MOTT MACDONALD

EIRGRID

Step 4A Consultant's Development Options Report

Celtic Interconnector Project

Co-financed by the European Union
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1 Introduction

1.1 The Project

Mott MacDonald Ireland has been appointed by EirGrid plc as the Lead Planning Consultant for the Celtic Interconnector Project (hereafter referred to as 'The Project').

The Celtic Interconnector is a proposed electrical link which will enable the movement of electricity between Ireland and France. EirGrid has been working with its counterpart in France, RTÉ, to jointly investigate the feasibility of an interconnector between our two countries.

At this stage, no decision has been made to build the Celtic Interconnector. Should the project proceed, it is currently anticipated that a final decision to commence construction would be made in 2021. The interconnector would then go live in 2026.

The main elements of the Celtic Interconnector in Ireland are presented and illustrated below:

- A High Voltage Direct Current (HVDC) submarine circuit, approximately 500km in length, placed on or beneath the seabed between France and Ireland;
- A landfall location where the submarine circuit comes onshore;
- A HVDC land circuit between the landfall and a converter station (see below). It is proposed to use an underground cable (UGC) for this element;
- A converter station, to convert the electricity from HVDC to High Voltage Alternating Current (HVAC), which is used on the Irish transmission grid;
- A HVAC UGC land circuit between the converter station and the connection point to the grid; and
- A connection point to an existing substation on the transmission grid.

Figure 1: Celtic Interconnector Project

Source: EirGrid

1.2 Purpose of this Report

The Project is being developed in accordance with EirGrid's six-step Framework for Grid Development (see Figure 1). This report relates to Step 4 of the Framework.

Figure 2: EirGrid's Six-Step Framework for Grid Development

Source: EirGrid

The Step 3 Preferred Options Report published in August 2019 confirmed the following short-list of Converter Station Location Zones (CSLZs) and Landfall Locations to be considered for further assessment in Step 4.

Table 1: Step 3 Shortlist

CSLZ	Landfall Location
CSLZ 1 – Ballyadam	Ballinwilling Strand 2 (BW2)
CSLZ 6 – Leamlara	Redbarn Beach
CSLZ 9 – Knockraha	Claycastle Beach
CSLZ 10 – Pigeon Hill	
CSLZ 12 – Kilquane	
CSLZ 14 – Ballyvatta	

Source: Step 3 Performance Matrix Assessments

This Step 4A Report presents an analysis of the shortlisted CSLZ and landfall location options. It identifies at least one potential site within each of the CSLZs, and presents a comparative evaluation of those sites against a set of criteria. The Report identifies what EirGrid, on the basis of information currently gathered, considers to be the Emerging Best Performing Option (EBPO) for the location of the converter station, landfall and onshore cable routes.

The analysis presented in this report includes detailed consideration of feedback received from EirGrid's Step 3 consultation process (Step 3 Consultation Report), as well as studies that have been carried out on the short-listed options. An update to the Step 3 Strategic Social Impact Assessment Scoping Report, is also provided in Appendix B *Strategic SIA Scoping* to reflect the information gathered, and feedback received during the Step 3 consultation process.

The content and conclusions of this report are the focus for the next round of stakeholder consultation. EirGrid will consider all feedback arising, and will use this – and any further survey

and analysis undertaken, to confirm the Best Performing Option (BPO) at Step 4B. The BPO will be the option taken forward into the Statutory consenting process.

1.3 Structure of This Report

The remaining sections of this report are structured as follows;

Table 2: Report Structure

Chapter 2	Methodology and Approach
Chapter 3	Route Identification
Chapter 4	Converter Station Site 1
Chapter 5	Converter Station Site 6
Chapter 6	Converter Station Site 9A
Chapter 7	Converter Station Site 9B
Chapter 8	Converter Station Site 10
Chapter 9	Converter Station Site 12
Chapter 10	Converter Station Site 14
Chapter 11	Landfall Location
Chapter 12	Emerging Best Performing Option
Appendix A	Glossary
Appendix B	Strategic SIA Scoping
Appendix C	Route Option Identification
Appendix D	Cultural Heritage Report

Source: Mott MacDonald

2 Methodology and Approach

2.1 Introduction

As detailed in Section 1.2 *Purpose of this Report*, this Step 4A Report presents an analysis of the options which were shortlisted in Step 3 (in accordance with EirGrid's Framework for Grid Development). These are presented in **Figure 3** overleaf.

As noted in Section 1, the aim of this process is to identify the location of an Emerging Best Performing Option (EPBO) for the Irish onshore elements of the Celtic Interconnector – comprising the converter station, landfall and cable routes.

This approach to options identification and appraisal is considered to comprise a best practice approach to the Consideration of Alternatives for a project, which is a requirement of the Environmental Impact Assessment (EIA) Directive 2014/52/EU. The Directive requires that an EIA in respect of a proposed development outlines the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and gives an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment.

Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018) prepared by the Department of Housing, Planning and Local Government confirms that *"reasonable alternatives"* may relate to matters such as project design, technology, location, size and scale. The purpose of considering alternatives is to provide a framework for sound decision-making based on the principles of sustainable development, and to find the most effective way of meeting the need and purpose of a project, which enhances the environmental benefits of the planned activity, while avoiding, reducing or remediating potentially significant negative environmental impacts.

2.2 Identification of Converter Station Site Options

In Step 3 of the development of The Project, a number of potentially feasible CSLZs were identified. These were subject to a generally high-level analysis, for the purposes of shortlisting a smaller number of CSLZs. At the latter end of the Step 3 process, six shortlisted zones were presented for public and stakeholder feedback. Following consideration of this feedback, the zones were confirmed as the shortlist of CSLZ options, and are now the focus of further analysis in Step 4.

Five of the six CSLZs are located in the vicinity of the identified grid connection node (the existing Knockraha 220 kV substation). The sixth CSLZ (CSLZ 1) is centred on a large site owned by the Industrial Development Authority (IDA).

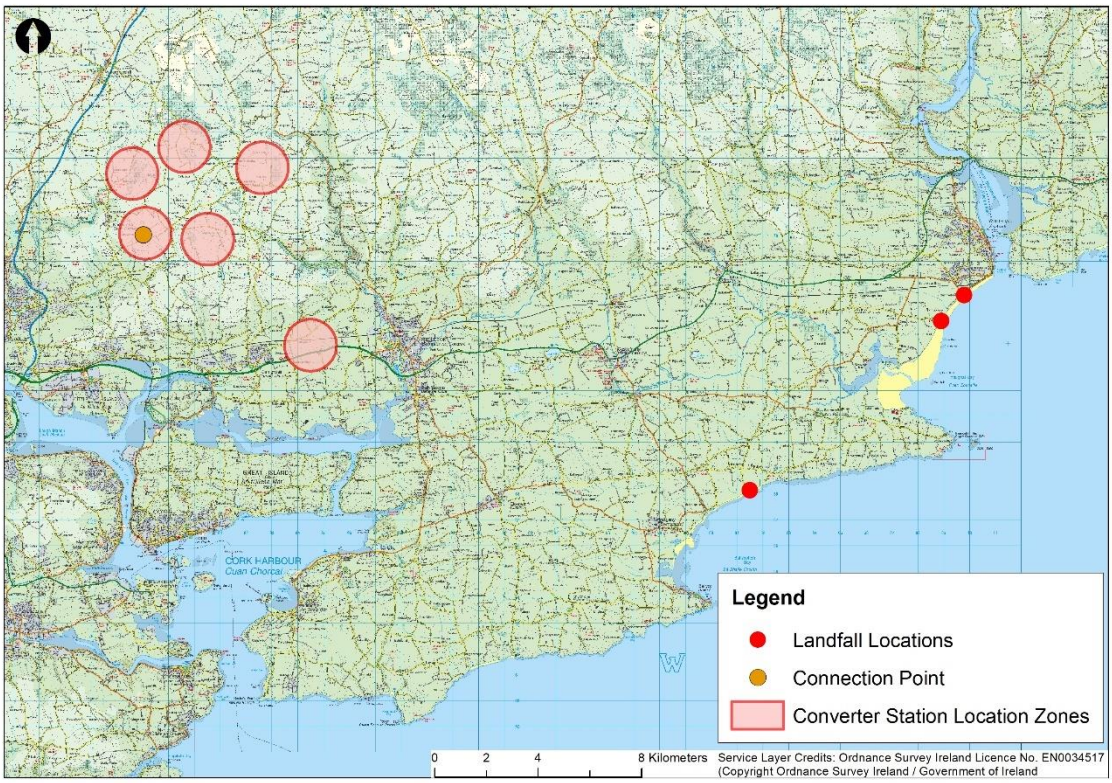
Within Step 4, following confirmation of the shortlist of CSLZs, EirGrid and its Consultants identified at least one feasible site within each zone that could potentially accommodate the converter station. These are known as Converter Station Site (CSS) options. Subsequent sections of this report will provide further detail regarding the identification of CSSs. For clarity, the rest of this report focuses on the identified CSSs rather than the larger CSLZs.

