700	4-5	2-3	3	4	3	3-4	3	3	3-4	3	3	3
0900	4-5	4-5	4-5	4-5	4	4	3-4	4	4	4-5	4	4

Table 9.10 Biological Water Quality Data for the Dromore River

0015 – Bridge W of Killycrom, grid reference 278600 320800
0036 – Bridge d/s Ballintra Bridge, grid reference 274400 320100
0075 – Bridge SW of Bartleys Grove, grid reference 269096 324195
0090 – Bridge SE of Edenaferkin, grid reference 269573 322131
0150 – Meeting House Lane Bridge, Ballybay, grid reference 271686 320500
0200 – Bridge d/s L Major, grid reference 271940 320165
0300 – Balladian Bridge, grid reference 269589 319748
0500 – Ballynascarva Bridge, grid reference 264655 316409
0700 – Br W of Clementstown, grid reference 259 132 314766
0900 – Killycreeny Bridge (Mid), grid reference 255694 313094

At their most recent monitoring periods monitoring stations 0015, 0075 and 0900 were classified as "unpolluted". Monitoring stations 0150, 0300 and 0700 were classified as "moderately polluted". Monitoring stations 0036, 0090, 0200 and 0500 were classified as "moderately polluted".

Overall Results

The most common type of pollution in surface water bodies is organic pollution caused by sewage, animal manure slurries and food processing

wastes. The main effects of organic pollution are therefore, the depletion of oxygen in the area immediately downstream of the discharge point and eutrophication (i.e., enrichment) in the recovery zone further downstream. Eutrophication, which is caused by the inappropriate and/or excessive application of organic (slurry) and inorganic (artificial) manure to agricultural and forestry lands, has become very widespread in recent years.

Physical pollution refers to siltation arising from quarrying, bog and forestry development and arterial drainage. Some wastes (e.g., sewage and manure slurries) commonly exert the three effects viz. organic, toxic and physical.

9.4.2 Hydrogeology

Groundwater can be defined as water that is stored in, or moves through, pores and cracks in sub-soils. Groundwater aquifers are rocks or deposits that contain sufficient void spaces and are permeable enough, to allow water to flow through them in significant quantities. The potential of rock to store and transport water is governed by permeability of which there are two types, intergranular and fissure permeability[4].

Intergranular permeability is found in sediments, sands, gravels and clays whereas fissure permeability is found in bedrock, where water moves through (and is stored in) cracks, fissures, planes and solution openings. The aquifer underlying the study area is a quaternary aquifer and therefore the primary characteristic of this aquifer is defined by intergranular permeability as opposed to fissure permeability which would apply in the case of bedrock aquifer.

Bedrock Aquifers

The Geological Survey of Ireland Online maps were consulted in relation to the occurrence of bedrock aquifers in the study area. The study area consists mainly of locally important aquifers, which are described as generally moderately productive in local zones. A Regionally Important Aquifer (karstified, with good development potential) is located in the area surrounding Carrickmacross. The bedrock here consists of pure bedded limestone.

Gravel Aquifers

There are no gravel aquifers of considerable quality underlying the study area.

Groundwater Protection Zones

The GSI, EPA and the DoELG have developed a programme of Groundwater Protection Schemes[5], with the aim of maintaining the quantity and quality of groundwater in Ireland, in addition the programme aims, in some cases to improve groundwater quality by applying a risk assessment approach to groundwater protection and sustainable development.

The Groundwater Protection Scheme divides a chosen area into a number of Groundwater Protection Zones, according to the degree of protection required for the aquifer. These zones are based on both aquifer vulnerability and the degree of importance the aquifer holds; regional, local or not important.

This protection scheme will outline the degree of vulnerability of the aquifers in the relevant county, and provide guidance on how to protect them. Under the European Water Framework Directive, the aquifer classification part of the scheme has been carried out for all of Ireland.

Well Card Data

There are numerous wells and springs throughout this area which draw from the aquifers. Well card data from the GSI for the study area contains information relating to the depth to bedrock and yield. Well card data for a section of the study area is shown in Table 9.11. Depth to bedrock (DTB) is between 0.9 and 31.0m below ground level (BGL) in the general area. The wells in the area extend deep into the bedrock and therefore most groundwater abstracted in the area is from the bedrock.

It can be seen that abstractions of up to 391.0 m^3/day can be obtained from the aquifer. Having regard to this data, it can be concluded that the aquifer is a source of local water supply in the area and is an important source of base flow for streams and rivers.

Terms of reference for Table 9.11 include the following:

A – Agricultural Use
U – Unknown
D – Domestic Use Only
E – Excellent (>400m3/d)
I – Industrial Use
M – Moderate (40– 100m3/d)
Pub – Public Supply
G – Good (100 – 400m3/d)
Po – Poor (<40m3/d)
DTB – Depth to Bedrock
Dom – Domestic use only
B – Agricultural & domestic Use

Usage	Easting	Northing	Townland	DTB	Depth	Yield	Yield Class
I	28252	31904	Connabury	-	67.9	546	E
P	28053	32067	Corrinshige	-	97.5	654	E
I	28057	32061	Corrinshige	-	19.5	39.2	P
D	28099	32108	Corracloghan	-	25	391	G
-	28124	31921	Tullyskerry	-	50	-	-
-	28126	31924	Tullyskerry	-	31	-	-
-	28125	31926	Tullyskerry	-	18	-	-
-	27987	31912	Corderryoane	31	-	-	-
-	27988	31914	Corderryoane	15	-	-	-
-	27982	31918	Corderryoane	-	26	-	-
-	27985	31918	Corderryoane	12	-	-	-
-	27984	31914	Corderryoane	15	-	-	-
-	28127	31922	Tullyskerry	-	28	-	-
-	27982	31917	Corderryoane	18	-	-	-
-	27980	31915	Corderryoane	9	-	-	-

-	27988	31917	Corderryoane	12	-	-	-
-	27982	31915	Corderryoane	6		-	-
P	28051	32066	Corrinshige	-	91.4	1962	E
P	28057	32061	Corrinshige	-	-	-	-
I	28254	31903	Connabury	-	94.2	65.5	M
P	28257	31907	Connabury	15.8	61	545	E
B	27979	31914	Corderryoane	2.7	18.3	13.1	P
A	28170	31812	Kinnagin	9.1	25.9	24	P
-	28167	31810	Kinnagin	3.4	16.8	76.3	M
-	28093	32102	Corracloghan	3.7	22.9	30.5	P
-	28096	32108	Corracloghan	3.1	30.8	32.7	P
-	28124	31921	Tullyskerry	3.7	37.8	32.7	P
D	28089	32110	Corracloghan	0.9	30.5	6.5	P
I	28051	32062	Corrinshige	-	122	196	G
D	27951	31981	Modesse	2.1	45.7	32.7	P
D	28054	32066	Corrinshige	2.7	35.4	43.6	M
I	28055	32067	Corrinshige	-	22	-	-
I	28251	31910	Connabury	-	67.9	141.7	G
U	28078	31991	muldrumman	-	64	54.5	M
U	28072	31989	muldrumman	-	-	-	-
U	28074	31996	muldrumman	22.9	29.3	54.5	M
U	28079	31997	muldrumman	-	-	-	
U	28210	31924	Bree	10.1	21.9	87.3	M
U	28208	31922	Bree	7.3	21.6	131	G
U	28214	31924	Bree	-	41.1	218	G
U	28211	31927	Bree	7.6	18.6	109	G
B	28164	31809	Kinnagin	3.4	38.1	32.7	P
B	28161	31804	Kinnagin	3.1	54.9	21.8	P
I	28255	31911	Connabury	-	-	602	E
I	27961	31987	Modesse	28.5	33.5	-	-
I	27955	31988	Modesse	34.3	39.5	-	-
I	27953	31980	Modesse	33.2	38.2	-	-
I	27958	31985	Modesse	33.8	38.3	-	-
I	27949	31975	Modesse	33.4	33.6	-	-
I	27952	31986	Modesse	24.8	29.3		
I	27954	31977	Modesse	27.2	33		

Table 9.11 GSI Well Card Data

9.5 Discussion of Findings

9.5.1 Hydrology

Several rivers and lakes are located within the study area. The rivers bisect the various proposed route corridors at different locations. There are also a number of minor watercourses that bisect the route corridors.

Based on the findings of the desk study, the water quality of the rivers in the study area was found to be generally good with the majority classified as "unpolluted" during the most recent monitoring event.

9.5.2 Hydrogeology

The study area is predominantly underlain by locally important aquifers, generally moderately productive in local zones. A regionally important karst aquifer with good development potential underlies the area around Carrickmacross, regionally important fissured aquifers are also located to the west of this aquifer in isolated areas.

9.6 Characteristics of the Proposed Development

The proposed substation and lattice towers will involve excavation of topsoil and subsoil. In the event of groundwater being encountered during the excavation, dewatering may be required. The construction will take place in a phased manner.

9.7 Potential Impact of the Proposed Development

Due to the interrelationship between the hydrology and hydrogeology at the proposed location of the development, the potential impacts and mitigation measures will be common to both.

9.7.1 Site Activities

The construction phase of the development will involve the following key activities that may have potential impacts on the local hydrology and hydrogeology:

- Watercourse crossing
- Site compound construction
- Oil, fuel and site vehicle storage
- Construction of lattice towers
- Concrete pouring
- Site cabling
- Stockpilng of material
- Surplus Material
- Borrow Pits (if required)
- Land Slippage

During the operational phase potential impacts include contamination (oil, fuels and sediment) from maintenance traffic.

9.7.2 Peat Slides

Peat consistency is dependant on water content, age and constituent material. Peat stability is dependant on depth of material, water content, strength and integrity of the overlying vegetation and the slope (type and gradient) that the bog is positioned on. Where development occurs in deep peat, peat slides can potentially occur in areas greater than 1.5m deep and

situated on a relatively steep convex slope with poor sub peat drainage which results in high water retention. Peat depths at intervals along the proposed interconnector route will be confirmed prior to construction, as is normal engineering practice.

9.7.3 Flow Alterations

During construction there is potential for increased runoff due to the introduction of impermeable surfaces such as the substation site compounds and access roads, and the compaction of soils. This will reduce the infiltration capacity of the study area and increase the rate and volume of direct surface runoff. The potential environmental impact of this is to increase flow rates, leading to increases in channel erosion, sediment loading reaching watercourses and downstream flood risk.

The lattice tower bases have the potential to affect local flows within the peat, potentially leading to barriers or preferential pathways. If excavations for tower bases or borrow pits encounter groundwater, it may need to be pumped, resulting in localised drawdown of the water table. This applies to the construction of the substation also.

9.7.4 Sediment Discharges

There is the potential for the release of sediments into watercourses as a consequence of the following activities:

Soil stripping to construct the substation, access roads, site compounds during the construction phase, tower foundations and other infrastructure.
Run-off and erosion from soil stockpiles (prior to reinstatement).
Dewatering of excavations for tower foundations or borrow pits.
Erosion from increased flows as a result of the development.

The result of increased sediment loading to watercourses is to degrade water quality of the receiving waters and change the substrate character.

9.7.5 Contaminant Discharges

During construction of the development, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refueling machinery on site.
- The use of concrete and cement for the tower foundation.
- There will be a risk of pollution from site traffic through the accidental release of oils, fuels and other contaminants from vehicles.

- Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and fauna and flora.

9.8 Remedial and Mitigation Measures

9.8.1 Construction Phase

The construction phase of the development will involve the following key activities that may have potential impacts on the local hydrology and hydrogeology:

- Watercourse crossing
- Site compound construction
- Oil, fuel and site vehicle storage
- Construction of lattice towers
- Concrete pouring
- Site cabling
- Stockpilng of material
- Surplus Material
- Borrow Pits (if required)
- Land Slippage

During the operational phase potential impacts include contamination (oil, fuels and sediment) from maintenance traffic.

Watercourse Crossing

As far as possible, the access roads will be developed to minimise the number of watercourse crossings. It is likely that culverts will be used on site.

Culverts beneath the access roads will be located at or close to the locations of natural flow paths to allow existing flows to continue. Lateral drainage would be within shallow geotextile and rock lined ditches to avoid the drainage of surrounding soils. Where these drainage channels outlet on the downhill side of the roads soakaways will be placed to prevent soil erosion and hence entrainment of sediments.

All watercourse crossings will be planned in consultation with the local authority, and in accordance with the necessary guidelines.

Works near Watercourses

Some construction works on site will take place in the vicinity of watercourses in the riparian zone. The riparian zone is described as the land immediately adjoining and influenced by the aquatic zone, (The Forestry Commission, 2003). A buffer zone will be established to protect the riparian and aquatic zones from disturbance from construction work. The buffer zone generally extends beyond the riparian zone. The width of a buffer zone will be determined by the risk of sediment movement. This in turn depends on land

use and soil type gradient in the surrounding area, in addition to the characteristics of the catchment area. The following gives an indication of average widths of the buffer zones:

- Head water streams, less than 1m wide - 5m on either side
- Stream width between 1 and 2 m – 10m on either side
- For streams wider than 2m – 20m on either side
- For Lakes and pools – at least 20m on either side

Site Compound Construction

A site compound may be required during the construction phase of the development. It is recommended that soil stripped from this area will be stored appropriately for restoration following the construction phase.

Additional mitigation measures will include the following:

- Runoff from the compound during construction will not be allowed to enter any watercourse and will instead be captured and passed through settlement ponds to remove silt.
- Drainage from this area will be collected and treated prior to discharge.
- All on-site toilet facilities will be sealed.

Oil, Fuel and Site Vehicle Storage

To minimise any impact on the underlying subsurface strata from material spillages, all oils and fuels used during construction will be stored within temporary bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (plus an allowance of 30 mm for rainwater ingress). Filling and draw-off points will be located entirely within the bunded area(s). Drainage from the bunded area(s) will be diverted for collection and safe disposal.

The refuelling and the addition of hydraulic oils or lubricants to construction vehicles, will take place in a designated area (where possible) on the site, which will be away from surface water gulleys or drains. In the event of a machine requiring refuelling outside of this area, fuel will be transported in a mobile double skinned tank. An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in this area. All relevant personnel will be fully trained in the use of this equipment.

During the operational phase there is potential for the leakage of oil from the transformers. This will be mitigated by containing the transformer within a bunded area and ensuring regular maintenance.

These measures will ensure that accidental inputs to and subsequent contamination of ground water and surface water do no occur during normal and or emergency conditions.

Construction of Towers

The proposed towers will require excavation of foundations to a suitable depth, as determined by the site engineers.

The construction of tower bases will temporarily change the groundwater regime should excavations extend below the water table and considering the requirement for pumping to enable the pouring of concrete. The following mitigation measures will be adopted:

- Operate machinery from access road
- Minimise time for excavations being open as far as possible.
- Dewatering requirement will be kept to a minimum.
- The locally excavated material will be reinstated surrounding the base immediately following construction to allow recovery of any potential groundwater level change as quickly as possible.
- Aggregate will be imported rather than quarried on site

Concrete Pouring

Concrete will be mixed off–site and imported to the site. The pouring of concrete for tower bases will take place within a designated area using a geosynthetic material to prevent concrete runoff into the soil/groundwater media.

An accident plan will be prepared and provided to drivers of vehicles carrying concrete in order to raise awareness of the potential impact of concrete on the environment. In addition, staff will be notified of procedures for the clean up of any accidental spills.

Wash down and washout of concrete transporting vehicles will take place at an appropriate facility offsite.

Site Cabling

If underground cabling is required, the trenches will be open for the shortest practicable time period.

Stockpiles

The nature of the construction activities will involve the stripping and stockpiling of topsoil, peat and other excavated material until it is required for reinstatement. There is the potential that rain falling on such stockpiles may result in slippage and a washout of sediments, which may affect the water quality of nearby watercourses.

This can be minimised by revegetating or sealing long-term stockpiles to reduce the potential for erosion. In addition, it must be ensured that stockpiles are not located in the immediate vicinity of a watercourse. Runoff from stockpile areas will be diverted through a settlement pond prior to discharge to a local watercourse to minimise sediment loadings.

Surplus Material (if any)
Any surplus material will be managed in compliance with the Waste Management Acts of 1996 – 2003 and Section 5 of the Waste Management (Collection Permit) Regulations of 2001.

Borrow Pits (if required)
There is a risk that dewatering of borrow pits or excavated areas may locally draw down the local water table and impact watercourses. However, this is likely to be short-term localised effect, as the groundwater levels should recover after pumping ceases. Proposed borrow pit sites will be assessed for their potential impact on local hydrogeology prior to excavation to minimise this potential impact

Borrow pit locations will be identified and will be at least 250m away from private water supplies. In case of emergency a back-up water supply will be made available. The potential for the reduction in the level of the water table, in addition to the alteration of the flow in springs, will be assessed during the designated route assessment phase.