The CSSs were identified having regard to the following criteria:

- Feedback from Step 3 consultation;
- Potential Visual and other Environmental Impact, and Ease of Mitigation;

- Proximity to sensitive receptors; and
- Folio Size.

Figure 3: Shortlist of Options



Source: Mott MacDonald

2.3 Identification of Route Options

The route options can be separated into two types:

- HVDC route options between the identified Landfall Locations and the CSSs; and
- HVAC route options between the CSSs and the connection point (Knockraha substation).

In general, the identification of route options should give consideration to the existing road network of an area, its alignment and quality, and its level of usage. It should also consider the nature and extent of cable laying works.

The following are important considerations taken into account in the cable route selection:

- Construction of the converter station and installation of the HVDC and HVAC cables will result in localised but temporary traffic and road disruption. Once installed and operational, the cable system will have no noticeable impact on traffic management and road use;
- The levels of disruption during the construction phase will be a factor of the length and type of cable and existing road conditions;
- Typically, a trench width of approximately 0.8m will be required for the installation of the HVDC cable (between the landfall and the CSS) and a trench width of approximately 2.0m

will be required for the installation of the HVAC cable (between the CSS and the connection point). Images of typical trenches can be seen in the Step 3 Constraints Report;

- For all of the CSS options under consideration, it is anticipated that road closures, except for local access, will be required for all potential HVDC routes where the road does not have a hard shoulder;
- Road closures, except for local access, will also be required for all potential HVAC cable routes along the local road network between the CSS and Knockraha substation, with the exception of any portions of the route which follow the N25.

On the basis of the above, it can generally be assumed that the closer the converter station is to the Knockraha substation, the shorter the HVAC cable route will be, and consequently the less potential there will be for significant traffic disruption associated with the HVAC cable route.

Further details on the process adopted and the basis for identification of the HVDC and HVAC routes to be assessed for each CSS and Landfall are provided in Section 3.

2.4 Identification of Landfall Options

The Step 3 Performance Matrix Assessments identified Ballinwilling Strand 2, Redbarn Beach and Claycastle Beach as the shortlisted landfall location options for further assessment.

Having due regard to the constraints identified in the Offshore Constraints Report, the main differentiator under the environmental assessment criterion related to the potential for higher levels of disturbance to the marine environment associated with rock cutting. The offshore route to Claycastle Beach was found to be the best performing landfall option in terms of sediment coverage and no rock cutting requirements.

This Step 4A Report further assesses the short-listed landfall options from an onshore perspective to confirm the best performing option when onshore considerations are taken into account. These options are further assessed in Chapter 11 *Landfall Locations*.

2.5 Criteria Used for Comparison of Options

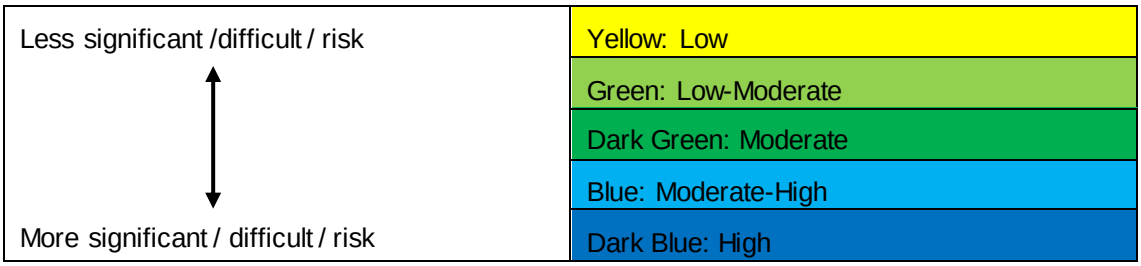
The project is following EirGrid's six-step approach to grid development as outlined in EirGrid's Have Your Say document. This approach facilitates engagement and consultation with stakeholders and the public which helps to explore options fully and make more informed decisions.

As part of the approach, a comprehensive and consistent multi criteria analysis is applied to decision making. The multi criteria analysis facilitates a balanced consideration of the following criteria relating to project development:

- Environmental;
- Socio-Economic;
- Technical;
- Deliverability; and
- Economic.

Each of the options has been assessed across the constraints criteria detailed below based on the ranking approach presented in **Figure 4**.

Figure 4: Criteria Ranking



Source: EirGrid

2.5.1 Environmental Criteria

The environmental risks and considerations associated with the CSSs, and HVDC/HVAC route options, are considered in this report under the following headings;

- Land Use Planning
  - Land Use
  - Land Use Zoning
- Soils and Geology
  - Ground Conditions
- Landscape and Visual
  - Landscape designations, scenic routes, protected views etc.
- Biodiversity (Flora and Fauna)
- Waterbodies, Drainage and Flood Risk
  - Watercourses and water crossings
  - Flood risk
- Cultural Heritage
  - Protected and unrecorded cultural heritage

Information Gathering

In general, these sections have been informed by a desk-based review of publicly available datasets.

- Cork County Development Plan 2014 – 2020 (http://corkcocodevplan.com/);
- Cork County Council Mapping (http://corkcoco.maps.arcgis.com/apps/Viewer/index.html?appid=da57dce5b97747e6bc962902248836fb);
- Municipal District Local Area Plans for East Cork and Cobh (http://corklocalareaplans.com/);
- Myplan.ie Mapping (http://www.myplan.ie/webapp/));
- EIA Portal (https://housinggovie.maps.arcgis.com/apps/webappviewer/index.html?id=d7d5a3d48f104ecbb206e7e5f84b71f1);
- National Parks and Wildlife Services, NPWS (https://www.npws.ie/);
- National Biodiversity Data Centre (https://maps.biodiversityireland.ie/);

- Irish Ramsar Wetland Committee (http://www.irishwetlands.ie/);
- Environmental Protection Area (EPA) mapping (https://gis.epa.ie/EPAMaps/AAGeoTool);
- Geological Survey Ireland, GSI (https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228);
- National Monuments Service, Site and Monuments Records, SMR (https://www.archaeology.ie/);
- National Inventory of Archaeological Heritage (http://www.buildingsofireland.ie/);
- Heritage Mapping (https://www.heritagemaps.ie/WebApps/HeritageMaps/index.html);
- Irish Wetland Bird Survey, i-WeBS (https://www.birdwatchireland.ie/?tabid=111) ;
- Project Related Documents (http://www.eirgridgroup.com/the-grid/projects/celtic-interconnector/related-documents/index.xml);
- The Karst of Ireland (GSI, Geotechnical Society of Ireland, International Association of Hydrologists, Irish Association of Economic Geology, 2000, https://www.gsi.ie/en-ie/publications/Pages/The-Karst-of-Ireland.aspx); and
- Property Registration Authority, PRAI (https://www.prai.ie/).

In terms of land-use planning, a review of valid planning applications within the last five years, within the townlands of the identified CSS options and the general surrounding area was undertaken. In addition, valid planning applications along the HVDC/HVAC route options were also reviewed. A number of large scale proposed developments are of particular note, in the context of potential in-combination traffic disruption and disturbance and these have been considered, as detailed below, in the preparation of this report;

- Midleton Energy Storage System (Planning Reference no. 184550). Located in Carrigogna, directly east of the existing Midleton 110 kV substation.
- Amarenco Solar Midleton Limited Solar Farm (Planning Reference no. 187164). Located directly south of the existing Midleton 110 kV substation.
- Terra Solar II Limited Solar Farm (Planning Reference no. 186769). Located in Lysaghtstown with proposed access along the L7634 Local Road. The solar farm will connect to Midleton 110 kV substation to the east, via the HVDC route option under consideration for all converter station site options, with the exception of CSS 1.
- Terra Solar II Limited Solar Farm (Planning Reference no. 195729). Located in Lysaghtstown along the L7634 directly east of Terra Solar II Limited Solar Farm (Planning Reference no. 186769). Further Information requested for planning permission on 30th August 2019.
- Lightsource Renewable Energy Ireland Limited, Ballyvatta – Clash Solar Farm (Planning Reference no. 175370). Located adjacent to forest to the west of CSS 14 in the townlands of Clash and Ballyvatta. Grid connection via existing Knockraha 110 kV substation.

The biodiversity sections of this report have also been informed by preliminary ecological site walkovers and ornithological surveys of the short-listed options by suitably qualified ecologists.

The assessment of karst and flood risk associated with CSS 1 was carried out by a Mott MacDonald hydrogeologist, specialising in karst systems, based on a literature and desktop review.

A cultural heritage constraints study of the shortlisted CSLZs was carried out by Rubicon Heritage Services Ltd, during Step 3. A copy of this report is provided in Appendix D *Cultural Heritage Report*.

In addition, digital terrain mapping was sourced by EirGrid from the Ordnance Survey Ireland (OSI) for the study area. GeoDirectory data for each of the CSLZ's was also acquired.

2.5.2 Socio-Economic Constraints Criteria

The social risks and considerations associated with the CSSs considered the sensitivity of adjoining lands in the context of traffic, noise and visual criteria. The noise sections were informed by proximity to residential properties.

MacroWorks Ltd. were commissioned to prepare and analyse the potential visibility of the converter station options, both in terms of the extent of visibility and sensitive receptors likely to be afforded visibility. This process requires the preparation of Zone of Theoretical Visibility (ZTV) maps.

ZTV mapping is a computer analysis process used to determine from where potential views may be afforded for the proposed structures from the surrounding area. Traditionally, bare-ground terrain data (Digital Terrain Model – DTM) was used for this exercise, but in this instance, the analysis uses the highest points of the proposed structures in conjunction with a Digital Surface Model (DSM). DSM data takes account of existing vegetation and buildings in terms of the screening they offer, generating a more realistic measure of visual exposure. It is not practical, or necessary in this instance, to undertake DSM based ZTV analysis over vast areas so a consolidated 2km study area has been selected for each site and this is also likely to be consistent with the Landscape and Visual Impact Assessment study area to be employed for the eventual appraisal of the best performing option.

It is important to note that the DSM-based ZTV maps are indicative in nature as the preliminary design of the converter station compound has not yet been developed. Further, it is somewhat conservative in the analysis of the potential for visibility of the proposed structures as they do not differentiate between whether the whole structure is openly visible or just the roofline appearing above substantial intervening screening. Another consideration of DSM data in the context of this analysis is that it is a snapshot of the screening situation at the time of the data capture. Seasonal variation through growth and/or cutting may result in minor changes to hedgerow screening potential. A limitation also arises due to the aerial overhead nature of data capture which can result in the under-reporting of potential visibility beneath the tree or woodland canopy and can also understate the (visibly) porous nature of some thin hedgerows.

Traffic, noise and landscape and visual impact assessments of the BPO will be carried out once the preliminary design is complete to inform the consent applications.

2.5.3 Technical Constraints Criteria

In Step 3, the technical assessment included consideration under the criteria laid out in EirGrid's Framework for Grid Development:

- **General Compliance with System Reliability, Security Standards –** EirGrid's reliability and security standards are defined in the Transmission System Security and Planning Standards and their Operation Security Standards.
- **Headroom** – This is the amount of additional capacity each option offers that would be available for the future without requiring further upgrade.
- **Expansion / Extendibility** – This considers the ease with which the solution option can be expanded, for example it may be possible to uprate an overhead line to a higher capacity or a new voltage in the future.

- **Technology Operational Risk** – This criterion aims to capture the risk of operating different technologies on the network. For example, HVAC technology is very well known in terms of its operation, but there is less experience and fewer skills available around the operation of HVDC technology. Celtic Interconnector is a HVDC project, however EirGrid currently operates the East West Interconnector (EWIC) and the proposed technology will be similar.
- **Average Failure Rates** – Industry data indicates that cable failures on a statistical basis are related to cable length.
- **Repeatability** – "Repeatability" means whether a proposal can be readily repeated in the transmission network.

These criteria are designed to ensure the technical differences between very different options are captured at the option selection stage. In these technical terms, the options under consideration for this project are essentially very similar, in that all options utilise the same technologies (such as HVAC cable, HVDC cable and converter station technology) and feature the same electrical arrangement. The differences between the options relate only to the relative lengths of the HVAC and HVDC cable routes.

As all options will provide the same capacity, assessment under the criteria of headroom and expansion/extendibility will find that all options perform the same. Also, because all options utilise the same technology, operational risks, failure rates, repeatability, and general compliance with system reliability and security standards also all perform the same.

The only differentiating factor is the need for additional equipment as a direct result of the length of the AC cable associated with the connection option. Step 3 assessment captured this need under "Repeatability". Adjustments to the technical assessment will only be made for sites which no longer require this additional equipment.

2.5.4 Deliverability Constraints Criteria

Each landfall, HVDC route, converter station site and HVAC route shall be assessed with respect to Deliverability performance on the basis of the following criteria:

- **Dependence on other infrastructure projects:** This will assess the extent to which the route may be impacted by other infrastructure projects in the area;
- **Design complexity:** Each route section will be assessed in terms of the length of the route, obstacles encountered along the section, the number of utility crossings that will need to be made, the need for Horizontal Directional Drilling (HDD), requirements to micro-route to ensure minimum duct bending radius of 20m, and the extent to which services have already been installed within the roadway;
- **Traffic disturbance impact:** Each route section will be assessed in terms of level of disruption including: the need for traffic management; the availability of alternate routes for diversion during installation works; and anticipated length of time the diversion or traffic management shall be in place;
- **Permits and wayleaves:** This will include consideration of the number of permits required for crossing other utilities, licenses, and wayleaves; and
- **Implementation Timelines:** The installation timelines will be directly impacted by the deliverability criteria outlined above. Consideration will be given to the length of ducting that can be installed per day, as well as any seasonal and local constraints that may impact the implementation. The critical path of the construction programme is the installation of the marine cable. As such, all onshore routes that can be implemented within this critical path will be evaluated equally favourably. Installation of the cable route will assume a standard 5-day working week and the following installation rates.

- 100m per crew per day for installation of the HVDC route on the N25;
- 50m per crew per day for installation of the HVDC route on local roads and cross country; and
- 25m per crew per day for installation of the HVAC route on local roads and cross country.

2.5.5 Economic Constraints Criteria

Cable Route Cost Methodology

Each onshore route section is evaluated in terms of:

- kilometre installed;
- service crossing; and
- HDD section.

The costs for the HVDC cable are based on a single circuit 320 kV cable and costs for the HVAC cable are based on single circuit 220 kV cable with two cables per phase. Both rates used are for installation in roadways during daytime hours. Note that these costs are indicative and used only for the purposes of comparison between options.

In assessing service crossings, focus has been placed on the differences between the reference installation rate and the required crossing. This results in the key differences being the:

- depth of excavation;
- additional trench support;
- support for the service being crossed; and
- the method of excavation.

The method of excavation changes where either a gas main or electrical cable is being crossed. In these circumstances, hand digging is required. For water service crossings mechanical excavation methods with suitable supervision and controls are assumed to be used.

Traffic management costs are included in the reference rate and consequently incur no additional cost for a service crossing.

The key parameters are outlined in the table below:

Table 3: Typical service crossing details

	Water Main	Sewer Main	Gas Transmission	Gas Distribution	MV/LV Cables
Depth of Service	900mm	1200mm	1200mm	1,000mm	900mm
Diameter of Service	450mm	450mm	900mm	700mm	400mm
Minimum separation from service	300mm	300mm	600mm	600mm	300mm
Method of Excavation	Excavator	Excavator	Hand Dig	Hand Dig	Hand Dig

Source: Sourced from utility codes of practice as available in September 2019

Converter Station Costs

Costs are expected to be similar for all Converter Station Sites, but allowance will be made for location specific aspects such as:

- Volume of cut and fill required;
- Quantity of import material;
- Quantity of export material;
- Ground conditions being assessed as one of the following:
  - standard
  - marsh
  - rock
- Quantity and size of culverts/ bridges required on site;
- Assessment of drainage works required on site; and
- Assessment of remedial works required on local road network to facilitate construction traffic.

Costs will be based on an overall compound footprint of 300m x 150m.

Additional costs will be allocated for the site laydown area based on a footprint of 150m x 100m.

Landfall Costs

No further information or design development on the landfall locations and near-shore cable route has been advanced in Step 4. Costs as estimated in Step 3 for the landfall locations and near-shore marine cable route have been revised by Wood Group and these costs are used in the assessment.

Overall Cost / Economic Evaluation

The performance of each option from an economic perspective will be assigned according to the colours defined previously. The economic assessment includes costs as follows:

- Landfall location costs include, with associated works, the:
  - Offshore HVDC marine cable form the offshore common point;
  - Landfall location; and
  - HVDC route from the landfall location to Churchtown (just east of Midleton).
- Converter Station costs include, with associated works, the:
  - HVDC route from Churchtown to the CSS;
  - converter station; and
  - HVAC route from the CSS to Knockraha 220kV station.

Each colour represents a band of cost-estimates above a pre-determined baseline cost. A colour is assigned to each Converter Station Site and Landfall Location on the basis of the site-specific costs associated with development at that location.

There is a parallel procurement process being implemented for this project. As such, baseline cost estimates and bands are not included in this Step 4A report given the commercial sensitivity of the procurement process.

3 Route Identification

3.1 Identification of Route Sections

3.1.1 Basis for Step 3 Route Section Identification

The initial route sections were chosen through desktop analysis to determine feasible routes to inform the Step 3 assessment. This desktop assessment considered the roads available between Knockraha substation, the 14 originally identified CSLZs and the five originally identified Landfall Locations.

The roads were selected based on the shortest distance between the landfalls and Knockraha substation, as well as their type and width. For example, regional and national roads were chosen over narrower local roads. In some cases, however, only local roads were available, and, in this instance, the most direct and widest roads were considered. This assessment was supported by windscreen surveys of the roads.