In the case of borrow pits, perimeter drains will be constructed to minimise the amount of surface water runoff entering them and hence reduce the potential need to dewater.

Provided the aforementioned mitigation measures are adopted the residual impact relating to land slippage is considered neutral.

9.8.2 Operational Phase

Interconnector Route
Apart from the general maintenance of the lattice towers there will be few on-site activities during the operational phase. The following mitigation measures are proposed:

Watercourse Crossing
Regular inspection of culverts for any potential sediment build up will take place during the operational phase.

Settlement Ponds
The settlement ponds will be inspected regularly throughout the operational phase and immediately after heavy rainfall events.

Lattice Towers
The construction of the tower foundations would be from concrete that is sulphate resistant and appropriate for the site conditions. This would ensure that there will be little corrosion of the tower bases during the operational phase.

The risk of polluting the local hydrological regime from the operating equipment is limited. As part of the standard operations procedures, routine monitoring and maintenance will be carried out to minimise these risks to acceptably low levels of likelihood and severity.

Substation
Surface water drainage will be directed to a soakaway with no oil/petrol interceptor. All the surface water from the roofs of the proposed development will be disposed of within the site boundaries by separate lines to the soakaway which will have the capacity to attenuate any pollutants.

9.9 Route Selection

Based on the findings of the desk study, for the site hydrology and the hydrogeology, the most preferred option is Option A. The potential impacts in relation to the construction of the lattice towers will be identical for each route option. However Option A provides a route whereby construction within the vicinity of the river and lakes is avoided. The aforementioned mitigation measures highlighted will ameliorate the potential impact of the proposed developments on the surrounding environment in terms of hydrology and hydrogeology.

9.10 References

- EPA, (2003), Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), Environmental Publications, 17 Duke Street, Dublin 2.

- EPA, (2002), Guidelines on the Information to be contained in Environmental Impact Statements, Environmental Publications, 17 Duke Street, Dublin 2.

- EPA, (2002), EPA 2002 Water Quality Database, Johnstown Castle Estate, Wexford.

- McConnell, B.J. and Philcox, M.E., (1994), Geology of Kildare-Wicklow, Sheet 16. Geological Survey of Ireland.

- DoELG, EPA & GSI, (1999), Groundwater Protection Scheme Guidelines.

APPENDIX 9.1

General Characteristics of the various Biological Quality Classes (EPA)

Quality Classes	**Class A**		**Class B**	**Class C**	**Class D**	
Quality Ratings	**Q5**	**Q4**	**Q3-4**	**Q3**	**Q2**	**Q1**
Pollution Status	Pristine, Unpolluted	Unpolluted	Slight Pollution	Moderate Pollution	Heavy Pollution	Gross Pollution
Organic Waste Load	None	None	Light	Considerable	Heavy	Excessive
Maximum B.O.D.	Low (< 3mg/l)	Low (< 3mg/l)	Occasionally elevated	High at times	Usually High	Usually very high
Dissolved Oxygen	Close to 100% at all times	80%-120%	Fluctuates from <80% to >120%	Very unstable, Potential fish-kills	Low, sometimes zero	Very low, often zero
Annual median PO_4	0.015 mg/l	0.03 mg/l	0.045 mg/l	0.07 mg/l	> 0.1 mg/l	> 0.1 mg/l
Siltation	None	May be light	May be light	May be considerable	Usually heavy	heavy and anaerobic
'Sewage Fungus'	Never	Never	Never	May be some	Usually abundant	May be abundant
Filamentous Algae	Limited Development	Considerable growth, diverse communities	Luxuriant growths, typically Cladophora	Excessive growths, typically Cladophora	Usually abundant	None
Macrophytes	Diverse communities, limited growths	Diverse Communities, Considerable Growths	Reduced diversity, luxuriant growths	Limited diversity, excessive growths	Tolerant species only, may be abundant	Most tolerant forms, minimal diversity
Water Quality	Highest quality	Fair Quality	Variable quality	Doubtful quality	Poor quality	Bad quality
Abstraction Potential	Suitable for all	Suitable for all	Potential problems	Advanced treatment	Low grade abstractions	Extremely limited
Fishery Potential	Game fisheries	Good game fisheries	Game fish at risk	Coarse fisheries	Fish usually absent	Fish absent
Amenity Value	Very high	High	Considerable	Reduced	Low	Zero

Section 10 – Soils Report

10.1 Introduction

This report was written on behalf of ESBI Engineering & Facility Management Ltd. (hereafter refereed to as ESBI) for a proposed 400kV overhead transmission line from a new 400/220kV substation in the vicinity of Kingscourt Co. Cavan to a border crossing point north east of Clontribret, Co. Monghan for approximately 45km. Three preliminary route corridor options have been chosen. The final route option will be decided following the completion of the desk study on the potential environmental impacts of the project on the area.

The 400kV overhead transmission line will require the use of support structures which will consist of steel lattice towers ranging in height from 27m-44m. The interval spacing between each tower is typically 350m but can be up to 500m. A proposal also exists to construct a new 400/220kV substation in the environs of Kingscourt, located in the vicinity of the existing Louth-Flagford 220kV line.

AWN Consulting Limited has prepared a preliminary report to assess the impact of the proposed developments on the surrounding environment in terms of soils and geology.

10.2 Assessment Methodology

The assessment of the potential impact of the proposed development on the soil and geological environment was carried out according to the methodology specified by the Environmental Protection Agency (EPA) and the Institute of Geologists of Ireland (IGI).

The Geological Survey of Ireland (GSI) geological maps and records for the area were inspected, with reference to solid and drift geological deposits.

A reconnaissance exercise was carried out on the 23rd and the 26th May 2006, by AWN Consulting Ltd in order to assess the baseline soils and geological environment along the proposed route corridor options and the proposed substation location study area.

10.3 Information Sources

This assessment is based on the collection of a range of data and information from published material relating to the soils and geological environment in the study area. The data and other sources of information used are listed in Table 10.1.

Discipline	Sources of Information
Topography	Ordnance Survey of Ireland Discovery Series 1:50, 000 Map Series, No. 28B and 35
Soils	Soil Map of Ireland, An Foras Taluntaisi, 1980
Geology	Geological Survey of Ireland, Monaghan - Carlingford, Solid Edition, 1:50,000.

Table 10.1 Information Sources

10.4 The Receiving Environment

10.4.1 Solid Geology

An inspection of the Geological Survey of Ireland (GSI) records shows the study area to be underlain by rocks of the Lower Palaeozoic Period, (Ordovician/Silurian Age). The different geological formations that make up the study area are the following:

SK – Shercock Formation: Grey to green-grey quartz felsic igneous, white mica rich, fine to coarse grained medium thick bedded turbidite and massive sandstone.

KY – Kernaghkilly Formation: Pale green to grey-green to dark grey or black pyritic, graptolitic, shale/mudstone, and some minor pale grey silaceous feldspathic graded tuff.

OL – Oghill Formation: Grey/grey-green massive greywacke, microconglomerate and amalgamated beds with subordinate turbiditic greywacke and local, infaulted dark grey or black pyritic, occasionally graptolitic shale/mudstone.

LA – Lough Avaghon Formation: Grey, fine to coarse-grained massive quartz intermediate and quartz-felsic igneous rich turbiditic greywacke, microconglomerate and amalgamated beds.

D – Dolerite: Finer grained variety of gabbro, intruded as thin sheets (dykes and sills).

The area is known as the Central Belt. The central belt is made up of at least four tracts. It comprises of rocks varying in age form the Ordivician (Llanvirn) to Silurian (Llandovery).

The GSI Well Card Index is a record of wells drilled in Ireland. This Index shows a number of wells in the vicinity of the study area. While much useful information can be obtained from this Index, it is important to note that it is by no means exhaustive, as it requires individual drillers to submit details of

wells in each area. This index is currently on request to the Geological Survey of Ireland.

10.4.2 Drift Geology

The Quaternary geological period extends from about 1.5 million years ago to the present day and can be sub-divided into the Pleistocene Epoch, which covers the Ice Age period and which extended to 10,000 years ago and the Holocene Epoch, which extends from that time to the present day.

The Pleistocene Epoch in Ireland began when there was a significant cooling of the Earth's climate, and it was characterised by alternating extended periods of very cold conditions, during which time much of the country was covered by an ice sheet. These colder periods were separated by warmer periods, known as interglacials, which lasted for approximately 10,000 years at a time. It is under debate whether or not the last glacial period is over, or whether we are in the middle of another interglacial period.

The ice sheet in Ireland was formed by a number of coalescing ice domes, from which the ice flowed outwards in a radial pattern. As the ice travelled over the ground, it eroded the underlying bedrock, which resulted in the formation of sediment beneath and within the ice sheet. The particle size distribution of the sediment varied greatly and ranged from clay particles to large boulders. This material has been labelled glacial till or boulder clay and is the most widespread soil type in Ireland. If conditions were suitable, sediment was also deposited as distinct bands of sand, gravel, silt and clay. Glacial till can range in thickness from less than 1m thick to tens of metres in depth.

The study area was glaciated on at least two occasions but the majority of the sediments today are as a result of the last glaciation which was at its maximum some 24,000 years ago.

10.4.3 Soil

The soils distribution across the study area is provided on the General Soil Map of Ireland. The map identified Gleys and Acid Brown Earths as the distinct soil types that exists in the general area.

Gleys

Gleys are soils in which the effects of drainage impedance dominate and which have developed under the influence of permanent or intermittent waterlogging. The impedance may be due to a high watertable, to a 'perched' watertable caused by the impervious nature of the soil itself, or to seepage of runoff from slopes. Most gleys have poor physical conditions, which make them unsuitable for cultivation or for intensive grassland farming. Their productive capacity is also affected by restricted growth in spring and autumn.

Acid Brown Earths

These are relatively mature, well-drained, mineral soils possessing a rather uniform profile that have not been extensively leached or degraded. Most Brown Earths occur on lime-deficient parent materials and are therefore, acid in nature; these are called Acid Brown Earths. These soils, in general, possess medium textures (sandy loam, loam, sandy clay loam) and this, together with their friability, desirable structure and drainage characteristics, accounts for the fact that they are amongst the most extensively cultivated soils. Although often of relatively low nutrient status, they respond well to manurial amendments.

10.4.4 Peat conditions

In order to assess for the potential occurrence of peat, investigations will take place at intervals along the route. The peat depth will be recorded using a peat gouge auger. The shaft of the auger will be placed in the peat and is pushed into the subsurface until it reaches bedrock. The length of the shaft is then taken corresponding to the length of the peat. The peat gouge auger can reach 8.0m in depth. The locations will be recorded using a Garmin eTrexLegend Global Positioning System (GPS). The accuracy depends on the weather conditions and the quality of the GPS.

10.5 Characteristics of the Proposed Development

10.5.1 Construction

Surface soil, subsoil and bedrock will be excavated during the construction of the Interconnector route and the substation. All existing surplus soils in the immediate post-construction restoration works will be stored on site for reuse. The soils will be suitably classified in accordance with the regulatory requirements for off site disposal reuse.

10.5.2 Operation

Apart from the operation and general maintenance of the lattice towers, there will be few on-site activities during the operational phase of the interconnector route. In relation to the substation, additional impermeable surface areas will be created during the operational phase.

10.6 Potential Impacts of the Proposed Development

The potential impacts of the proposal for the construction and operation phases of the development on the soil and geological environment are outlined in the following paragraphs.

10.6.1 Construction

Removal of the upper soil layers will occur in a development such as this. The most likely contaminant that may be found is hydrocarbon contamination, from vehicles.

As there will be large volumes of material excavated during each phase of construction, mitigation measures will be employed to ensure that there is no negative impact on the soil environment from the storage and transport of this material.

Machinery used during the construction phase will include diesel-powered trucks, excavators, bulldozers, cranes and graders. The potential impacts to the underlying soil and geology from the construction of the proposed development could derive from accidental spillage of fuels, oils, paints and solvents, which could impact soil, bedrock and groundwater quality, if allowed to infiltrate to the ground during storage and dispensing operations.

Where development occurs in deep peat, peat slides can potentially occur in areas greater than 0.5m deep. Peat depths around proposed access roads and tower locations should be confirmed prior to construction, as is normal engineering practice.

It is not expected that the importation of landscaping materials, such as topsoil will be required as part of the proposed development works. If required, details for the correct importation of soil are outlined in Section 10.7.1.

In relation to the construction phase the potential impact on the soils and geology is considered to be permanent and imperceptible.

10.6.2 Operation

Due to the fact that (based on the information available and the site reconnaissance) there does not appear to be significant features of geological value. The potential impact of the development on the local geology is considered to be neutral.

Due to the nature of the development, there will be machinery periodically on the site at a given time. This may lead to occasional accidental emissions, in the form of oil, petrol or diesel leaks, which could cause contamination if they enter the soil and bedrock environment.

In relation to the operational phase the potential impact on the soils and geology is considered to be long term and imperceptible.

10.7 Remedial and Mitigation Measures

The following mitigation measures are designed to address the impacts associated with the construction and operational phase of the development.

10.7.1 Construction

Planned construction works will be carried out in such a manner as to ensure the least feasible disturbance of soils. It is envisaged that all topsoil will be retained on site where possible as fill material. Some of the surface soil and subsoil and rock excavated will be, where possible, retained on site.

All excavated materials will be visually assessed for signs of possible contamination such as staining or strong odours. Should any unusual staining or odour be noticed, samples of this soil will be analysed for the presence of possible contaminants in order to ensure that historical pollution of the soil has not occurred. Should it be determined that any of the soil excavated is contaminated, this will be dealt with appropriately as per the Waste Management Act of 1996 and associated regulations.

Excess fill and unsuitable excavated material will be deposited in appropriate and approved infill sites, in compliance with the Waste Management Acts of 1996 – 2003 and Section 5 of the Waste Management (Collection Permit) Regulations of 2001. The same procedure will apply to the importation of materials on to site for landscaping purposes.

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents and paints used during construction will be stored within specially constructed dedicated temporary bunded areas. Oil and fuel storage tanks will be stored in designated areas with an impervious base. These areas will be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Filling and draw-off points will be located entirely within the bunded area(s). Drainage from the bunded area(s) will be diverted for collection and safe disposal.

Refueling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area of the site, away from surface water gullies or drains. The vehicles will never be left unattended during refueling. Spill kits and hydrocarbon adsorbent packs will be stored in this area and operators will be fully trained in the use of this equipment.

All associated hazardous waste residuals will also be approximately stored within temporary bunded storage areas prior to removal by an appropriate EPA or Council approved waste management contractor for off-site treatment/recycling/disposal. All other building waste will be collected in on-site skips for removal by a licensed waste management contractor.

10.7.2 Operation

In terms of surface water run off, in order to prevent potential contamination of soil/groundwater media with surface water runoff that may be contaminated with oil/solids, an interceptor will be installed at the substation through which surface water run-off will be channeled, prior to discharge to the main drainage scheme.

A regular inspection and maintenance/desludging programme will be implemented whereby any oil/solids/debris trapped within the interceptors will be removed and disposed of off-site by an appropriately licensed Council or EPA approved waste disposal contractor.

In terms of waste management, waste residuals will be stored within appropriate storage areas of sufficient capacity prior to removal by a suitably licensed waste management contractor for off-site treatment/recycling/disposal.

10.8 Route Selection

In terms of the route selection, based on the desk study of the soils and geology there is no preferred route corridor option. No sites of geological significance appear to be present along the different route options. The potential impacts relating to the soils and geology are generally related to the construction phase and the management of machinery on site. The mitigation measures highlighted in the report will further ameliorate the potential impact of the proposed developments on the surrounding environment in terms of soils and geology.

10.9 References

- EPA, (2003,) Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) CAAS Environmental Services, 6 Merrion Square, Dublin 2

- EPA, (2002), EPA Draft Guidelines on the Information to be Contained in Environmental Impact Statements CAAS Environmental Services, 6 Merrion Square, Dublin 2

- The Institute of Geologists of Ireland, (2002), Geology in Environmental Impact Statements – A Guide, the Institute of Geologists of Ireland.

- Sleeman, A.G. and Pracht, M., (1994), Geology of the Shannon Estuary, Sheet 17. Geological Survey of Ireland.