3.1.2 Greenway (Midleton to Youghal disused railway)

Cork County Council (CCC) is progressing plans to develop a greenway along the alignment of the disused Midleton to Youghal railway line. Currently, these plans are based on the assumption of ownership of the alignment remaining with Iarnród Éireann; operation and maintenance of the greenway would be managed by CCC under a licence or lease agreement.

While there is merit in considering the disused railway line as a potential corridor for the HVDC cable route between the various landfall locations and the CSS options, there are concerns regarding the use of the greenway for a permanent cable route, in particular with regard to:

- Duration of the Cork County Council lease: it is understood that the duration of the lease is likely to be of the order or 15-20 years. The design life of a circuit such as the Celtic Interconnector can be expected to be of the order of 40-60 years.
- Potential conflict of the co-existence of the HVDC cable with a future restored rail line: Within the expected lease agreement, Iarnród Éireann is expected to retain the right to re-open the railway at any time. This presents difficulties for the operation of the cable route, both for access in case of a fault or maintenance, potential for damage during railway construction, and the consequent potential requirement to establish a new cable route for the Interconnector should the railway be reopened.
- Project Timelines: CCC plan to clear the site in late 2019 with a view to opening the greenway during 2021. The greenway consent, in its current form, does not allow for the co-location of the cable route, and although an allowance has been made for the installation of ducting along the route, these ducts would not be suitable for the Interconnector. Given the likely consenting timelines for the Celtic Interconnector, it is therefore reasonably anticipated that any co-location of the cable route with the greenway would require cable construction works after the greenway opening (likely during 2023 – 2025).

On the basis of the currently available information, including concerns related to its use as outlined above, EirGrid is not intending to further consider the greenway as part of the cable route for the Celtic Interconnector with the possible exception of some short sections where the proposed greenway may offer opportunities in terms of the avoidance of constrained areas along the route.

3.1.3 N25 between Youghal and Carrigtwohill

Step 3 identified the N25 as a potential cable route offering the widest carriageway and a hard shoulder. Consultation has since been progressed with Transport for Ireland (TII) who have confirmed:

- support, in principle, for the use of the N25 between Youghal and Midleton;
- that an upgrade to the N25 between Midleton and Carrigtwohill is being investigated and is likely to proceed and further that:
  - this plan coincides with the N25 Route Protection Corridor described in Step 3;
  - the upgrade will be an in-line upgrade. As such, the final line and elevation of the road will not be known for a significant amount of time. Construction of the cable route prior to the finalisation of the upgrade design presents a substantial risk to the Project as the cable would need to be de-energised and relocated during the construction of the N25 upgrade. This means that the N25 between Midleton and Carrigtwohill does not form part of this assessment.

3.1.4 Identification of Additional Route Sections for Step 4A

Following on from the short-listing to six CSLZs and three Landfall Locations, additional route sections were identified through desktop assessment, followed by further windscreen surveys. The choice of these additional route sections was informed by:

- Alternatives to challenging routes identified through the first assessment;
- Discussions with TII and Cork County Council regarding alternatives to laying underground cable through the main thoroughfare of Castlemartyr and Killeagh and avoiding any prospective upgrades of the N25 west of Midleton;
- Covering a wider network of roads around the converter zones near Knockraha.

In total, 73 route sections were identified for assessment. These route sections are presented in Appendix C *Route Options Identification.*

3.2 Route Section Refinement

The following procedure for route refinement and pre-screening is applicable to both the HVDC and HVAC routes.

3.2.1 Data Collected

For each section, the following information was gathered:

- Distance;
- Road width;
- Number of parallel services;
- Number of crossings of:
  - Water Mains;
  - Gravity Mains;
  - Gas Transmission;
  - Gas Distribution;
  - MV-LV cables;
  - Water courses; and

  - Railway crossings;
- Cultural Heritage sites that may influence the route (e.g., protected bridges); and
- Slope information.

Data on bridges has been received from TII for bridges along the N25.

3.2.2 Initial Pre-screening

Given the number of route sections under assessment and the substantial quantity of combinations in which these can form a route from the landfall location to CSS to Knockraha 220 kV substation, extensive work would be required to generate a list of all possible routes for all possible combinations of CSS and landfall locations. Thus, for each CSS and landfall location combination, an implementation of Dijkstra's algorithm was used to determine the set of route sections which minimises each of the following parameters individually:

- Route length;
- Total number of crossings;
- Route sections less than 5m in width;
- Route sections with congested underground services; and
- Cultural Heritage sites.

Dijkstra's algorithm is a well-known method for finding shortest paths between two points and has been used by mapping companies for that purpose. This assessment has used this algorithm to find paths which have the lowest number of features according to the list above. Each of these paths is called a "minimising route".

Thus, for each of the CSSs and Landfall Locations combinations, up to five minimising routes have been compiled (one for each individual parameter above). Any route section which does not appear in any of the compiled routes is not considered any further as that route section does not form a part of any minimising route.

It should be noted that in some cases, the same route satisfies more than one of the five criteria above, and as such, there are fewer than five minimising routes identified for some CSS and Landfall Location combinations.

3.2.3 Separation of Analysis Sections

Cable route access to each of the Landfall Locations and CSSs is an important part of the route assessment. As such, assessment of these locations should not be executed in isolation of the HVAC and HVDC routes relevant to the locations.

An outcome of the initial pre-screening above is that all minimising HVDC routes from the landfalls converge at the intersection of the N25 and L3627 towards Mogeely near Churchtown, and therefore this intersection is a common point. Conversely, any route which does not include this intersection is not a minimising route. The intersection point is highlighted in **Figure 5**.

As such, the assessment has been separated into two sections:

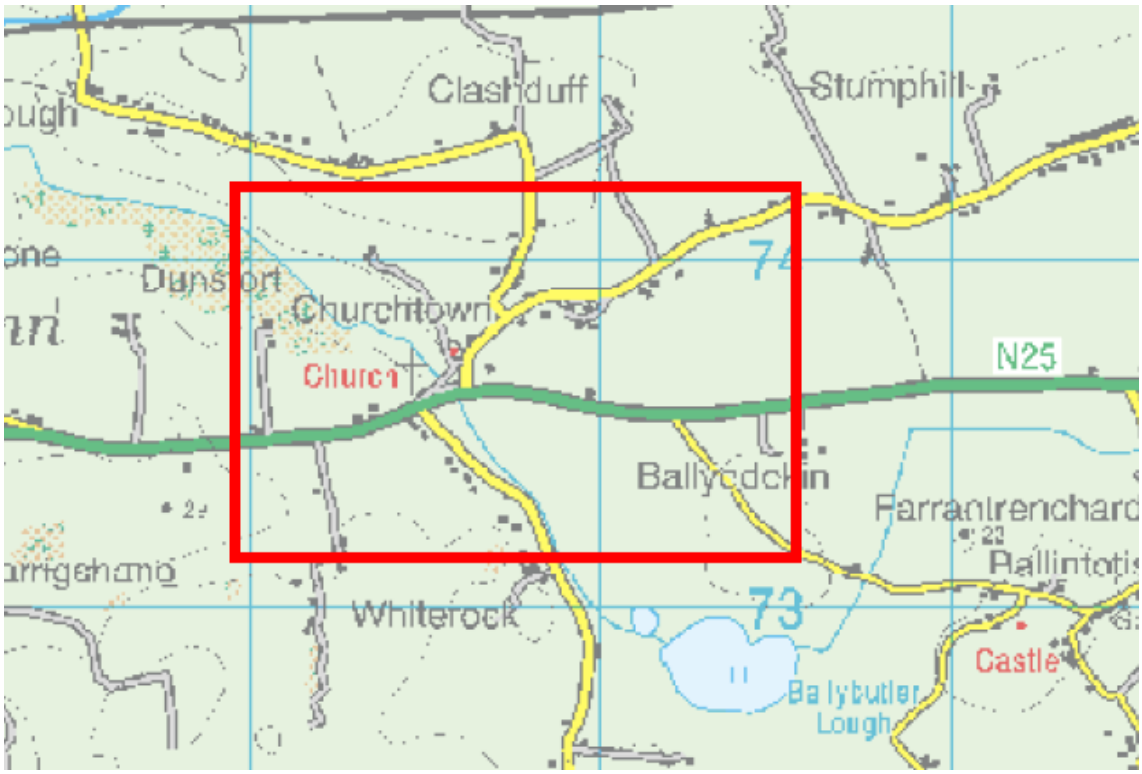
- Landfall Assessment including assessment of the:
  - HVDC route from Churchtown to each Landfall Location.
  - Landfall Location.
  - Landfall Location to offshore common point.
- Converter Station Site Assessment which includes assessment of the:

- HVDC route from Churchtown to each Converter Station Site.
- The Converter Station location.
- AC route from the Converter Station location to Knockraha 220 kV substation.

Following this separation, each CSS location can therefore be assessed on the same basis and combinations of factors, allowing for a like-for-like comparison between the sites. This is similarly the case for assessment of the landfall locations. Selection of the best performing Landfall Location and CSS, with due consideration of their approaching routes, will result in the selection of the best performing HVDC and HVAC cable routes from a project perspective.

Only the sets of route sections resulting from the pre-screening process are considered, and only the best performing route sections for each Landfall Location and CSS as per the criteria above and the deliverability criteria presented in Section 2.5.4 is assessed within this Step 4A report for the purposes of comparison between sites.

Figure 5: Common Intersection Point at Churchtown



Source: Mott MacDonald

4 Converter Station Site 1

4.1 Identification of Converter Station Site 1

Converter Station Location Zone 1 (CSLZ 1) is focused on lands east of Carrigtwohill and north of the N25 National Primary Road. These lands are owned by the Industrial Development Authority (IDA).

Converter Station Site 1 (CSS 1) is commonly referred to as the former Amgen site. Ownership of the site reverted to the IDA in 2010 after Amgen, a biotechnology company, abandoned plans to develop it on foot of permission Refs. PL04.222364 and PL04.219908.

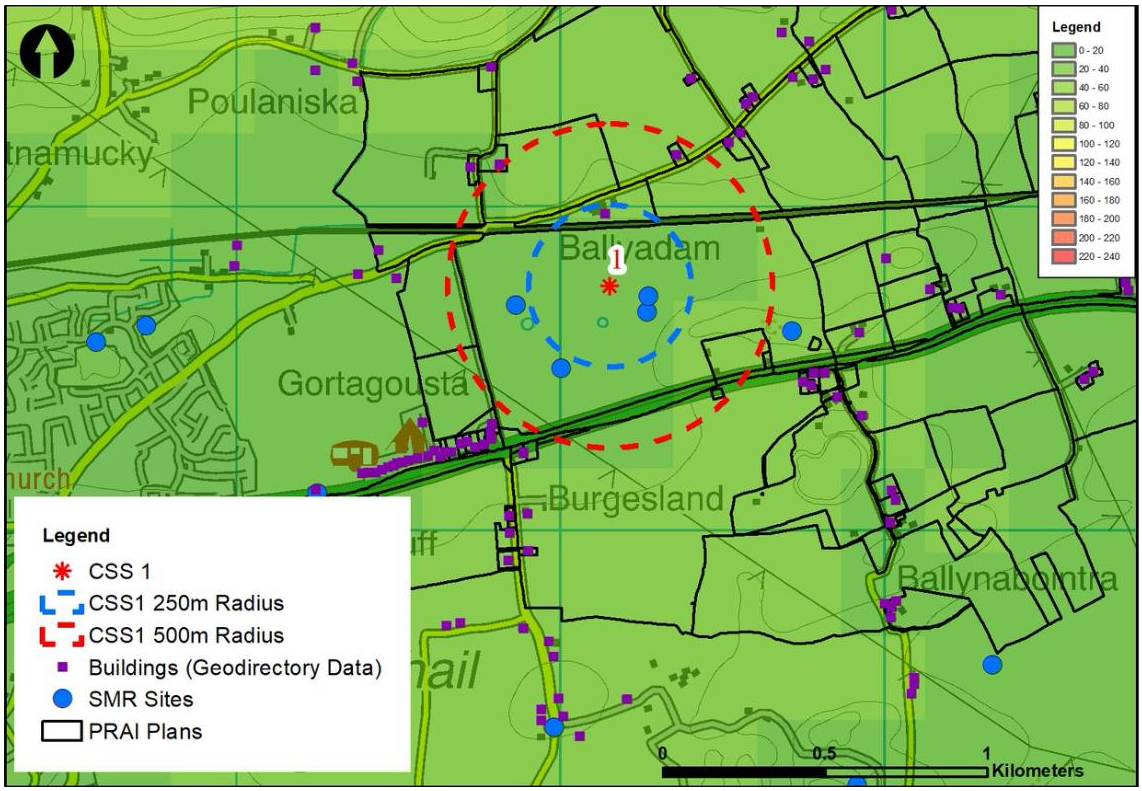
4.2 CSS 1

CSS 1 is located within the townland of Ballyadam, Electoral Division (ED) of Carrigtwohill, between the settlements of Midleton and Carrigtwohill. It is located to the south of the Cork / Midleton rail line, appropriately 7.4km straight line distance from Knockraha 220 kV station.

The site was formerly agricultural land, but has been partially developed for industrial use. As a consequence, large areas of topsoil have been removed in the northern half of the site exposing the limestone bedrock. The site has remained vacant for more than 10 years.

According to GeoDirectory data, the nearest residential property is located approximately 224m to the north of the site. There are two residential properties located within 500m, and approximately 50 residential properties within 1km of the site. Carrigtwohill United AFC pitches are located directly west of the site, and Milebush Quarry is located to the south. Jasmine Villa Caravan and Camping Park is located to the south west.

Figure 6: CSS 1



Source: Mott MacDonald

4.3 CSS 1 Route Options

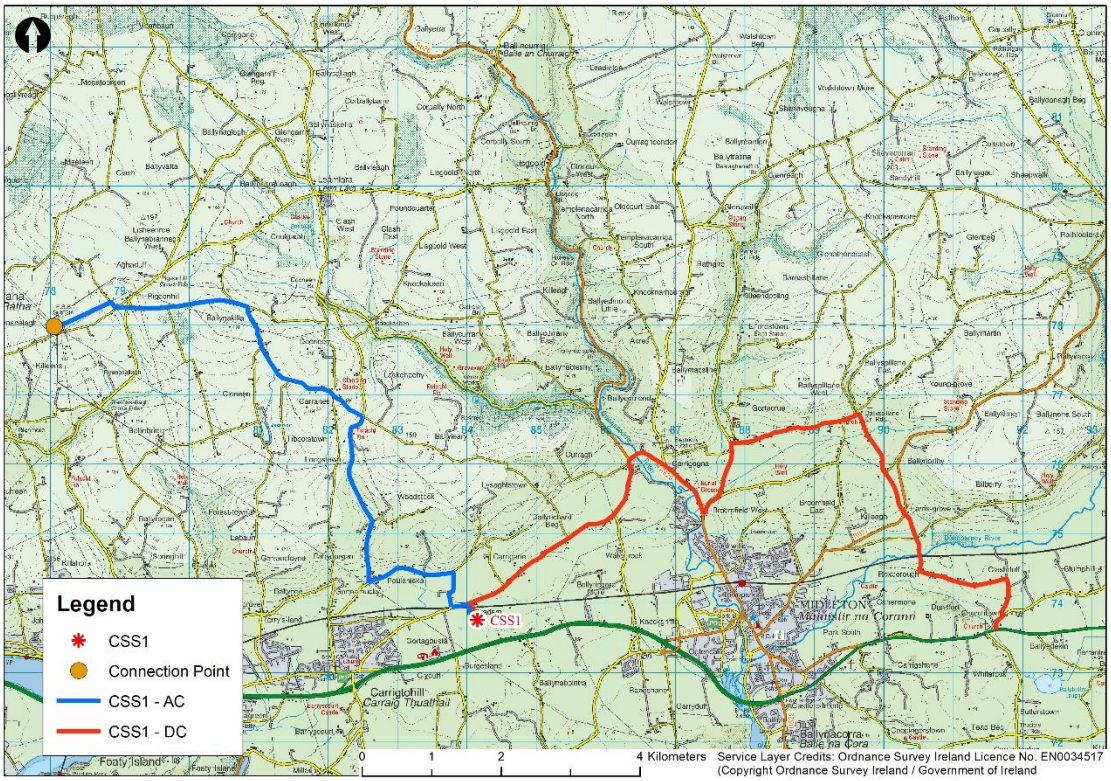
4.3.1 HVDC Route

The identified HVDC route option between the landfall locations and CSS 1 avoids the N25 (see Chapter 3). It follows the road north of Churchtown (the common point of convergence), to Ballyspillane cross roads, then west to East Cork Golf Club, south to Broomfield Ridge before joining the R626, travelling in a westerly direction via Water Rock Golf Course to CSS 1 / Jasmine Villa Caravan and Camping Park.

4.3.2 HVAC Route

The HVAC route option between CSS 1 and Knockraha 220 kV substation runs north from the site under the operational railway line between Carrigtwohill and Midleton, east towards Grangecon Demesne, then north towards Kilgoura Quarry and north west at Upper Garranes, turning west towards Knockraha Substation, running cross country, then north along local roads, then again cross country directly west to the connection point.

Figure 7: CSS 1: HVDC / HVAC route options from the common point of convergence at Churchtown



Source: Mott MacDonald

The following sections provide further detail regarding this site in line with the multi criteria analysis. All distances referenced have been taken from the centre point of the asterisk presented in **Figure 6**.

4.4 Environmental Risks and Constraints

4.4.1 Land Use Planning

As noted above, CSS 1 is located on the site formerly intended for location of the Amgen facility. A planning application to for preparatory site works (Ref. 06/8898) was granted permission on appeal by An Bord Pleanála (ABP) in November 2006 (Ref. PL04.219908). A subsequent permission was granted by ABP in July 2007 (Ref. PL04.222364).