- An Foras Taluntaisi, (1980), Soil Map of Ireland

Section 11 – Cultural Heritage Report

11.1 Introduction

This report was written on behalf of ESBI Engineering and Facility Management Ltd (hereafter referred to as ESBI) for a proposed 400kV overhead electricity transmission line from a new 400/220kV substation in the vicinity of Kingscourt Co. Cavan to a border crossing point northeast of Clontibret Co. Monaghan for approximately 45km. The list of tables and figures is shown at the end of this section.

11.2 Description of the Proposed Development

The proposed Cavan - Tyrone 400kV Interconnector project will consist of a new 400/220kV substation to be located in the vicinity of Kingscourt Co. Cavan. The footprint of the substation will measure about 300m by 300m. The proposed powerline will be about 45km in length when the preferred route option is chosen.

The 400kV overhead transmission line will require the use of support structures which will consist of steel lattice towers ranging in height from 27m-44m. The towers will require four foundations, one per leg, each of which will be machine dug and filled with concrete. The interval spacing between each tower is typically 350m but can be up to 500m.

11.3 Methodology

11.3.1 Desk Based Study

11.3.1.1 Record of Monuments and Places

The Record of Monuments and Places (RMP) was established under the National Monuments Acts (1930-94). It is based upon the older non-statutory Sites and Monuments Record and information from county archaeological inventories. It records known upstanding archaeological monuments, the original location of destroyed monuments and the location of possible sites identified through, documentary, cartographic, photographic research and field inspections. The RMP consists of a numbered list, organised by county and subdivided by 6" map sheets showing the location of each site. The RMP data is compiled from the files of the Archaeological Survey, which combines cartographic sources and all published and publicly available documentary sources including periodicals, the records of the National Museum of Ireland (NMI) and the aerial photographs of the Geological Survey of Ireland (GSI).

11.3.1.2 The Topographic Files of the National Museum of Ireland

The topographical files of the National Museum of Ireland (NMI) identify all recorded stray finds held in the NMI archive that have been acquired by the state in accordance with national monuments legislation. The files sometimes

include reports on excavations undertaken by NMI archaeologists in the early 20th century. The amount and the usefulness of the information on each stray find can vary considerably. The finds are listed by county and townland and/or street name.

11.4 Archaeological, Architectural and Cultural Heritage in the Receiving Environment

11.4.1 Archaeological and Historical Background

11.4.1.1 Prehistoric Period

The number of prehistoric sites and monuments that are located on or close to the proposed project is quite small. The earliest monument from this period dates to the Neolithic (4000BC) with several megalithic tombs in evidence. Two of these are located in the constraints circle for the substation. A wedge-tomb is located at Edengora (ME002-037) and is incorporated into a sub-circular enclosure and comprises of an unroofed gallery. The monument at Ervery (ME002-025) is a ruined portal tomb represented by a displaced roof stone resting against a portal stone.

Two other megalithic tombs are located along route corridor option A: a portion of a wedge-shaped gallery grave (MO019-037) in Cornamucklagh South and a court cairn (MO014-022) in Lemgare.

11.4.1.2 Early Christian Period (400AD-800AD)

By far the most numerous of monument type in the study area are ringforts (Raths and Cashels) accounting for over 90% of the sites identified for this project. The most significant component of Early Christian secular settlement is the ringfort. They are the most ubiquitous of all archaeological monuments in the country, numbering almost 40,000. They mainly functioned as farmsteads which consisted of circular enclosures made of earthen banks and an outer ditch. The number of banks can vary from one to three enclosing banks and ditches, and is usually taken as an indication of status and wealth. Ringforts functioned both as defensive farmsteads and also corals for the protection of valuable cattle.

Several of the recorded monuments are classified as earthwork sites. This category of monument describes anomalous earthen structures that do not have any diagnostic features that would allow for a classification within another category. These sites are also sub-surface with no visible above ground presence. They are often originally identified from 19th Century OS maps.

There is one crannóg (ME002-007) located within the constraints circle for the substation. Crannógs are habitation sites located on man-made islands and are predominantly Early Christian in date. They are found in shallow lakes

and bogs, concentrated in the inter-drumlin lakes north of the central plain and are a common monument in County Cavan.

11.4.1.3 The Anglo-Norman Period (1100AD onwards)

There are a few archaeological monuments from this period and are located within the constraints area for the substation. The castle and bawn site (CV035-016) is in the townland of Cordoagh but is no longer standing. The castle was erected by Conor O'Reilly in the 15th century but was apparently abandoned after the Plantation. Local tradition associates this site with the 'Fair Green' located at Muff (CV035-058).

The 'Fair Green' is marked on all editions of the 19th century OS maps and is marked as a sub-rectangular level area.

11.4.2 Record of Monuments and Places

11.4.2.1 Recorded Monuments within Substation Constraints Area

A total of 38 known archaeological sites are situated within the constraints circle for the proposed substation (Table 1, Fig. 1). There is a concentration of sites running north to south down the eastern half of the circle, whilst there is a relatively low density of known archaeological sites in the western and north-western quadrant of the circle (Fig. 1). The proposed footprint of the substation will occupy an area of about 300m by 300m so it will likely be possible to also locate the substation in the areas that have been identified as having a higher density of archaeological sites. A more detailed analysis will be required when the emerging location of the substation is known. In particular this will involve a site visit to verify the accuracy of the national grid coordinates. It should be noted that the NGR for recorded monuments have been found to be inaccurate in the past.

Table 1: Known Archaeological Sites for Substation Constraints Area

RMP	NGR	Townland	County	Site Type	Fig No.
CV035-001	27481/29347	Balloughly	Cavan	Rath	1
CV035-002	27520/29326	Balloughly	Cavan	Rath	1
CV035-004	27571/29342	Birragh	Cavan	rath	1
CV035-014	27412/29325	Clonturkan	Cavan	Rath	1
CV034-016	27307/29328	Coppanagh	Cavan	Rath	1
CV034-017	27318/29349	Coppanagh	Cavan	Rath site	1
CV035-016	27475/29596	Cordoagh	Cavan	Castle & bawn site	1
CV035-029	27611/29539	Cortober	Cavan	Rath	1

RMP	NGR	Townland	County	Site Type	Fig No.
CV035-030	27660/29478	Cortober	Cavan	Rath	1
CV035-031	27674/29532	Cortober	Cavan	Rath	1
CV035-032	27683/29476	Cortober	Cavan	Rath	1
CV035-034	27378/29306	Drumbar	Cavan	Rath	1
CV035-039	27774/29549	Dunaree	Cavan	Rath	1
CV035-044	27428/29497	Iaragh	Cavan	Rath	1
CV035-045	27474/29526	Iaragh	Cavan	Rath site	1
CV035-055	27579/29525	Lisnasassonagh	Cavan	Rath	1
CV035-058	27505/29592	Muff	Cavan	Fair green	1
ME002-039	27493/29203	Boherlea	Meath	Ringfort	1
ME002-040	27516/29242	Boherlea	Meath	Standing stone	1
ME001-002	27255/29217	Corgreagh	Meath	Ringfort	1
ME001-003	27244/29178	Corgreagh	Meath	Ringfort	1
ME002-010	27758/29396	Corrakeeran	Meath	Ringfort	1
ME002-037	27442/29191	Edengora	Meath	Megalithic tomb & enclosure	1
ME002-038	27466/29205	Edengora	Meath	Ringfort	1
ME002-007	27619/29413	Ervery	Meath	Crannog	1
ME002-008	27604/29375	Ervery	Meath	Enclosure	1
ME002-024	27683/29338	Ervery	Meath	Ringfort	1
ME002-025	27702/29307	Ervery	Meath	Megalithic tomb	1
ME002-028	27716/29271	Ervery	Meath	Ringfort	1
ME002-033	27312/29148	Kilboyne	Meath	Ringfort	1
ME002-035	27357/29140	Kilboyne	Meath	Ringfort	1
ME002-036	27374/29126	Kilboyne	Meath	Ringfort	1
ME002-032	27309/29189	Letachmentgallon	Meath	Enclosure site	1
ME002-044	27699/29212	Lislea	Meath	Ringfort	1

RMP	NGR	Townland	County	Site Type	Fig No.
ME001-001	27249/29246	Lisnaboy	Meath	Ringfort	1
ME002-026	27629/29278	Tullyweel	Meath	Ringfort	1
ME002-027	27667/29271	Tullyweel	Meath	Enclosure	1
ME002-041	27554/29115	Carnacally	Meath	Ringfort	1

11.4.2.2 Recorded Monuments along Route Option A (Red)

Route Option A (Red) directly impacted on five recorded archaeological sites: four earthwork sites (MO027-096, MO027-72, MO027-110, MO027-075); and a megalithic tomb (MO014-022). The route indirectly impacts on a further seven archaeological sites (Table 2, Figs 2 -6).

There are a number of megalithic tombs to the east of Ballybay Town three of which cover an area of about 3 kms in radius south and north of the disused Great Northern Railway. The remaining tombs are located throughout this landscape to the east and southeast. There does not appear to be any intervisibility between any of these monuments which also vary in type.These sites are as follows:

- MO024-003 Drumguillew Lower
- MO019-037 Cornamucklagh
- MO019-021 Dunmaurice
- MO019-025 Rausker
- MO019-030 Corlealackagh
- MO019-016 Lennan

The known archaeological sites for the three route corridor options are dealt with in detail in the Impact section of this report.

Table 2: Known Archaeological sites along Route Option A (Red)

RMP	NGR	Townland	County	Site Type	Fig No.
MO030-037	27615/30132	Scalkill	Monaghan	Ringfort	2
MO030-21	27664/30385	Cornalaragh	Monaghan	Ringfort	2
MO019-037	27555/32000	Cornamucklagh South	Monaghan	Megalithic tomb	5
MO019-038	27577/31971	Cornamucklagh South	Monaghan	Ringfort	5
MO027-037	27707/31029	Cornasassonagh	Monaghan	Earthwork site	4

RMP	NGR	Townland	County	Site Type	Fig No.
MO027-096	27533/30620	Corvally	Monaghan	Earthwork site	3
MO014-022	27997/32831	Lemgare	Monaghan	Megalithic tomb	6
MO014-021	27980/32869	Lemgare	Monaghan	Ringfort	6
MO027-72	27516/30847	Screenty	Monaghan	Earthwork site	3
MO027-110	27524/30837	Sreenty	Monaghan	Earthwork site	3
MO027-032	27677/31133	Tullyglass	Monaghan	Ringfort	4
MO027-075	27580/30875	Ummerafree	Monaghan	Earthwork site	3

11.4.2.3 Recorded Monuments along Route Option B (Blue)

Route Option B (Blue) directly impacted on two monuments: a ringfort (MO028-058) and an earthwork site (MO028-142). The route indirectly impacted on a further nine archaeological sites (Table 3, Figs 7-11). The known archaeological sites for the three route corridor options are dealt with in detail in the Impact section of this report.

Table 3: Known Archaeological sites along Route Option B (Blue)

RMP	NGR	Townland	County	Site Type	Fig No.
MO030-022	27798/30372	Cornalaragh	Monaghan	Ringfort	7
MO014-036	27979/32565	Croaghan	Monaghan	Church site possible	11
MO028-002	28123/31197	Dooraa	Monaghan	Ringfort	9
MO028-055	28056/30968	Drumberagh	Monaghan	Ringfort	8
MO028-058	28098/30940	Drumberagh	Monaghan	Ringfort	8
MO028-142	28172/30695	Drumbroagh	Monaghan	Earthwork site	8
MO019-032	27988/32090	Grig	Monaghan	Earthwork site	10
MO028-096	281420/30843	Killarue	Monaghan	Ringfort	8
MO028-098	28155/30823	Killarue	Monaghan	Ringfort	8
MO028-099	28184/30788	Killarue	Monaghan	Ringfort	8
MO014-035	27988/32627	Latnakelly	Monaghan	Ringfort	11

11.4.2.4 Recorded Monuments along Route Option C (Black)

Option C (Black) impacted directly on one recorded ringfort (MO015-004) and indirectly impacted on eight other recorded monuments (Table 4, Figs 12 - 15). The known archaeological sites for the three route corridor options are dealt with in detail in the Impact section of this report.

Table 4: Known Archaeological sites along Route Option C (Black)

RMP	NGR	Townland	County	Site Type	Fig No.
MO028-035	28416/31041	Corlygorm	Monaghan	Ringfort	12
MO028-036	28433/31020	Corlygorm	Monaghan	Ringfort	12
MO028-040	28603/31116	Drumillard	Monaghan	Ringfort	12
MO020-003	2836/3227	Erryroe	Monaghan	Earthwork site	14
MO025-039	28656/31294	Knockreagh	Monaghan	Ringfort	13
MO028-044	28718/31086	Maghernakill	Monaghan	Linear earthwork	13
MO028-066	28396/30988	Monalia	Monaghan	Ringfort	12
MO028-064	28343/30965	Rathmore	Monaghan	Ringfort	12
MO015-004	28073/32564	Tattyreagh north	Monaghan	Ringfort	15

11.4.3 The Topographical Files, National Museum of Ireland

11.4.3.1 Substation

There are 64 townlands within or partially within the constraints circle for the substation. Several of the townlands within the constraints circle for the substation have had stray find discoveries. The townland of Ervery, in particular was quite rich in finds. The excavated crannóg revealed the following artefacts: wooden staves, pewter dish, iron axe head, and bronze object. Several other stray finds were found over a period of time in this townland consisting of, a bronze strap buckle, pewter vessels, bronze enamelled buckle, bronze strap tag. Finds from Ervery Lough consisted of a bronze pin, ring pin and silver pennanular brooch and a human skull. Elsewhere within the constraints circle the stray finds in Table 5 were discovered.

Table 5: Stray finds from Substation Constraint Area (excl. Ervery)

Townland	Artefact Type	NMI Reg. No.
Cordoagh	Iron spearhead	IA/53/1974
Corraneary	Worked flint	1942:68

Edengora	Rotary quern	Record only
Mohercrom	Bronze spearhead	1963:33
Muff	Bronze axe	1942:412

The above artefacts date predominantly from the prehistoric period, most likely the Bronze Age. The pewter artefacts are likely to be post-medieval but may be a little earlier.

11.4.3.2 Route Option A (Red)

Route Option A passes through a total of 46 townlands, 6 of which have stray finds. Some of the artefacts were found in the bogs at Ardaragh and Corlea. Other artefact types discovered were a hammerstone, flint-slug knife, bronze javelin, and a rotary quern. The finds appear to be all from the prehistoric period.

Table 6: Stray finds from along Route Option A (Red)

Townland	**Artefact Type**	**NMI Reg. No.**
Ardaragh	Handles (found in bog)	Unregistered
Corlea	Wooden keg of bog butter	1965:275
Corlea	Rotary quern	1978:160
Cornasassanagh	Bronze spearhead	Unregistered
Corvalley	Bronze javelin	IA/128/62
Referagh	Hammerstone	1965:115
Skreenty	Flint-slug knife	1956:270

11.4.3.3 Route Option B (Blue)

Route Option B passes through a total of 40 townlands, 5 of which have stray find discoveries. At Annaghlogh a stone axehead was found and in Beagh a stone sinker and beehive quern were discovered. In the townland of Cornalaragh several bronze artefacts were found, a brooch, bronze object and a La Tène toilet box. At Drumbroagh a bronze wedge and bronze axe were found. All of these artefacts date from the prehistoric period and are probably from both the Bronze Age and Iron Age.

Table 7: Stray finds from along Route Option B (Blue)

Townland	**Artefact Type**	**NMI Reg. No.**
Annaghlogh	Stone axehead	1933:236
Beagh	Stone sinker	Unregistered
Beagh	Beehive quern	IA/81/1991
Cornalaragh	Brooch	1965:315
Cornalaragh	Bronze object	1965:253
Cornalaragh	Bronze La Tène toilet box	Unregistered

Drumbroagh	Bronze wedge/chisel	1941:368

11.4.3.4 Route Option C (Black)

Route option C passes through a total of 29 townlands, 1 of which had a stray find. In the townland of Drumharriff an adze was discovered. The date of this object is possibly Iron Age.

Table 8: Stray finds from along Route Option C (Black)

Townland	**Artefact Type**	**NMI Reg. No.**
Drumharriff	Adze	1941:357

11.4.3.5 Summary of Topographic Files Research

Within the constraint circle for the proposed substation, six out of sixty-four townlands had stray finds. The townland of Ervery and Ervery Lough had several stray finds, while the finds from the other townlands were single finds.

The route option C (black) has only one known stray find registered out of a total of 29 townlands. The route options A and B do have more stray finds but they also pass through more townlands.

The number of stray finds for the constraints circle and the three routes is typical and may not be significant.