Industrial development is a strategic development objective for CSS 1 of the Cobh Municipal District Local Area Plan (LAP) 2017. The LAP identifies that while the Ballyadam site (CT-I-03) was previously zoned for standalone uses only, it is now the intention of Cork County Council to allow a wider range of industrial uses on site. This is consistent with the Cork County Development Plan 2014 which includes the following objective in terms of land use planning for sites zoned for industry:

County Development Plan Objective ZU 3-7: Appropriate Uses in Industrial Areas

Promote the development of industrial areas as the primary location for uses that include manufacturing, repairs, medium to large scale warehousing and distribution, bioenergy plants, open storage, waste materials treatment, and recovery and transport operating centres. The development of inappropriate uses, such as office based industry and retailing will not normally be encouraged. Subject to local considerations, civic amenity sites and waste transfer stations may be suitable on industrial sites with warehousing and/or distribution uses.

The development of utility infrastructure, such as a converter station, within a site zoned for industry, while generally accepted on industrial zoned lands will not offer significant employment opportunity once operational as is considered to be the intention of Objective ZU 3-7. CSS 1 has therefore been assigned a ranking of **Moderate** in terms of land use planning.

4.4.2 Soils and Geology

As identified in the Step 3 Onshore Constraints Report, CSS 1 is located within an area of known karst features (the term 'karst' refers to features associated with dissolution and removal of limestone to create significant ground cavities and groundwater flowpaths, e.g. caves). The following section has been informed by further desktop assessment of karst and flood risk carried out by a hydrogeologist specialising in karst systems.

Approximately 30 caves and other karst features are recorded within approximately 3km of CSS 1, as illustrated in **Figure 8** and recorded below. The 2007 ABP Inspector's Report for the proposed development on the site per Ref PL04. 222364 refers to over 30 individual swallow holes (the term 'swallow hole' refers to a steep-sided and enclosed depression in a limestone region) in the northeast of the site, which had led to a suspension of construction works on the site. A small number were recorded in the middle of the site and six in the northwest of the site, with several more scattered around various parts of the site.

The 2012 Carrigtohill Groundwater Flood Risk Assessment[1], carried out on behalf of Cork County Council, noted that a new sink hole formation was observed on the site in 2010, highlighting relatively rapid geomorphic change on the site and the potential for significant future ground instability.

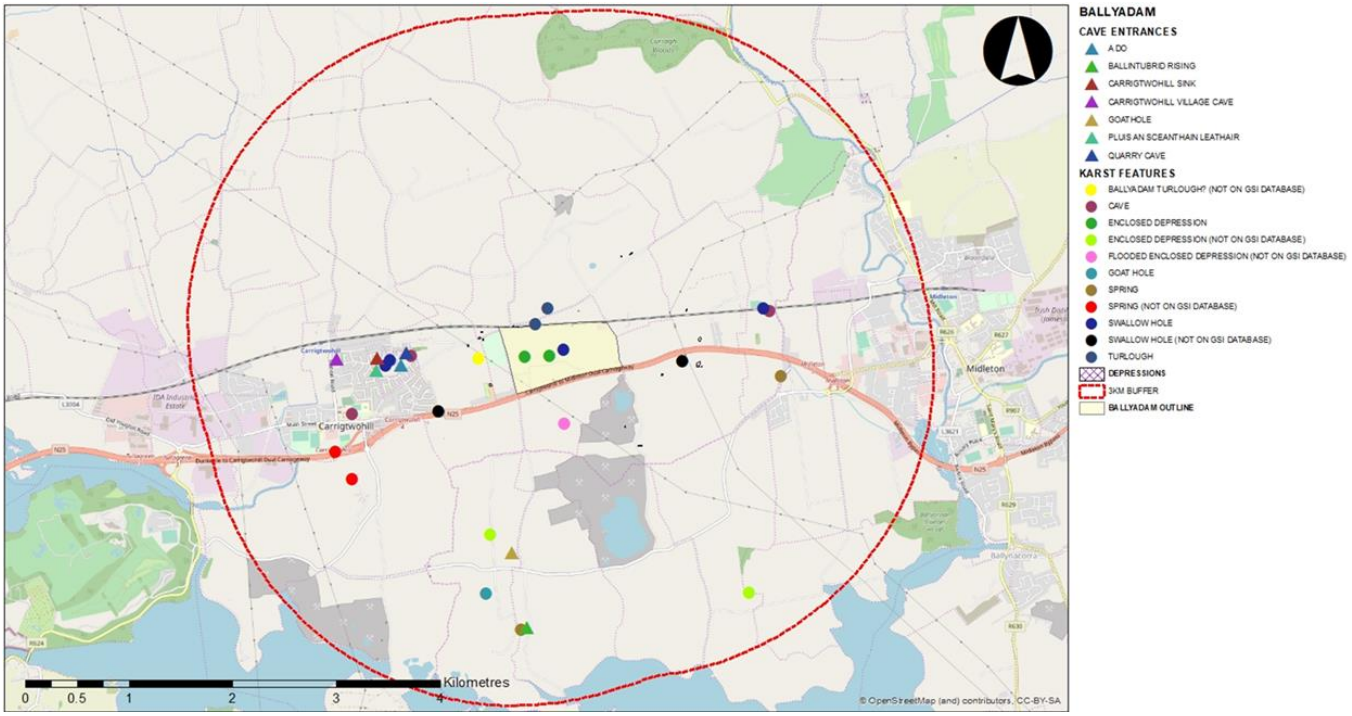
CSS 1 is located to the east of mapped cave networks associated with Carrigtwohill Quarry Cave and Pluais an Sciathain, which are shown in Figure 9 and Figure 10. The maximum local cave size recorded is at Con Cave in the Carrigtwohill Quarry Cave network, which is in the order of 15m, however, the full extents of these cave networks, and their maximum cave dimension sizes, are not known, there remains a high level of risk that they extend to CSS 1. Micro siting CSS1 within the site is unlikely change this evaluation.

Due to the geological and hydrogeological setting, it is considered extremely likely that there are other karst features in the vicinity which have not been identified as part of what essentially comprises a desk study and literature review.

Should this option progress, further assessments will need to be undertaken to gather more information on these identified environmental and ground stability concerns.

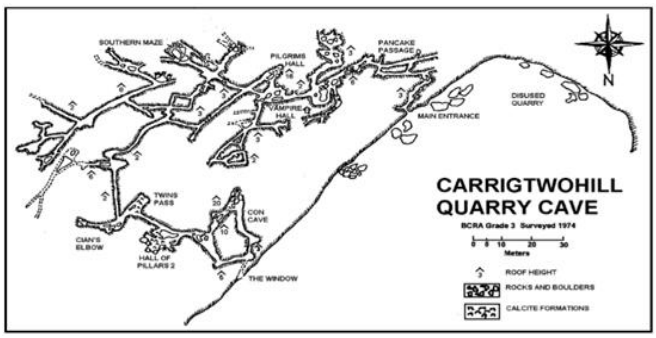
[1] https://corkcocoplans.ie/wp-content/uploads/bsk-pdf-manager/2016/07/Appendix-C-1023_CarrigtohillGroundwaterFRA_RevA-_withFig2Aand2B.pdf

Figure 8: CSS 1 Karst Features



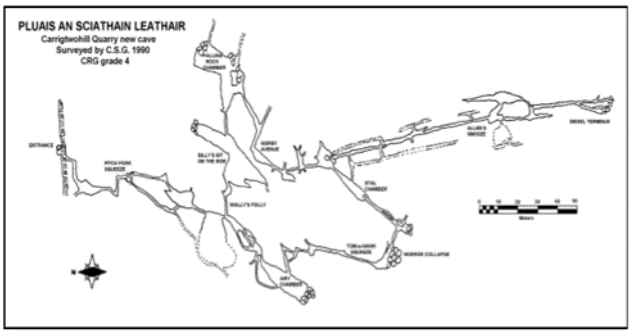
Source: Mott MacDonald

Figure 9: Carrigtwohill Quarry Cave



Source: Bunce, C. & Barry, P. 2011. Caves of County Cork. Speleological Union of Ireland.

Figure 10: Pluis an Sciathain



Source: Bunce, C. & Barry, P. 2011. Caves of County Cork. Speleological Union of Ireland.