11.5 Architectural Heritage

The Record of Protected Structures for the counties of Meath, Cavan and Monaghan were examined to ascertain whether there were any protected structures within the constraints circle for the proposed substation and along the Route Options A, B and C.

There are no protected structures within the constraints circle for the substation. There are also no protected structures along any of the route options. Route Option A passes through part of the demesne of Shantonagh House; however this house is not recorded as a protected structure.

11.6 Impact Assessments

11.6.1 Introduction

This section deals with the likely archaeological impacts that arise from the proposed development. It will detail the location of known archaeological monuments within the constraints of the project. It is important to note the limitations of the route selection report in that it largely involves a desk-survey and so therefore it is difficult to assess the exact level of potential of an archaeological site and its impact in regard to the following:

- Possible associated sub-surface archaeology associated with a recorded monument;
- The unknown extent of a recorded monument;
- The potential to reveal archaeological sites given the landscape type;
- It is possible that recorded or newly identified sites may prove to be natural when subjected to testing or excavation.

In the case of the proposed location of the substation all known archaeological sites and monuments are listed that occur within the constraints circle. No definitive location of the substation has been finalised. The preferred siting of the substation should take into account the location of the known archaeological monuments and be avoided.

With regard to the three route options, A, B and C all known archaeological sites on or within about 100m of the three line options is included in the inventory. Where the route of the transmission cables crosses over an archaeological monument this impact is categorised as a direct impact.

11.6.2 Substation

A total of **38** known archaeological monuments are located within the constraints circle. The predominant monument types are ringforts and variants of same such as earthworks and enclosures.

The north-west and north quadrants of the constraints circle are mostly devoid of known monuments with the southern and eastern quadrants having the highest density of archaeological sites.

11.6.3 Route Options A, B and C

Each option has been assessed for the presence of known archaeological monuments either within the route of the line (50m wide) or up to 100m outside of it. The archaeological implications for each route option have been set out in separate impact assessment tables. It emerges that the black route, option C, has **1** direct impact on known archaeological monument and would appear to be the preferred route. Route option B (blue), directly impacts on **2** known monuments and route option A (red) directly impacts on **5** known monuments.

The 400kV overhead transmission line will require the use of support structures which will consist of steel lattice towers ranging in height from 27m-44m. The towers will require four foundations, one per leg, each of which will be machine dug and filled with concrete. The interval spacing between each tower is typically 350m but can be up to 500m. This will allow for a certain degree of flexibility with regard to the positioning of support towers and avoidance of known archaeological sites. The invasive footprints of the support towers are also of a relatively minor impact.

11.6.3.1 Route Option A (Red)

Route option A leaves the proposed substation area located to the west of Kingscourt and heads in a roughly northerly direction. In the townland of Corlea in Cavan it heads in a northeast direction crossing the county boundary into Monaghan. At the townland of Scalkill the route passes to the southeast at about 90m distance from a recorded ringfort (MO030-037). In the townland of Cornalaragh the route turns northwest and passes to the northeast at about 20m distance to a ringfort (MO030-021). At the townland of Raferagh the route turns northerly again and directly impacts on an earthwork site (MO027-096) at Corvally, this site is sub-surface with no visible trace.

At Ouvry the route heads in a northeast direction and directly impacts on two recorded earthwork sites (MO027-072 and MO027-110), both of these sites are sub-surface with no visible features. In the townland of Ummerafree the route directly impacts on a recorded earthwork site (MO027-075), there are no visible surface remains of this monument. At Cornasassonagh the route passes at about 100m distance from a recorded earthwork site (MO027-037). The route later passes at about 90m distance from a recorded ringfort at Tullyglass (MO027-032).

Table 9: Impact Assessment Table for Route Option A (Red)

RMP	NGR	Townland	Site Type	Type of Impact	Distance (approx.)	Impact level	Fig No.
MO030-037		Scalkill	Ringfort	Indirect	90m	Slight	2
MO030-21	27664/30385	Cornalaragh	Ringfort	Indirect	20m	Moderate	2
MO019-037	27555/32000	Cornamucklagh South	Megalithic tomb	Indirect	60m	Slight	5
MO019-038	27577/31971	Cornamucklagh South	Ringfort	Indirect	100m	Slight	5
MO027-037	27707/31029	Cornasassonagh	Earthwork site	Indirect	100m	Slight	4
MO027-096	27533/30620	Corvally	Earthwork site	Direct	0m	Significant	3
MO014-022	27997/32831	Lemgare	Megalithic tomb	Direct	0m	significant	6
MO014-021	27980/32869	Lemgare	Ringfort	Indirect	100m	Slight	6
MO027-72	27516/30847	Screenty	Earthwork site	Direct	0m	Significant	3

RMP	NGR	Townland	Site Type	Type of Impact	Distance (approx.)	Impact level	Fig No.
MO027-110	27524/30837	Sreenty	Earthwork site	Direct	0m	Significant	3
MO027-032	27677/31133	Tullyglass	Ringfort	Indirect	90m	Slight	4
MO027-075	27580/30875	Ummerafree	Earthwork site	Direct	0m	Significant	3

The route then passes through the demesne lands of Shantonagh House in the townland of Shantonagh. The route does not pass near to Shantonagh House (not a protected structure). In the townland of Cornamucklagh South the route passes at about 100m distance to the west of a recorded ringfort (MO019-038) and about 60m distance to the west of a recorded megalithic tomb (MO019-037).

There are a number of megalithic tombs to the east of Ballybay Town three of which cover an area of about 3 kms in radius south and north of the disused Great Northern Railway. The remaining tombs are located throughout this landscape to the east and southeast of Route Option A. The closest distance between the monuments is 1.5kms. There does not appear to be any intervisibility between any of these monuments which also vary in type.These sites are as follows:

- MO024-003 Drumguillew Lower
- MO019-037 Cornamucklagh
- MO019-021 Dunmaurice
- MO019-025 Rausker
- MO019-030 Corlealackagh
- MO019-016 Lennan

With regard to their group value the proposed route option is unlikely to impact negatively on any of these monuments.
At Lemgare the route directly impacts on a recorded ringfort (MO014-022) and passes at about 100m distance to the southwest of a recorded ringfort (MO014-021).

11.6.3.2 Route Option B (Blue)

Route Option B splits from route option A in the townland of Drumgurra and heads in a north-easterly direction. In the townland of Drumboagh the route directly impacts on a recorded earthwork site (MO028-142), this site is sub-surface with no visible above ground presence.

With the route heading in an approximately north-westerly direction it indirectly impacts on three sites: a recorded ringfort to the southwest at a distance of about 80m (MO028-099), a recorded ringfort to the southwest at

a distance of about 100m (MO028-098) and another recorded ringfort to the southwest at a distance of about 100m (MO028-096).

In the townland of Drumberagh the route directly impacts on a recorded ringfort (MO028-058) and a little further north indirectly impacts on a recorded ringfort (MO028-055) located to the southwest of the route at a distance of about 100m.

At Dooraa townland the route indirectly impacts on a recorded ringfort (MO028-002) to the west of the route at a distance of about 100m. In the townland of Grig the route indirectly impacts on a recorded earthwork site (MO019-032), this monument is sub-surface and has no visible above ground presence. At Croghan the route indirectly impacts on a recorded possible church site (MO014-036) located to the west of the route at about 100m distance. In the townland of Latnakelly the route indirectly impacts on a recorded ringfort (MO014-035) to the northwest at a distance of about 100m.

Table 10: Impact Assessment Table for Route Option B

RMP	NGR	Townland	Site Type	Type of Impact	Distance (approx.)	Impact level	Fig No.
MO030-022	27798/30372	Cornalaragh	Ringfort	Indirect	150m	Im-perceptible	7
MO014-036	27979/32565	Croaghan	Church site possible	Indirect	100m	Slight	11
MO028-002	28123/31197	Dooraa	Ringfort	Indirect	100m	Slight	9
MO028-055	28056/30968	Drumberagh	Ringfort	Indirect	100m	Slight	8
MO028-058	28098/30940	Drumberagh	Ringfort	Direct	0m	Significant	8
MO028-142	28172/30695	Drumbroagh	Earthwork site	Direct	0m	Significant	8
MO019-032	27988/32090	Grig	Earthwork site	Indirect	100m	Slight	10
MO028-096	281420/30843	Killarue	Ringfort	Indirect	100m	Slight	8
MO028-098	28155/30823	Killarue	Ringfort	Indirect	100m	Slight	8
MO028-099	28184/30788	Killarue	Ringfort	Indirect	80m	Slight	8
MO014-035	27988/32627	Latnakelly	Ringfort	Indirect	100m	Slight	11

11.6.3.3 Route Option C (Black)

The route option C splits off from option B at the townland of Cornasleeve and heads in a north-easterly direction. The route indirectly impacts a recorded ringfort (MO028-064) located to the northwest of the route at a distance of about 100m. A little further along the route (about 500m) a recorded ringfort (MO028-066) is indirectly impacted upon. It is located to the southeast of the route at a distance of about 80m.

In the townland of Corlygorm the route indirectly impacts on a recorded ringfort located to the northwest of the route at a distance of about 70m. At Drumillard the route indirectly impacts on a recorded ringfort (MO028-040) located to the north of the route at a distance of about 30m. In the townland of Knockreagh Upper the route indirectly impacts on a recorded ringfort (MO025-039) to the east of the route at a distance of about 100m.

At Erryroe the route indirectly impacts on a recorded earthwork site (MO020-003), this site is sub-surface and has no visible above ground expression. It is located to the south-west of the route at a distance of about 10m. In the townland of Tattyreagh North the route directly impacts on a recorded ringfort (MO015-004).

Table 11: Impact Assessment Table for Route Option C (Black)

RMP	NGR	Townland	Site Type	Type of Impact	Distance (approx.)	Impact level	Fig No.
MO028-035	28416/31041	Corlygorm	Ringfort	Indirect	70m	Slight	12
MO028-036	28433/31020	Corlygorm	Ringfort	Indirect	110m	Slight	12
MO028-040	28603/31116	Drumillard	Ringfort	Indirect	30m	Moderate	12
MO020-003	2836/3227	Erryroe	Earthwork site	Indirect	10m	Potentially significant	14
MO025-039	28656/31294	Knockreagh	Ringfort	Indirect	100m	Slight	13
MO028-044	28718/31086	Maghernakill	Linear earthwork	Indirect	100m	Slight	13
MO028-066	28396/30988	Monalia	Ringfort	Indirect	80m	Slight	12
MO028-064	28343/30965	Rathmore	Ringfort	Indirect	100m	Slight	12
MO015-004	28073/32564	Tattyreagh north	Ringfort	Direct	0m	Profound	15

11.7 Route Option Appraisal

11.7.1 Route Corridor Options A, B and C

The route corridor option appraisal table below (Table 12) lists all of the known archaeological sites and monuments which are directly impacted on by the route corridor options for the power lines. Before assessing the results it is important to note the limitations of this table and also the other impact tables in this report. It is difficult to ascertain the exact impact level due to the potential to reveal at a future date, previously unknown archaeology and sub-surface archaeology as part of a possible archaeological testing strategy.

The route corridor option with the least predicted impacts, based on known archaeological sites, is option C (black) which impacts on one recorded ringfort (MO015-004). The second preferred route corridor is option B (blue) which impacts on two recorded sites, a ringfort (MO028-058) and an earthwork site (MO028-142). Finally, the least preferred route corridor is option A (red) which impacts on five known sites.

In **all** of the above cases however, there exists the possibility to re-adjust the routing of the power lines so as to avoid the known archaeology for all three routes. It is important to note that with regard to option A four of the five directly impacted sites are earthwork sites. These monuments are sub-surface with no visible above ground expression. The location of support towers away from these sites would be necessary, however it may be possible to still locate the route of the line across these sites as there would be no visible or physical impact.

There is a concern for the accuracy of the plotting of the route corridor options from the 1:50,000 scaled maps (provided by ESBI) onto the RMP constraint maps. These maps are at a much larger scale at 1:12,000. The transfer of information from the Discovery Series map to the RMP maps was done by eye using whatever landmarks were available to cross reference the location of the route; typically the landmarks were linear features, such as roads.

The route corridor options were identified following a desktop study coupled with a 'drive through' on the ground. The corridors can deviate several hundred meters depending on final line route selection.

There is a possibility that those sites that are directly impacted may in fact not be, and vice versa those sites which are indirectly impacted may actually be directly impacted. The national grid references for all known archaeological sites are provided and it is recommended that these figures are checked. (A word of caution about the reliability of these national grid references; they have been found in the past to be incorrect. It will be necessary therefore to confirm their location by a site visit.)

Table 12: Route Corridor Option Appraisal Table

Impact Level	**Route Option C**	**Route Option B**	**Route Option A**
Significant	Direct Impact on the following: recorded ringfort (MO015-004)	Direct impact on the following: recorded ringfort (MO028-058); recorded earthwork site (MO028-142)	Direct impact on the following: recorded earthwork site (MO027-096); recorded megalithic tomb (MO014-022); recorded earthwork site (MO027-072); recorded earthwork site (MO027-110); recorded earthwork site (MO027-075)
Negative Moderate	Close proximity to(10m) recorded earthwork site (MO020-003) Close proximity (30m) to recorded ringfort (MO028-040)		Close proximity (20m) to recorded ringfort (MO030-021)
Preference Level	**First Preference**	**Second Preference**	**Third Preference**

The potential impacts on the archaeological heritage for the routing of powerlines in general are considered moderate to low due to:

- The inherent and relative flexibility of the routing of power lines with possibility for avoidance of archaeological sites.
- The low invasive impact of the support tower footprints.

11.7.2 Substation

The constraints circle for the location of the proposed substation measures about 5.5km by 5.5km. The footprint of the substation will be about 300m by 300m. The number of archaeological sites within this circle is 38. All known archaeological sites should be avoided when evaluating the preferred location of the substation.

The predominant archaeological site type, within the constraints circle, is the ringfort. These monuments often appear in groups and this pattern is evident

from the supporting maps. Should the location of the substation be placed amidst a clearly related group of ringforts this would be of some concern and would require further investigation to assess whether there is a real relationship between these sites.

The quadrant to the west and north-west of the constraints circle is relatively devoid of known archaeological sites and may prove a suitable location for the substation. However, it must be borne in mind that the potential for the discovery of previously unknown sub-surface archaeology will require further evaluation once the exact location of the substation is known.

11.7.3 Recommendations

- Check the supplied grid references for the known archaeological sites that are directly and indirectly impacted by the route corridor options. When the emerging preferred route is known a site visit to confirm the location of any directly and indirectly impacted archaeological sites should be carried out. This will also apply to the location of the substation.

- When the emerging preferred route and location of the substation are known a detailed baseline study will be carried out. This will build significantly on the information gathered for this report. A field inspection of the entire preferred route and location of the substation will be carried out. Further research will be conducted on historic maps, recent archaeological excavations, Toponyms, aerial photographs. Proposed mitigation measures for any impacts in order to avoid, reduce and mitigate against significant adverse effects will be carried out in accordance with current best practice.