Table 4: Recorded Karst Features within 3km of CSS 1

KARST LANDFORM	X	Y
TURLOUGH	583953.8	574011.7
TURLOUGH	584073.8	574161.7
ENCLOSED DEPRESSION	583850.5	573698.3
ENCLOSED DEPRESSION	584087.8	573702.5
SWALLOW HOLE	584223.8	573761.7
CAVE	582754.1	573701.8
SWALLOW HOLE	582554.1	573661.8
SWALLOW HOLE	582514.1	573611.8
SPRING	586323.3	573511.8
CAVE	586213.4	574141.7
SWALLOW HOLE	586153.4	574161.7
CAVE	582184.2	573141.9
GOAT HOLE	583473.9	571412.3
SPRING	583813.9	571062.3
SWALLOW HOLE (NOT ON GSI DATABASE)	582987.2	573200.9
SPRING (NOT ON GSI DATABASE)	582191.5	572513.9
SPRING (NOT ON GSI DATABASE)	582028.2	572776.5
BALLYADAM TURLOUGH? (NOT ON GSI DATABASE)	583409.8	573682.5
FLOODED ENCLOSED DEPRESSION (NOT ON GSI DATABASE)	584235.1	573048.8
ENCLOSED DEPRESSION (NOT ON GSI DATABASE)	586014.3	571420.4
ENCLOSED DEPRESSION (NOT ON GSI DATABASE)	583516.6	571977
SWALLOW HOLE (NOT ON GSI DATABASE)	585369.9	573652.3

Table 5: Recorded Cave Locations within 3km of CSS 1

CAVE	X	Y
QUARRY CAVE	582716.9	573737.7
PLUIS AN SCIATHAIN LEATHAIR	582429.4	573568.3
A DO	582663.6	573619.7
BALLINTUBRID RISING	583878.1	571087.9
CARRIGTWOHILL SINK	582432.1	573688.1
CARRIGTWOHILL VILLAGE CAVE	582041.4	573675.4
GOATHOLE	583731.1	571808.4

Gibson *et al.* (2005) use a qualitative approach to define geohazard levels in karst terrains. From reviewing literature and GSI datasets, it is considered that CSS 1 would be classified as 'Moderate to High' or 'High hazard' in line with the descriptions provided overleaf. The level of uncertainty with regards the actual distribution of karst features, coupled with the high frequency of their surface expression on and near the site, is such that a 'High' ranking is considered appropriate for this site.

Table 6: Geohazard Descriptions

HAZARD	DESCRIPTION
LOW	Areas where soluble rocks are present, but very unlikely to cause any significant problems.
LOW TO MODERATE	Where soluble rocks are present and unlikely to cause any significant problems.
MODERATE	Areas where soluble rocks are present in considerable amounts, but problems are unlikely except in very adverse and unusual conditions.
MODERATE TO HIGH	Areas where soluble rocks are present in considerable amounts and where some surface subsidence has occurred; possibly hazardous in adverse conditions such as enhanced surface or sub-surface water movement.
HIGH	Areas where considerable thicknesses of soluble rocks are present and where significant surface subsidence has been observed either due to natural or induced dissolution. A high possibility that surface subsidence may occur and that some of it may be severe enough to affect pipelines and their infrastructure.

Source: Gibson et al. 2005

Karstic rockhead topography is notably unpredictable, with variations in depth, frequency of fissuring, the height and stability of buried pinnacles, the extent of loose blocks of rock and the frequency of buried sinkholes. There may be high variation in karst characterisation at an intra-site scale. There is a lack of interdependence between the components of the karst such that within a region there can be topographic variability and various minor karst classes. Therefore, classification can only be an approximate label as the full extent of karst system / cave network is unknown.

There remain a number of significant uncertainties associated with CSS 1. These include:

- Subsurface drainage routes (e.g. sink / spring connections);
- Characterisation of surface water / groundwater interaction;
- Groundwater and surface water flooding; and
- The impact of nearby quarry drainage on the rerouting of site drainage, and the potential impacts that changes in quarry abstractions may have on CSS 1, both in terms of ground instability and flooding.

As detailed above, there are significant uncertainties related to ground stability and environmental concerns at this site. What can be stated with certainty is that to confirm whether or not the risks identified will be realised requires significantly more detailed and specialist characterisation and complex civil design. Engineering this site would likely result in more significant resource use and higher levels of construction related traffic.

Therefore, in the context of this report, it is considered that the unknowns associated with CSS 1 represent a **Moderate – High** ranking for a critical infrastructure project of this nature.

4.4.3 Landscape and Visual

According to DTM, CSS 1 is at an elevation of approximately 30m AOD (Malin Head).

CSS 1 is located within a 'City Harbour and Estuary' landscape character area, which is classified as having 'Very High' sensitivity and 'National Importance' and is also part of an area defined as High Value Landscape in the Cork CDP.

The site is low lying and is potentially overlooked by a scenic route to the west (S42: Road at Cashnagarriffe, N.W. Carrigtwohill and Westwards to Caherlag). Scenic routes also occur to the north east (S43: R626 Leamlara to Midleton road), to the south west (S51: Road from Ballynacorra via East Ferry to Whitegate and Roche's Point) and to the south (S52: Road at N.E. Great Island) but these are all low-lying which hinders long distance views.

There is limited existing screening within the site, however the converter station would likely be viewed in the context of existing developments in the surrounding area. A ranking of **Low-Moderate** has therefore been assigned.

4.4.4 Biodiversity

CSS 1 is not located within the boundary of any site designated for the protection of biodiversity. The nearest protected areas to CSS 1 are Great Island Channel SAC (1058) and Cork Harbour SPA (4030), located approximately 2.5km from the site. Potential for effects on European sites have been taken into consideration in the evaluation of the converter station sites in the context of distance to potential sensitive receptors only. The next stage of assessment will consider the potential for significant effects on European Sites in the context of Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC). The need for measures to mitigate against significant effects will be determined.

The lands within and surrounding CSS 1 are of a karst nature and include typical karst features such as swallow holes, and underground caves and conduits. Karst landscapes offer minimum attenuation and allow the rapid movement of contaminants into groundwater. The possibility of a pollution pathway between the site and the European Sites protected within Cork Harbour would need to be investigated as part of an assessment in the context of Article 6 of the Habitats Directive (Council Directive 92/43/EEC) for the Celtic Interconnector project at a subsequent stage of environmental assessment.

A preliminary appraisal of the ecological potential of CSS 1 and the immediate surrounding area was made having carried out a site walkover in May 2019. The lands within CSS 1 comprise a mosaic of habitats closely associated with shallow, well-drained calcareous ground. The dominant habitat is dry calcareous grassland. The site also includes areas of immature woodland and scrub. There are also several drains within the site. Significant bee orchid (*Ophrys apifera*) numbers occur within the CSS 1 lands, along with several other notable plant species such as greater knapweed (*Centaurea scabiosa*)), viper's bugloss (*Echium vulgare*), and yellow wort (*Blackstonia perfoliata*). The Carrigtwohill Strategic Plan 2018 – 2020, identifies 'The Amgen Site' as having potential for the development of biodiversity enhancement to complement subsequent developments.

Figure 11: Bee Orchid

Source: Mott MacDonald May 2019

Figure 12: Greater Knapweed

Source: Mott MacDonald May 2019

The site provides suitable habitat to support protected animal species. There are records (source: NPWS) in the locality *inter alia* for hedgehog (*Erinaceus europaeus*), otter (*Lutra lutra*), pine marten (*Martes martes*), stoat (*Mustela erminea subsp. hibernica*), red squirrel (*Sciurus vulgaris*), pygmy shrew (*Sorex minutus*), common frog (*Rana temporaria*), and common lizard (*Zootoca vivipara*). The immature woodland within the site has no bat roost potential due to its size and absence of suitable roost features.

Breeding bird surveys of the CSS 1 were carried out in May 2019 and June 2019. A good diversity of bird species was observed, including species that are now rare or scarce in East Cork.

Table 7: Bird species of conservation concern, and specially protected raptor species recorded at CSS 1 in Spring/Summer 2019

Species	CSS 1 (1st May 2019)	CSS 1 (18th June 2019)	Breeding status at the site
Common Buzzard *(Buteo buteo)*	1	2	Probably breeding
Skylark	1	1	Confirmed breeding
Meadow Pipit	5	7	Confirmed breeding
Stonechat (*Saxicola rubicola*)	3	4	Confirmed breeding
Greenfinch (*Carduelis chloris*)	1		Confirmed breeding
Linnet (*Linaria cannabina*)	2	2	Confirmed breeding

Note: Red and Amber colours are used to highlight species of conservation concern as per K. Colhoun & S. Cummins (2013) 'Birds of Conservation Concern in Ireland 2014–2019'. Irish Birds 9: 523-544 (2013)

The Common Buzzard is now well established and widespread in East Cork and this was the only bird of prey species recorded at this site. Cuckoo (*Cuculus canorus*) was observed at the site. The bird is not protected under the EU Birds Directive. The bird possibly bred here but it may have been an early migrant on the move from elsewhere. Skylarks and Meadow Pipits have become increasingly rare and scarce birds respectively over much of East Cork.

Stonechat, Greenfinch, and Linnet have all become increasingly localised in their distribution across large areas of County Cork. 32 species were recorded on the two survey dates. The small wood in the south-eastern corner of the site contains a large rookery of at least 100 nests.

In addition, while not observed during survey, Barn owl (*Tyto alba*) has been recorded in the locality in recent years and is a red list species (high conservation concern). CSS 1 provides suitable foraging habitat for this species.