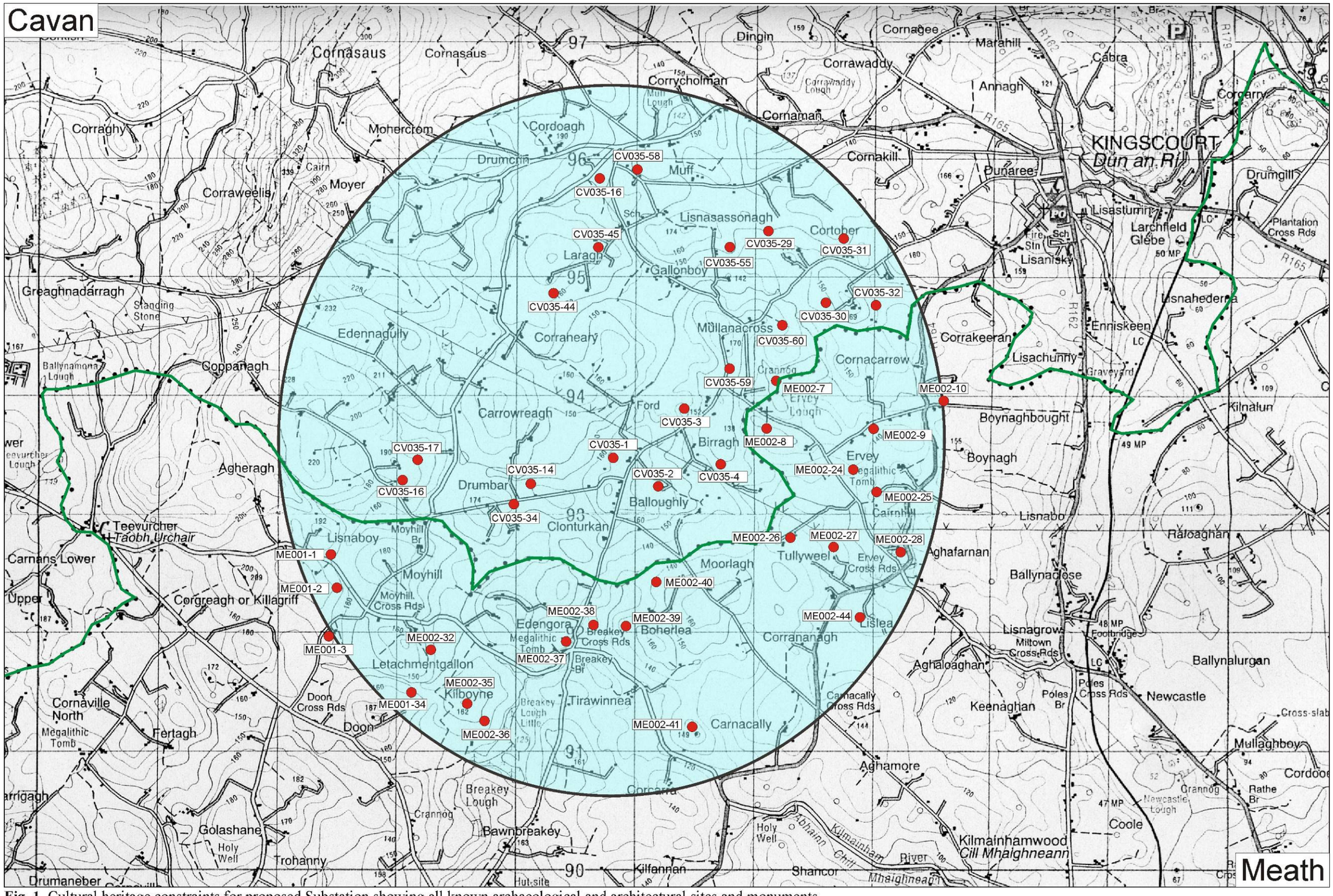


Fig. 1 Cultural heritage constraints for proposed Substation showing all known archaeological and architectural sites and monuments.

ROUTE OPTION A (Red)

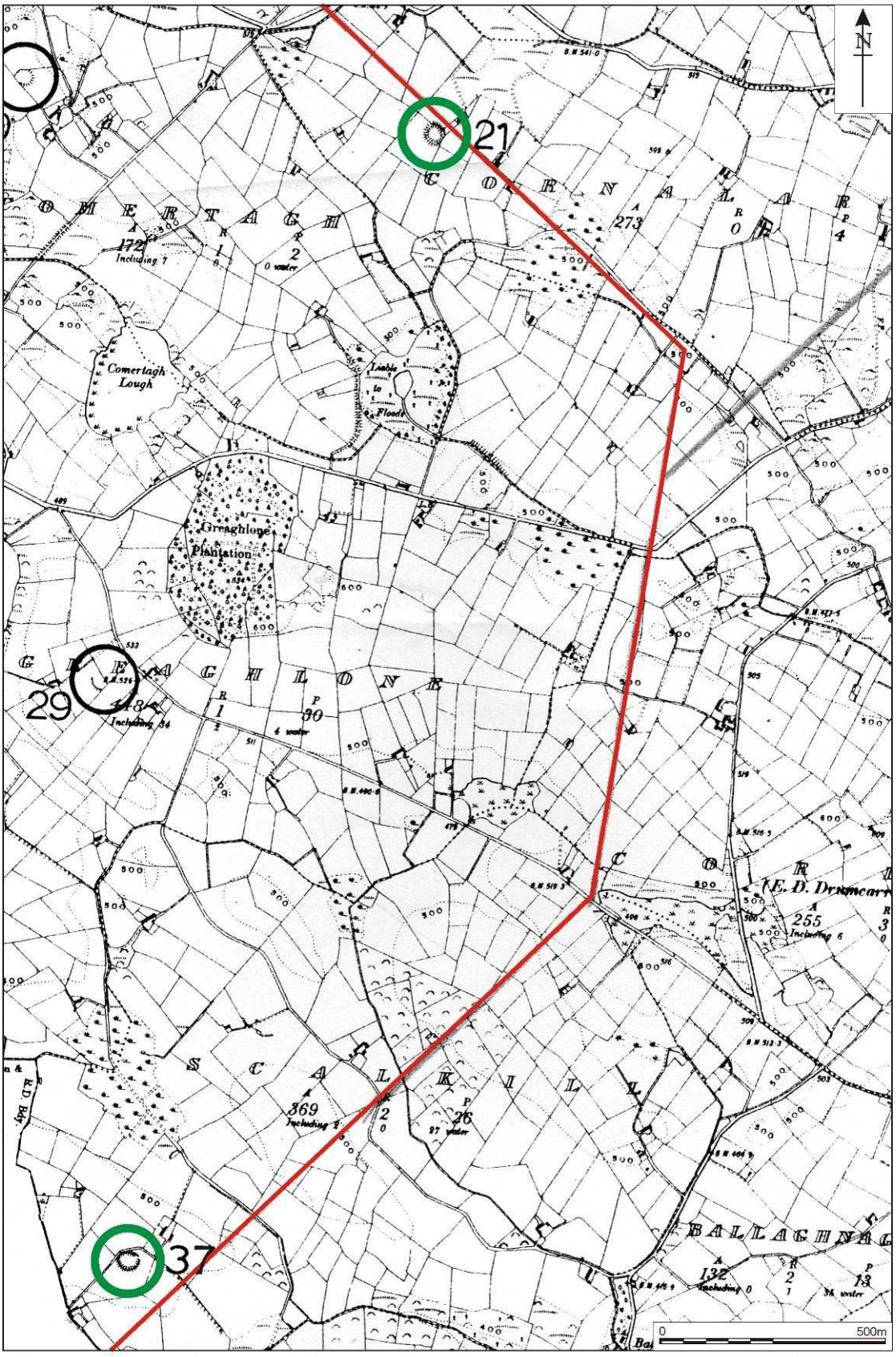


Fig 2 RMP Constraint Map of Co. Monaghan, Sheet 30. Date:1907-09 (RMP Detail:1996)

ROUTE OPTION A (Red)

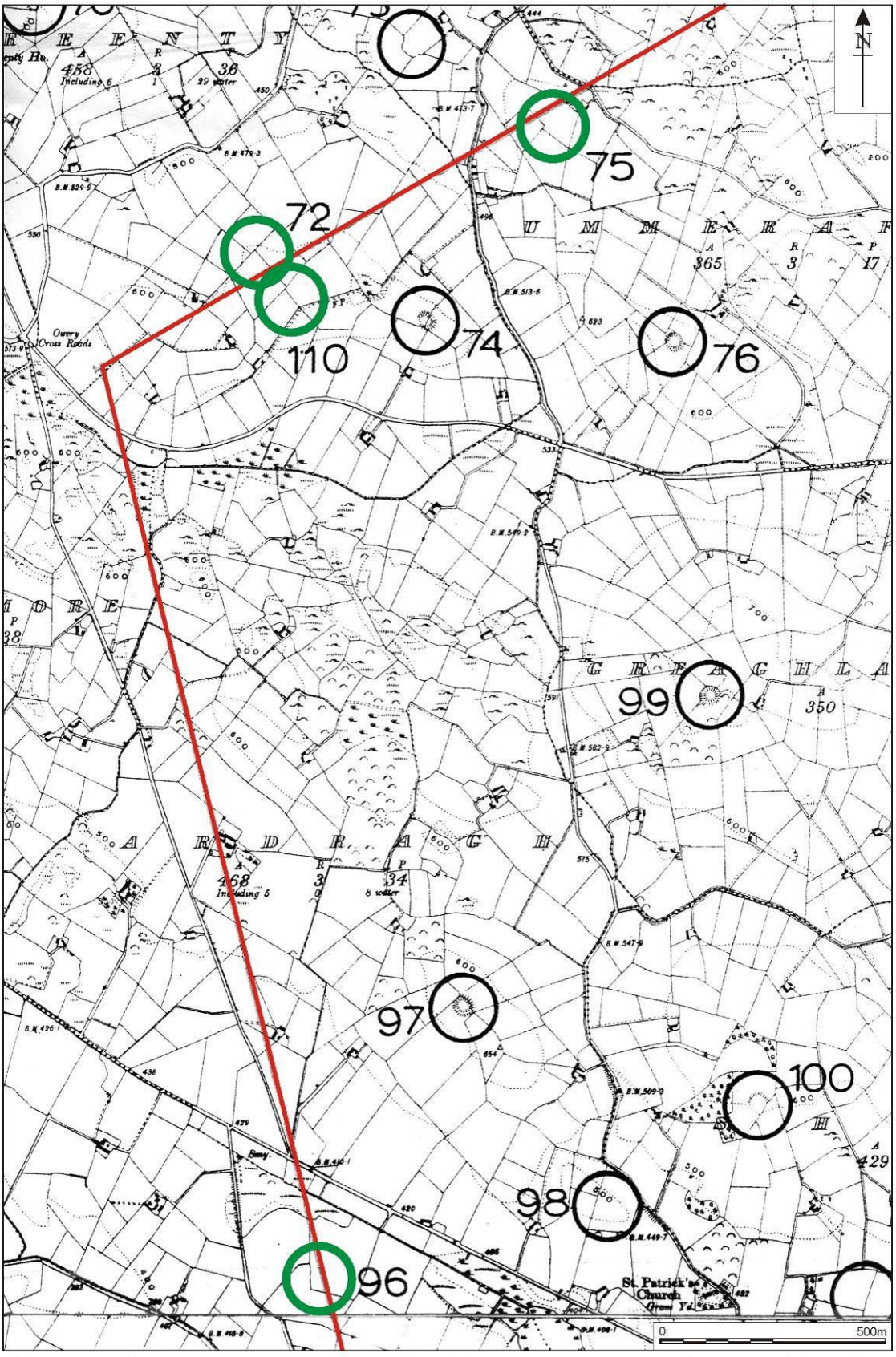


Fig 3 RMP Constraint Map of Co. Monaghan, Sheet 27. Date:1907-09 (RMP Detail:1996)

ROUTE OPTION A (Red)

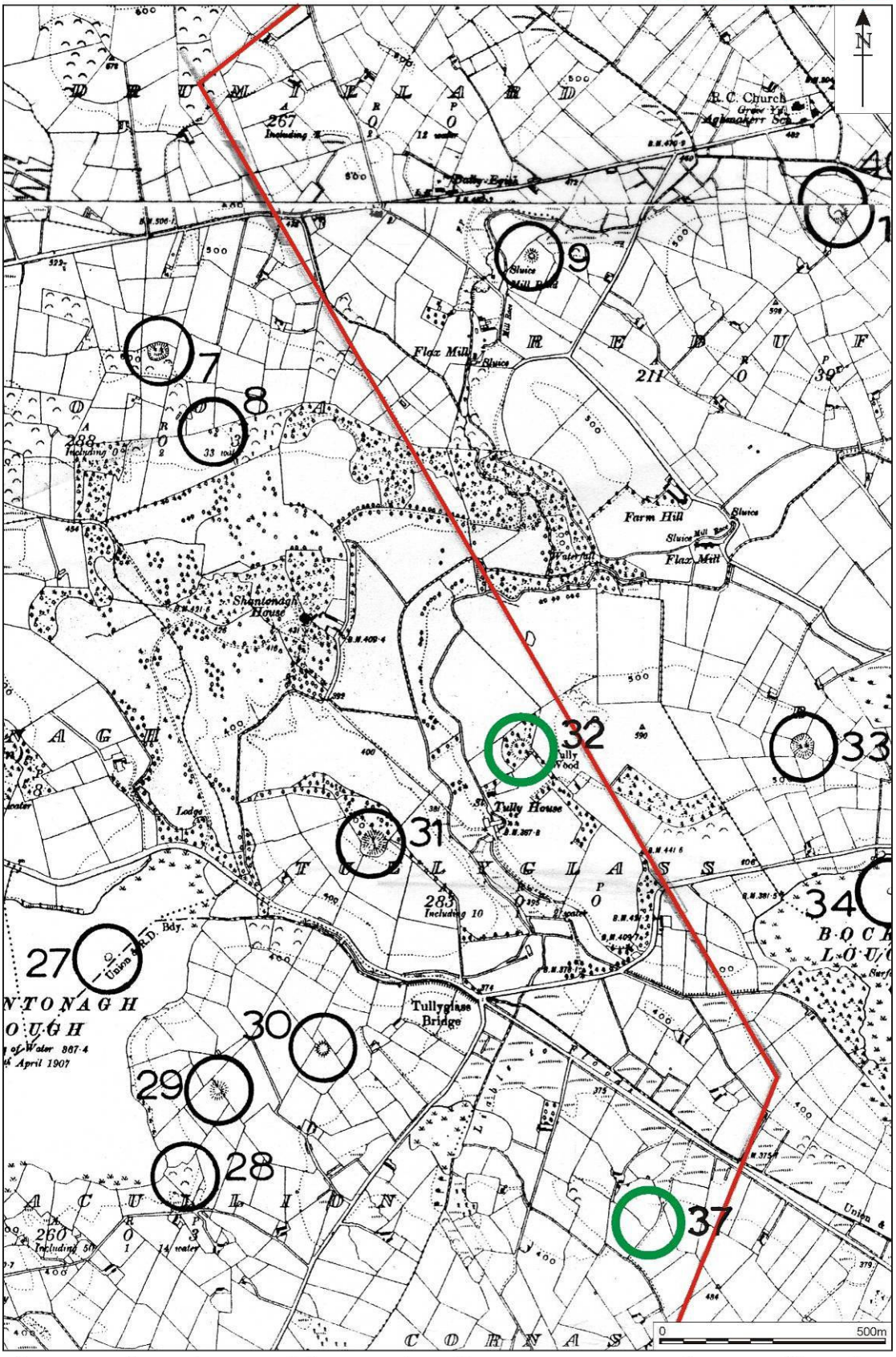


Fig 4 RMP Constraint Map of Co. Monaghan, Sheet 27. Date:1907-09 (RMP Detail:1996)

ROUTE OPTION A (Red)

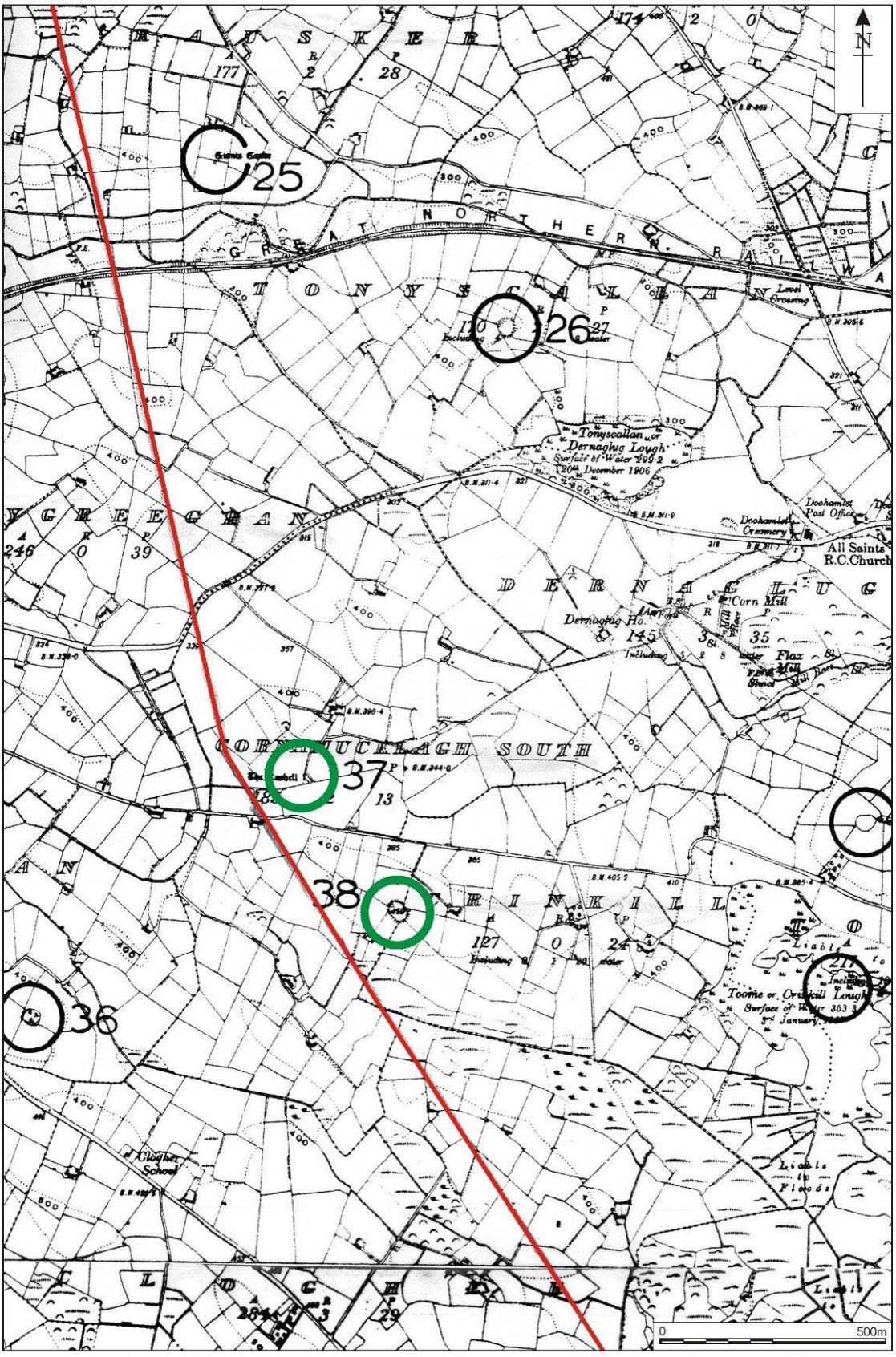


Fig 5 RMP Constraint Map of Co. Monaghan, Sheet 19. Date:1907-09 (RMP Detail:1996)

ROUTE OPTION A (Red)

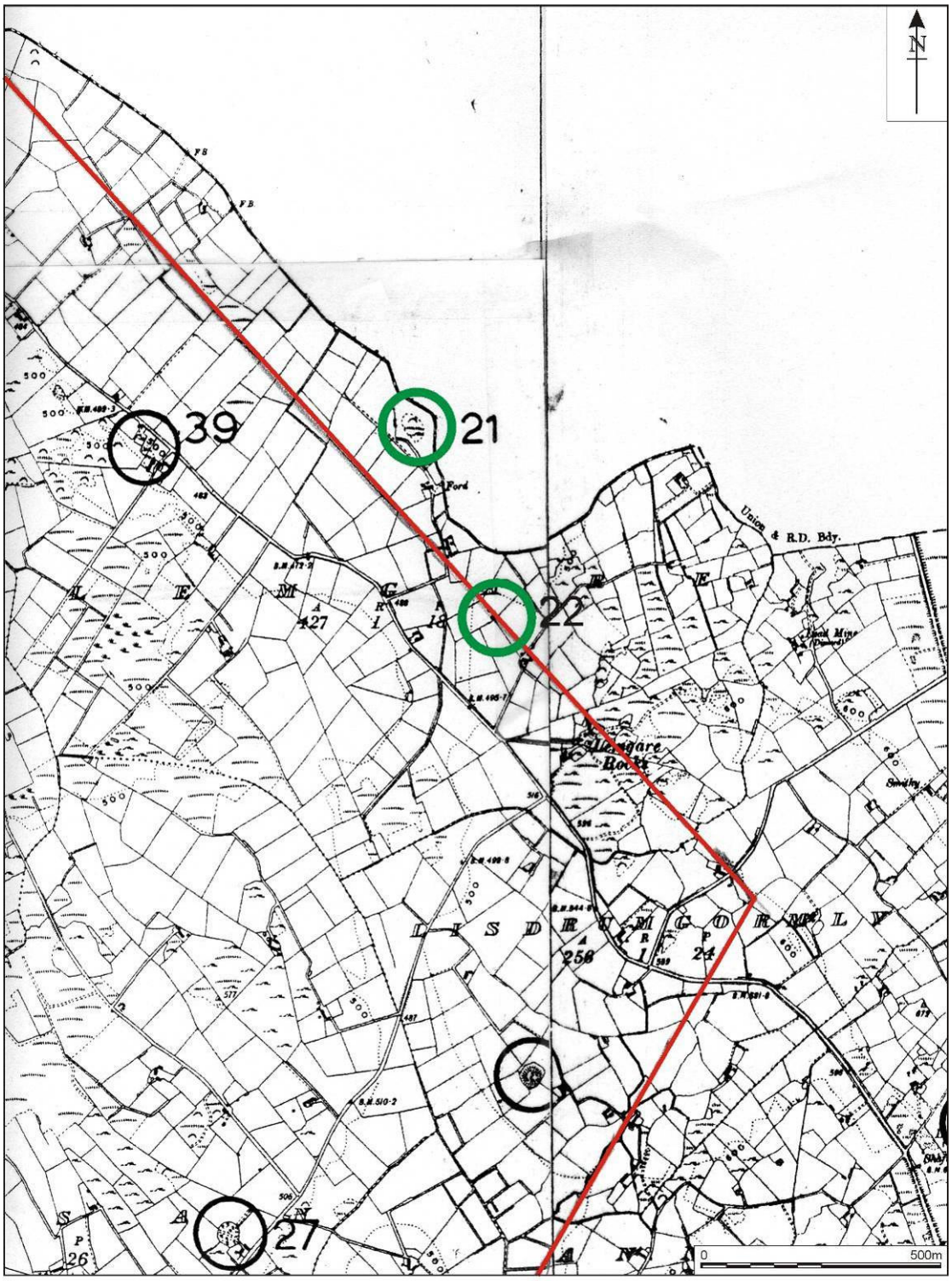


Fig 6 RMP Constraint Map of Co. Monaghan, Sheet 14. Date:1907-09 (RMP Detail:1996)

ROUTE OPTION B (Blue)

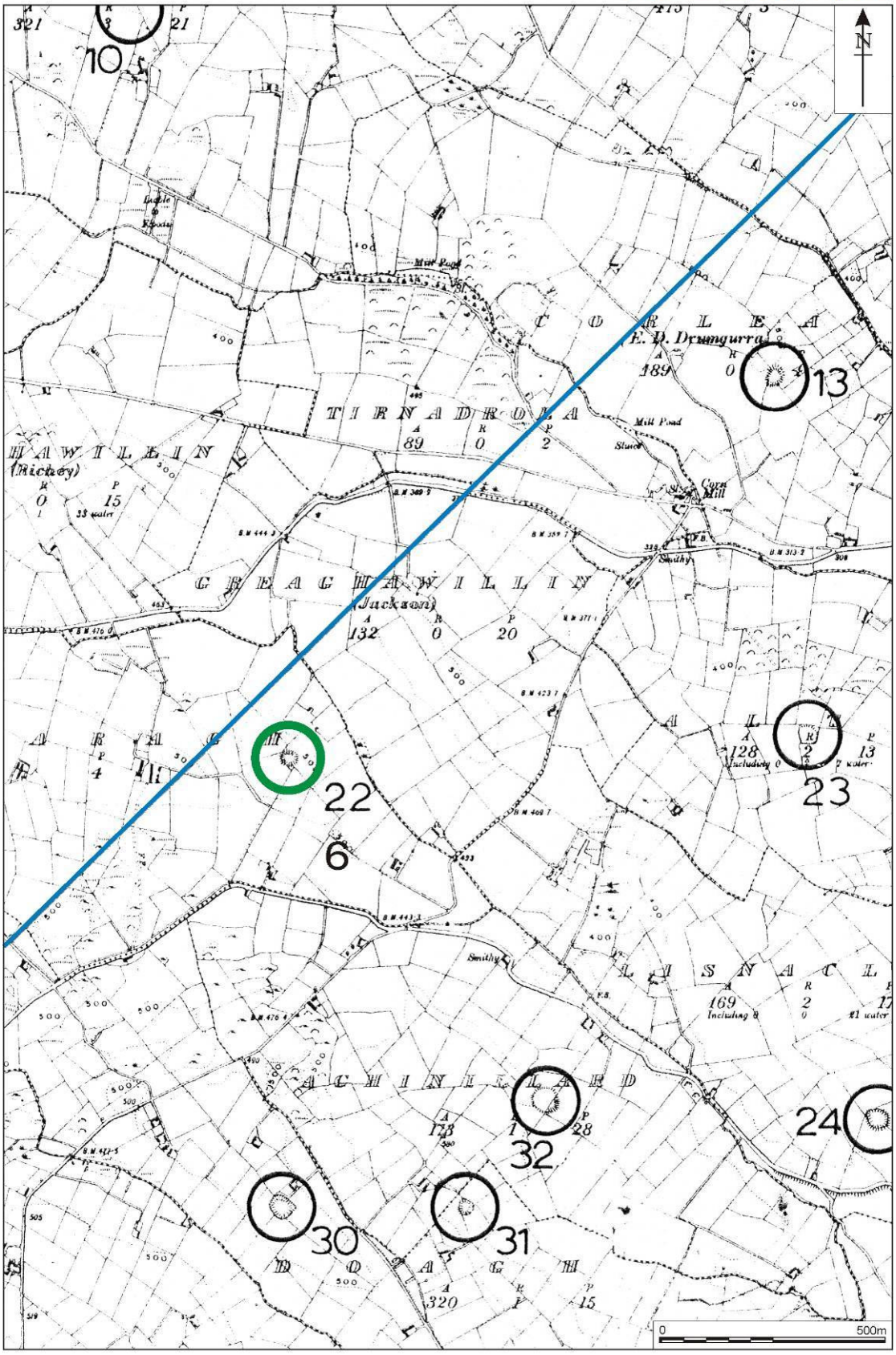


Fig 7 RMP Constraint Map of Co. Monaghan, Sheet 30. Date:1907-09 (RMP Detail:1996)

ROUTE OPTION B (Blue)

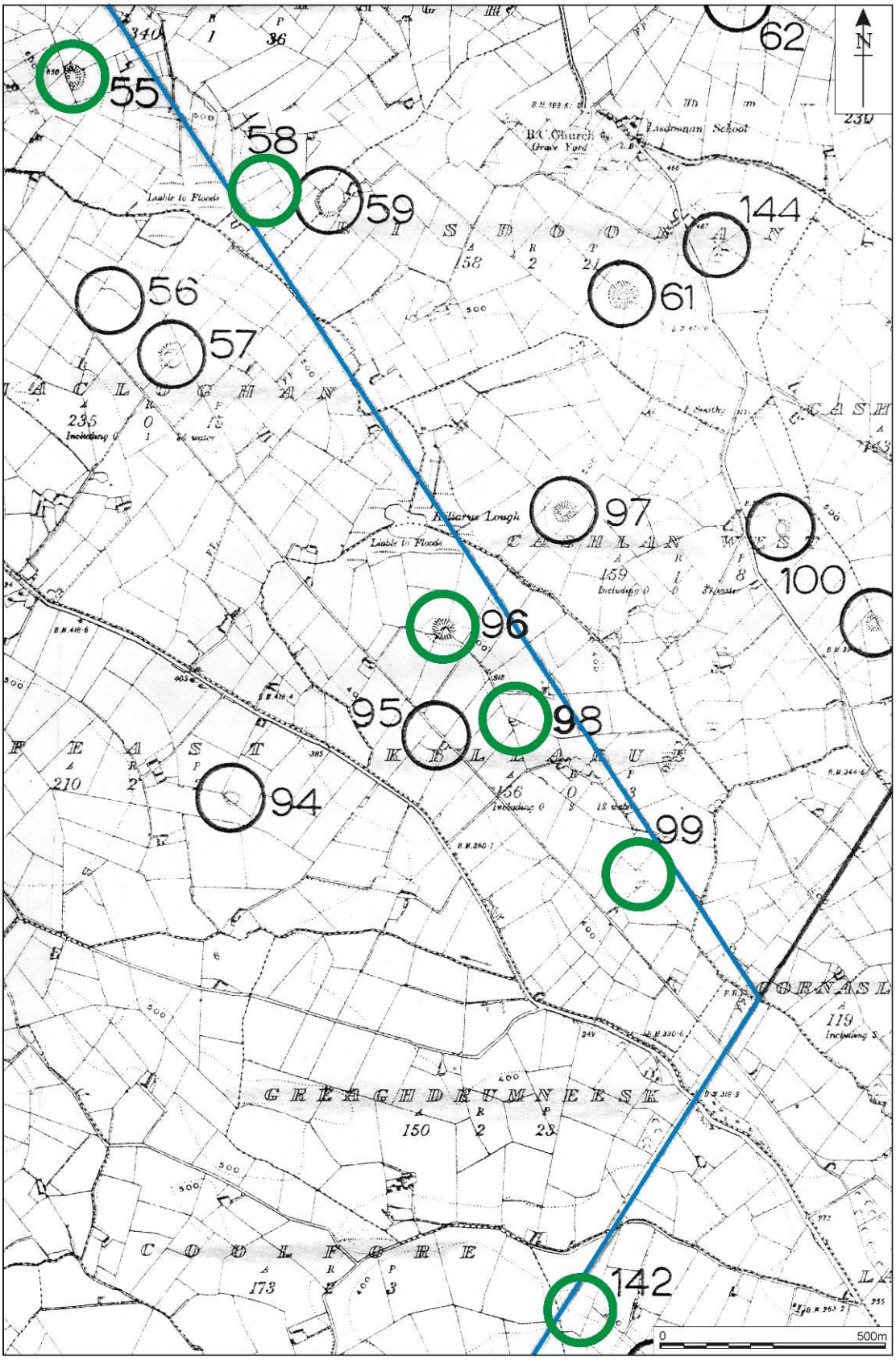


Fig 8 RMP Constraint Map of Co. Monaghan, Sheet 28. Date:1907-09 (RMP Detail:1996)

ROUTE OPTION B (Blue)

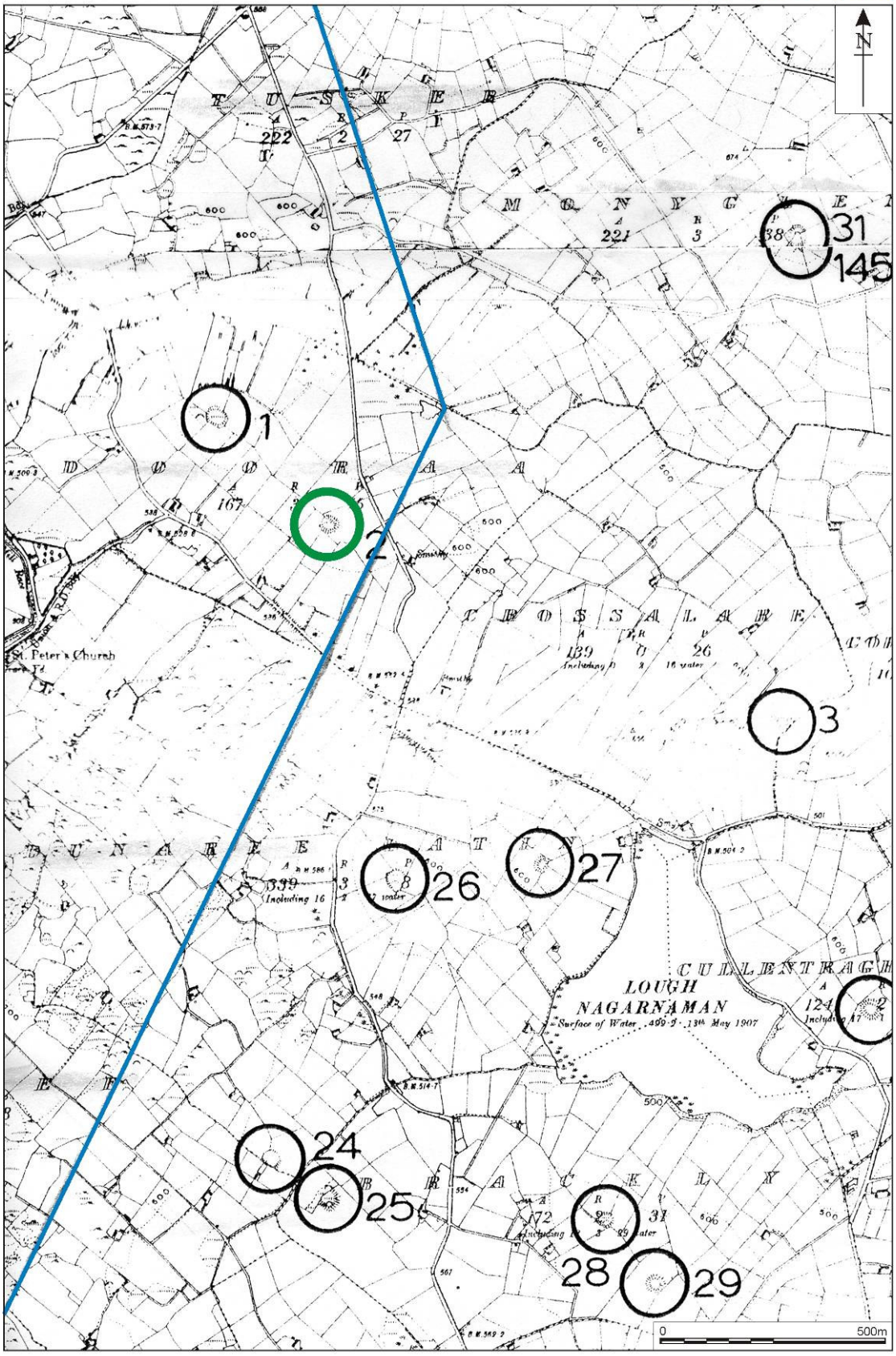


Fig 9 RMP Constraint Map of Co. Monaghan, Sheet 28. Date:1907-09 (RMP Detail:1996)

ROUTE OPTION B (Blue)

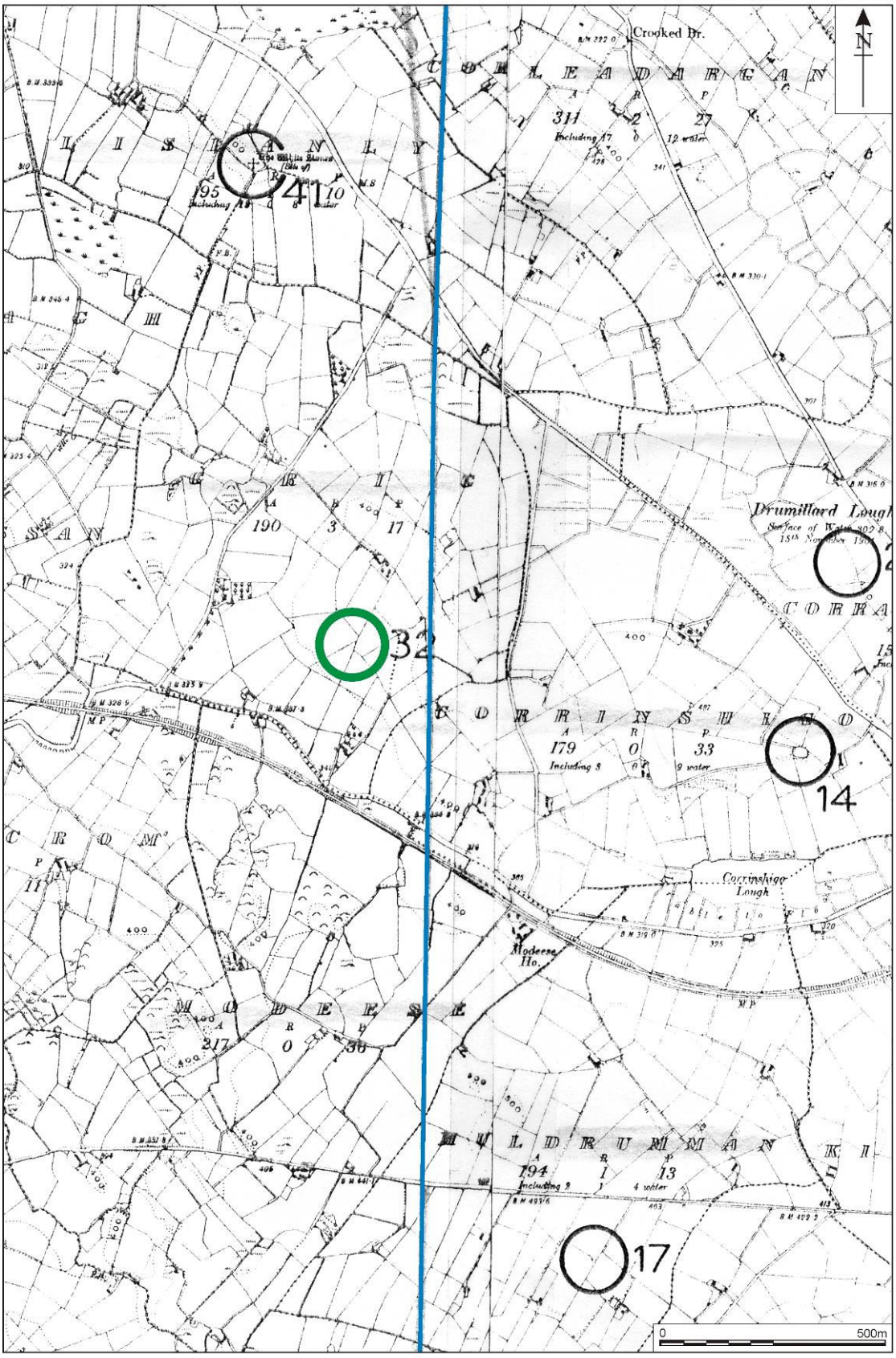


Fig 10 RMP Constraint Map of Co. Monaghan, Sheet 19. Date:1907-09 (RMP Detail:1996)

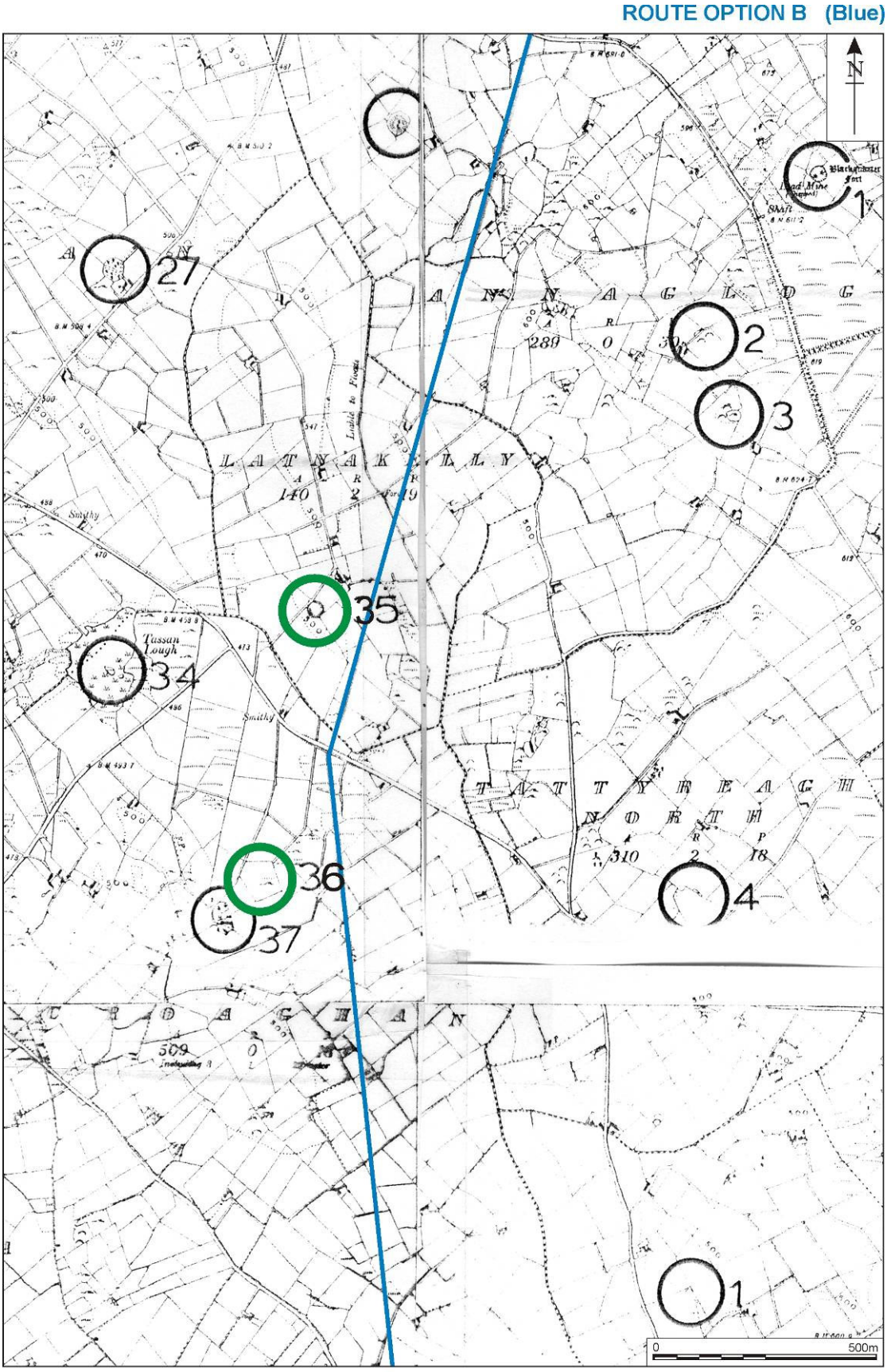


Fig 11 RMP Constraint Map of Co. Monaghan, Sheet 14. Date:1907-09 (RMP Detail:1996)

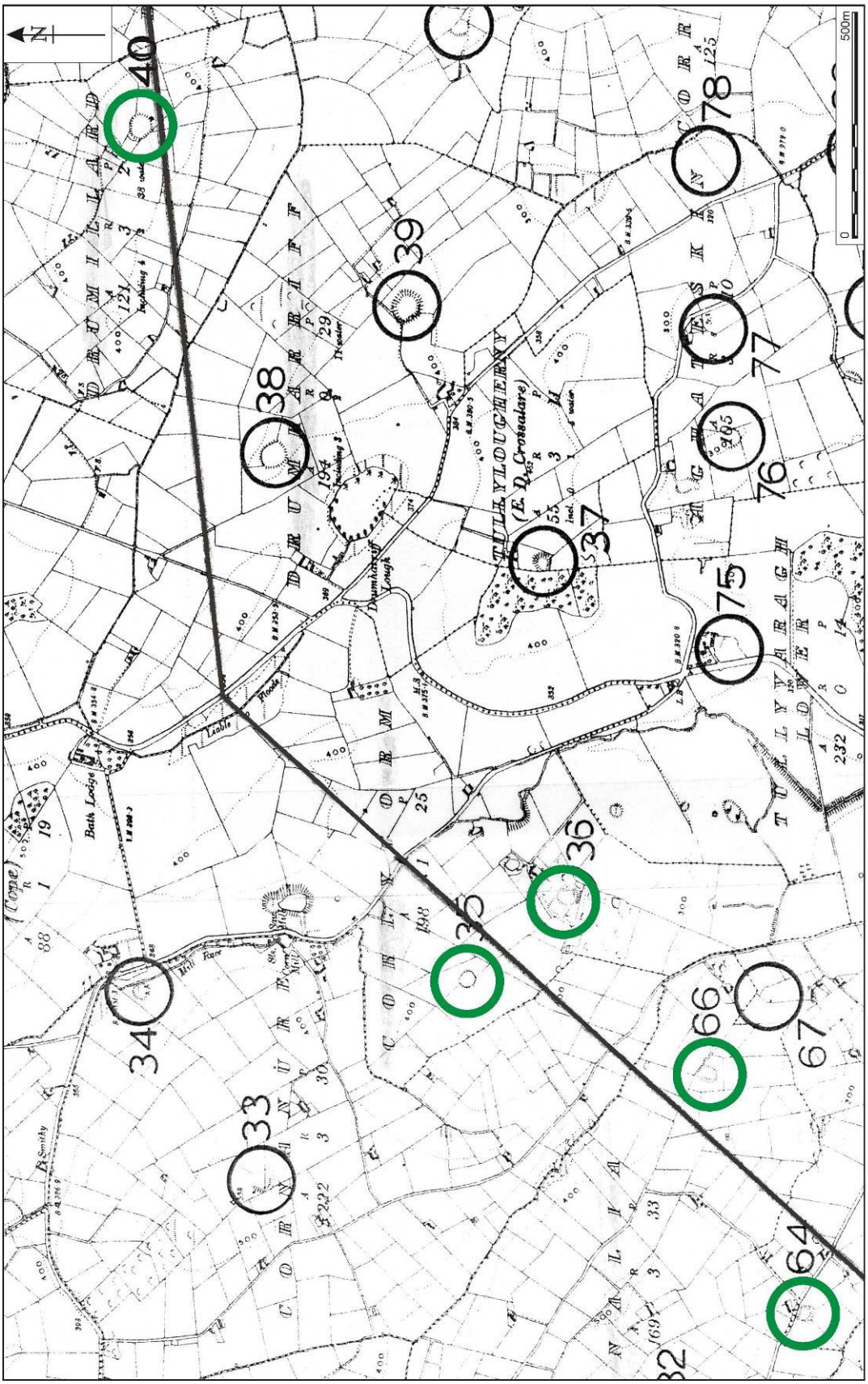


Fig 12 RMP Constraint Map of Co. Monaghan, Sheet 28. Date:1907-09 (RMP Detail:1996)

ROUTE OPTION C (Black)

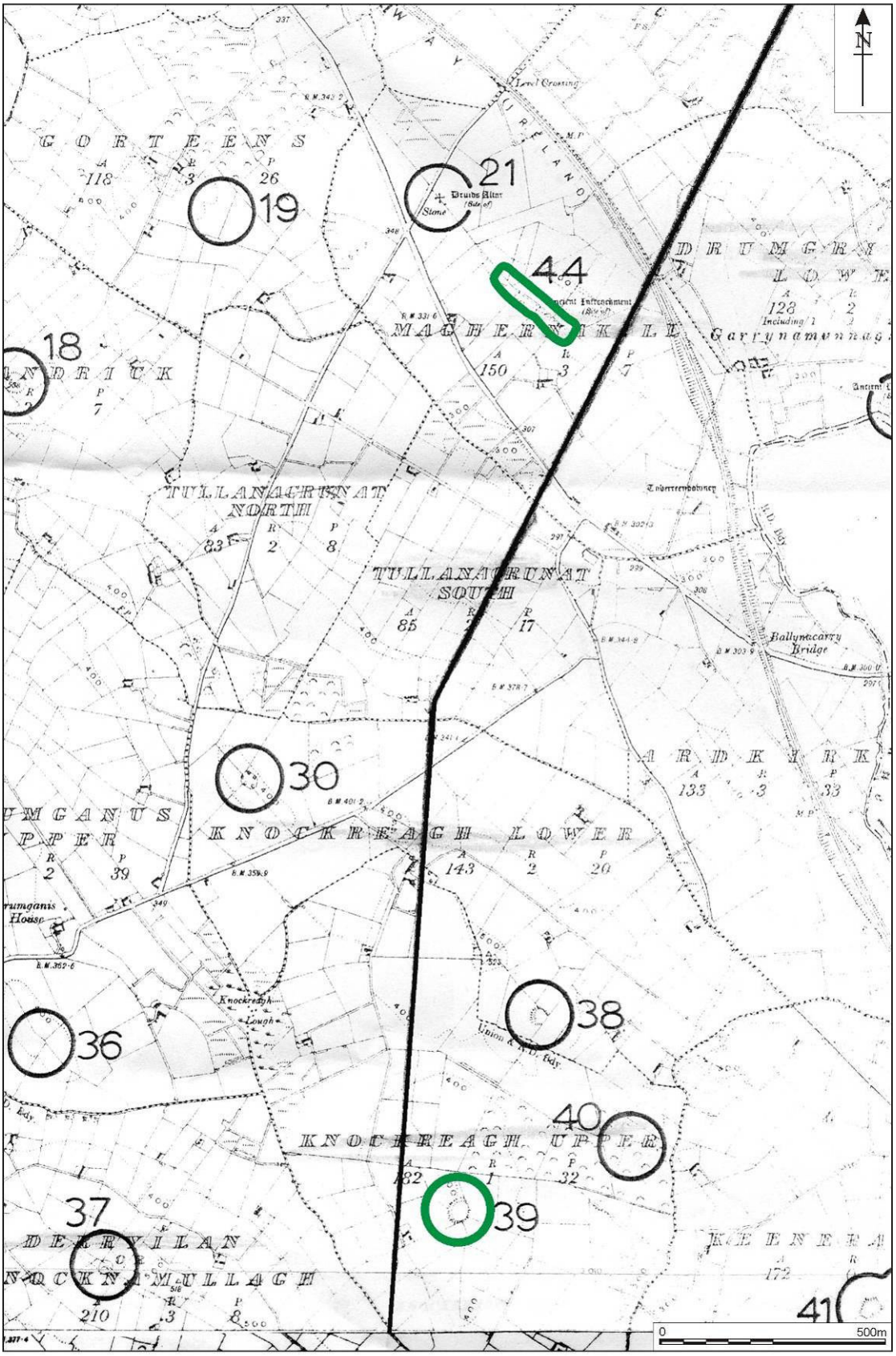


Fig 13 RMP Constraint Map of Co. Monaghan, Sheet 25. Date:1907-09 (RMP Detail:1996)

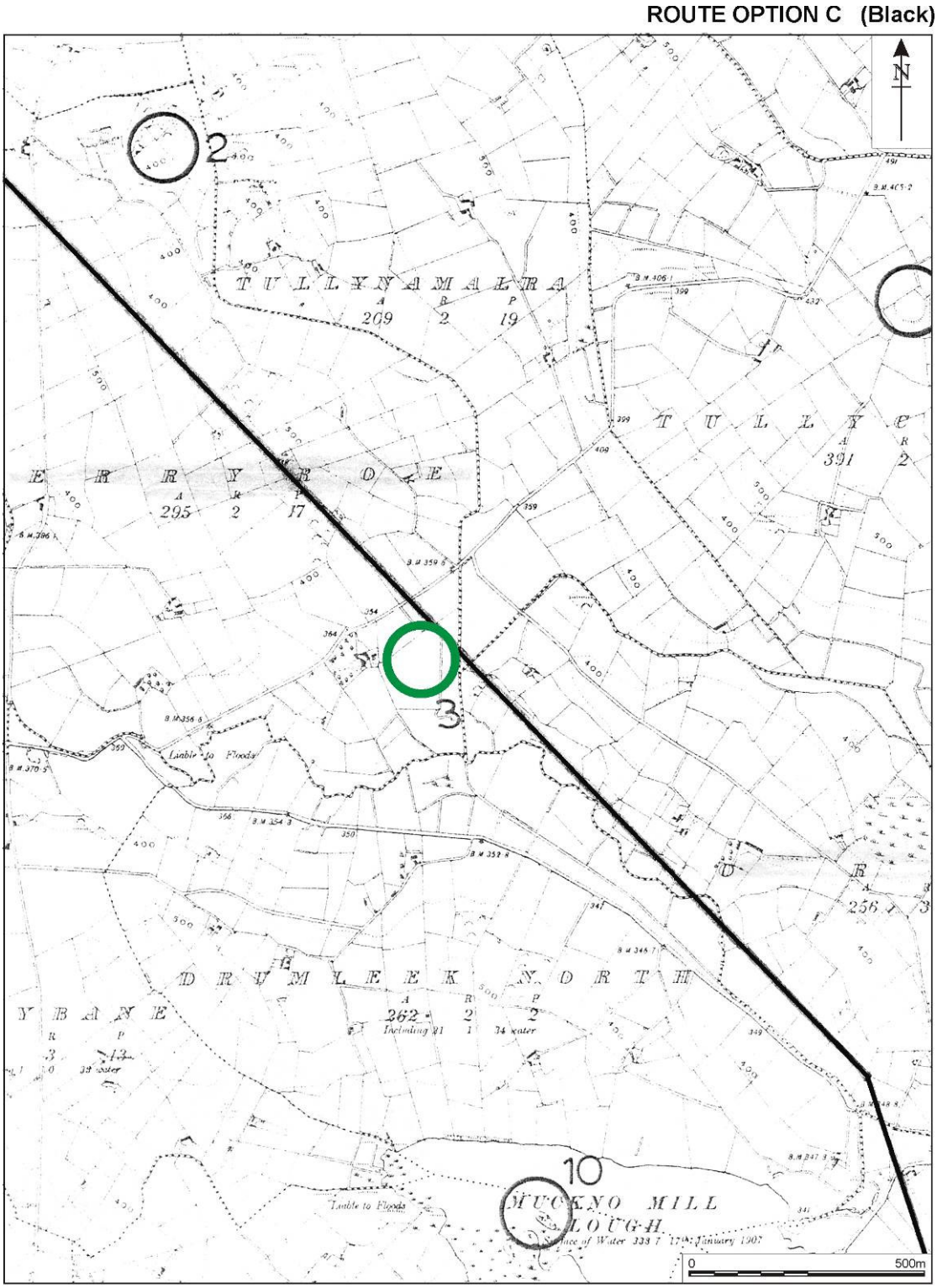


Fig 14 RMP Constraint Map of Co. Monaghan, Sheet 20. Date:1907-09 (RMP Detail:1996)

ROUTE OPTION C (Black)

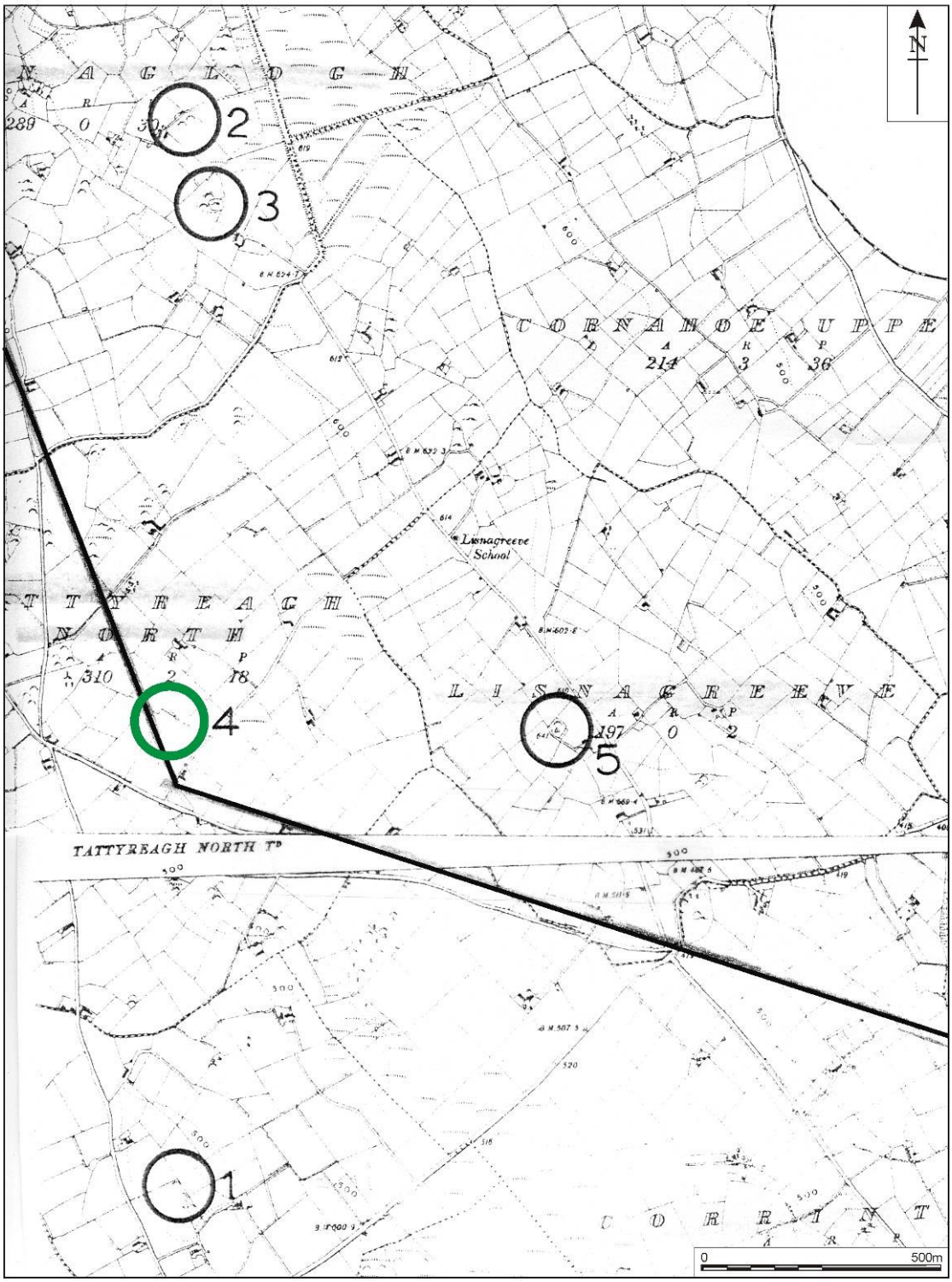


Fig 15 RMP Constraint Map of Co. Monaghan, Sheet 15. Date:1907-09 (RMP Detail:1996)

Figures

Tables

Section 12 – Station Location Report

12.1 Introduction

This section of the report analyses, in environmental terms, the potential sites for the electricity station that have been identified by ESBI in their site selection report. The purpose of this analysis is to ensure that the site that is eventually selected for the station location is not likely to create significant adverse environmental impacts. This report should be read in conjunction with the ESBI Site Selection Report.

12.2 Methodology

The sites have been evaluated to determine the presence of likely environmental constraints. This analysis has been carried out on the basis of a desk study only – using mapping, photography and a prior knowledge of the area[10].

The study area is located about 4 kms south-west of Kingscourt, Co. Cavan – near the border with Co. Meath. ***See attached A3 Site Selection Map***, which shows all the sites referred to in this section.

12.3 General

This search zone comprises an area of drumlin landscape with low intensity agriculture in small fields and high levels of topography variety leading to a frequency of streams and watercourses. It will be difficult to avoid the need for considerable civil works in most sites which will create further visual impacts and potential threats to water quality. There are localised pockets of increased archaeological potential within the area – mostly associated with hilltop sites.

12.4 Site by site Evaluation

12.4.1 Site 1

This site is relatively enclosed, though it is overlooked by housing. It is transected by a stream with some naturalised vegetation and a deep cutting – that may be of local ecological significance.

[10] Site visits in May and September covered all the three route corridors discussed in section 3 of this report.

12.4.2 Site 2

The site is relatively well enclosed with no overlooking – though it is open to exposure from long distance views to the north-east. It is bisected by a stream.

12.4.3 Site 3

This site contains archaeology and potential archaeology as well as areas of naturalized vegetation that may be of local ecological value. It is bounded by a stream. It is exposed to visibility from the north. There are a number of nearby dwellings.

12.4.4 Site 4

This site is bounded to the south by the County Boundary and a stream. It has low visibility and no overlooking.

12.4.5 Site 5

This site contains archaeology and is visually very prominent.

12.4.6 Site 6

This site is relatively free of environmental constraints.

12.4.7 Site 7

This site is relatively free of environmental constraints.

12.4.8 Site 8

This site is relatively free of environmental constraints.

12.4.9 Site 9

This site is relatively free of environmental constraints.

12.4.10 Site 10

This site contains archaeology, is visually prominent, is adjacent to a stream and a lough and is overlooked.

12.5 Summary

Due to the drumlin features there will be issues of visibility. This will arise either due to the structures themselves associated with the station, or the excavations required to establish a level base. This will occur on most of the

sites, a number of which have streams. Sites 2 and 4 and the cluster of 6, 7, 8 and 9 are probably the least visible sites. The general area of the site search has relatively few dwellings, which minimises the local effects of visibility. The issue of actual and potential archaeology on sites 4, 5, 10 and 3 respectively is more serious and will require further investigation. Sites 5 and 10 should clearly be avoided.

It should be noted that sites 4 and 5 traverse the county boundary between Counties Cavan and Meath. This needs to be considered in terms of administrative issues associated with the planning application.

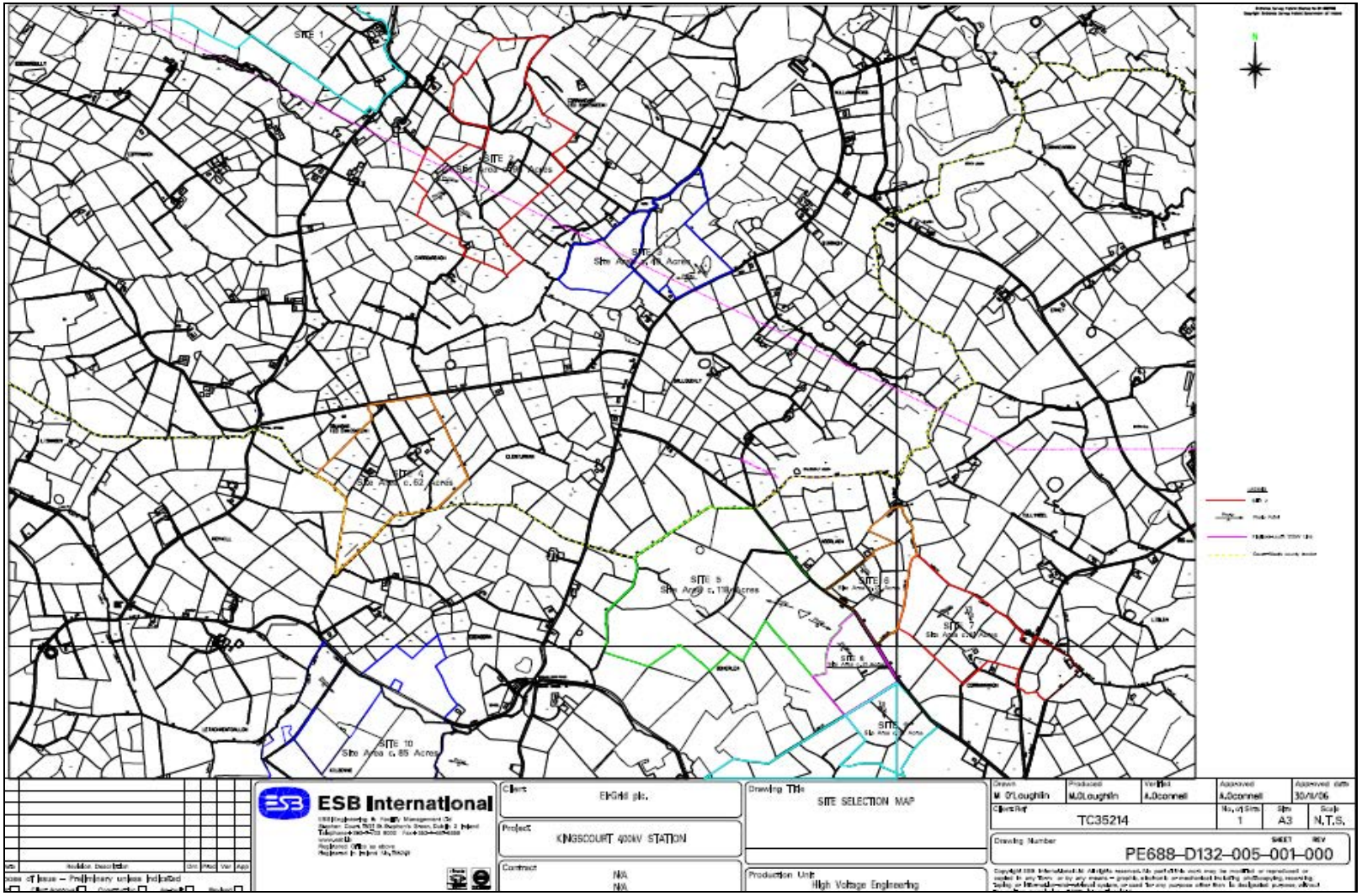
12.6 Evaluation Matrix

The following matrix provides an environmental evaluation of the potential sites under the headings of visibility, density of dwellings, archaeology, topography, ecology and water quality.

- Visibility – is the site visible generally?
- Dwellings – is there a high density of dwellings?
- Archaeology – is there a high density of archaeological features?
- Topography – is the site topographically diverse?
- Ecology – is there any ecological potential on the site?
- Water – is there the potential to affect water quality due to the presence of water bodies?

A tick under the heading indicates the impacts that are likely under the heading, with more ticks indicating a higher level of impact. A question mark indicates potential which requires further investigation.

Site	***Townland***	***Visibility***	***Dwellings***	***Arch.***	***Topo***	***Ecology***	***Water***
1	Corraweelis	✓	✓		✓	✓	✓
2	Corranearary				✓		
3	Birragh	✓	✓	✓?	✓	✓	✓
4	Drumbar*			✓	✓		✓
5	Boherlea I*	✓		✓✓	✓		
6	Moorlagh				✓		
7	Corrananagh				✓		
8	Boherlae II				✓		
9	Carnacally				✓		
10	Kilboyne	✓✓		✓	✓	✓?	✓



Site Selection Map