Ecological Evaluation

Location CSS 1 supports good biodiversity and hosts species of conservation concern. Calcareous grassland is typical of the west of Ireland and is less frequent within the southern regions of the country. This site has a high degree of biodiversity and supports regionally uncommon species of flora and bird. This is an important orchid site given the density of bee orchids present and could equate to the priority Annex I habitat 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia)[2]. Further botanical assessment of the site would be necessary to discern an association with the Annex I habitat 6210. However, on the basis of the preliminary appraisal, the site is classified as being at least of **County Importance** as per the ecological evaluation examples prescribed in the NRA (2009) *Guidelines for Assessment of Ecological Impacts of National Roads Schemes.*

Given the ecological value of the site, CSS 1 does not perform well in the context of biodiversity, and has been ranked as **Moderate – High**, in terms of ecology.

4.4.5 Waterbodies, Drainage and Flood Risk

The CSS 1 aquifer is classified as a Regionally Important Aquifer - Karstified (diffuse). The groundwater vulnerability in the area is classified as High to Extreme. Karst aquifers typically allow the rapid movement of contaminants into groundwater with minimal attenuation, which is exacerbated in the area of CSS 1 due to the limited presence of any potentially protective overburden geology.

A flood risk assessment of Carrigtwohill undertaken by JBA Consulting (2013) demonstrated considerable uncertainty regarding the hydrology in the area of CSS 1. The flood risk locations mapped by the JBA flood risk assessment are presented in Figure 13. The hydrogeological assessment highlights Area 5, in proximity to CSS 1, as an area at risk of groundwater flooding. The report states that Cork County Council have confirmed ongoing flooding issues in this location which has required the installation of mobile pumps.

The 2013 Carrigtwohill Flood Risk Assessment Report suggests that infilling of the Ballyadam Turloughs has altered the physical characteristics of the aquifer displacing groundwater flooding of the voids to the adjacent road to the west, while pumping of the water to the onsite attenuation pond has created a new swallow hole pathway. These physical changes may be diverting groundwater flow from historical flowpaths through the system into new flowpaths. The

[2] Further detailed botanical assessment against the 'Interpretation Manual of European Union Habitats - EUR28' is necessary to confirm correlation with the priority habitat 6210.

report also states that cessation of dewatering activities in 2010 at the Roadstone/Wood Quarry may have exacerbated the flooding reported adjacent to the site.

The 2012 Carrigtwohill Flood Risk Assessment Report referred to flooding events on the local road to the west of the site post groundworks, including the infilling of a 'man-made lake'. The attenuation pond developed to the south of the site, adjacent to the N25, was visited in 2010 and a new swallow hole was noted. This is almost certainly related to re-activation of pre-existing ground cavities as active collapses due to drainage alteration associated with the attenuation pond. An assessment of flood risk at CSS 1 would require further detailed characterisation due to the significant uncertainties highlighted in Section 4.4.2 *Soils and Geology.* The potential for local quarrying activities to impact on site hydrology must also be considered. It can be stated that management of karst features, such as infilling turloughs (which has been recorded on site), has reduced storage and increased the chances of flooding when compared with naturally functioning features. Hence, future management must take into account the full difficulties of dealing with turloughs, sinkholes etc., without which there will remain the significant risks of further flooding and ground instability.

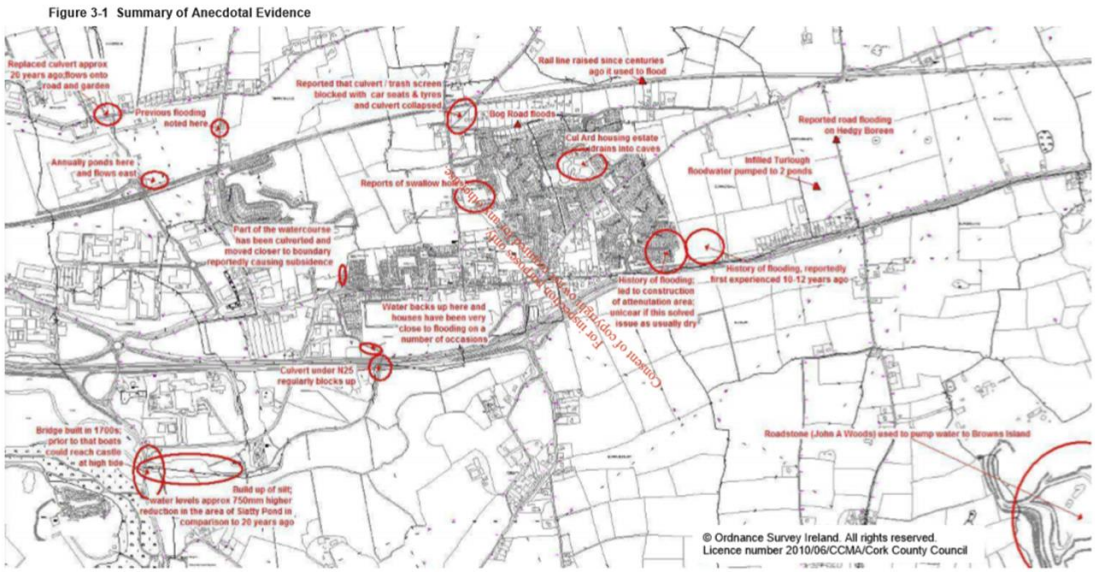
Special consideration is required towards fully informed and appropriate management of drainage on site. Inappropriate drainage is one of the principal causes of ground collapse in karst (Quarterly Journal of Engineering Geology and Hydrogeology, Waltham, 2016). Rutty and Jennings (2012) list the key implications of human interference on hydrology, which in turn impact the reactivation of existing karstic features:

- Increased water flow causes soil erosion at a greater rate.
  - This would be likely to accelerate the collapse of pre-existing subsidence sinkholes. This may activate existing features and initiate new drop-out collapse, as has already been observed.
- When the water table in the soil is lowered, effective stresses loading any soil arches increase and support from water pressure is lost.
  - This may result in collapse where the soil arch cannot support the extra load following construction.
- Diversion of surface water drainage will change sub-surface drainage conditions.
  - Where surface water is concentrated and finds a new drainage pathway to rock, then the flowing water may produce collapse of pre-existing cavities or initiate new cavities.

Water crossings will be required for the HVAC and HVDC routes assessed.

In the context of water quality, drainage and flood risk, CSS 1 does not perform well for a development of this nature and has been ranked as **Moderate – High.**

Figure 13: Summary of Anecdotal Evidence



Source: Carrigtwohill Flood Risk Assessment, JBA consulting, 2013

4.4.6 Cultural Heritage (Archaeological and Architectural Heritage)

A number of cultural heritage sites were recorded in advance of construction of the Amgen facility during the site archaeological monitoring carried out in 2007. From a review of the Inspector's Report Planning Reference (PL04.222364) it would appear that this monitoring was carried out post planning consent, potentially for the preparatory site works.

Two of these recorded cultural heritage sites are located within a 250m radius of the centre point of CSS 1 presented in Figure 6. The closest is located approximately 124m from the centre point. Development of a converter station on the former Amgen site has potential to impact directly on these sites.

There are four recorded cultural heritage sites within a radius of approximately 500m. The sites include Fulacht fia (record no. CO076-120----), Fulacht fia (record number CO076-121----), Burnt Mound (record no. CO076-122----), Fulacht fia (record no. CO076-123----).

Further detail of the cultural heritage value of the CSS 1 and the surrounding area is provided in Appendix D *Cultural Heritage Report,* an Archaeological, Architectural and Cultural Heritage constraints study of the Short-listed CSLZ's prepared by Rubicon Heritage Services Ltd.

Having regard to the distance from the recorded features and the type of known features, a **Moderate** evaluation has been assigned to CSS 1, in terms of cultural heritage. Whilst the evaluation is based on location of the CCS1 shown in **Figure 13**, micrositing the site east or west of this location is unlikely to change the evaluation.

4.4.7 Combined Environmental Performance

Taking the combined environmental factors into account, the CSS 1 option, results in a combined environmental performance ranking of **Moderate-High**.

Option	Land Use Planning	Soils and Geology	Landscape and Visual	Biodiversity	Waterbodies, Drainage and Flood Risk	Cultural Heritage	**Combined Environmental Performance**
CSS 1							

4.5 Social Risks and Constraints

4.5.1 Traffic

The roads along the HVAC route are generally just wide enough to accommodate two cars to pass each other and in some places such passing might not be possible. Each section would therefore require full closure during trench installation, requiring always that access is maintained for local residents. Suitable diversions for through-traffic are available along the length of the route. At a minimum installation rate of approximately 25m per day, this route will take a minimum of approximately 80 crew-weeks to install.

For the HVDC route, each section would require closure, while at all times maintaining access for local residents. Diversions are available for all sections along this route. On this basis, the significance of the traffic disturbance impact is assessed to be low-moderate. The minimum estimated installation rate is approximately 50m per crew per day, resulting in a minimum timeline of approximately 52 crew-weeks.

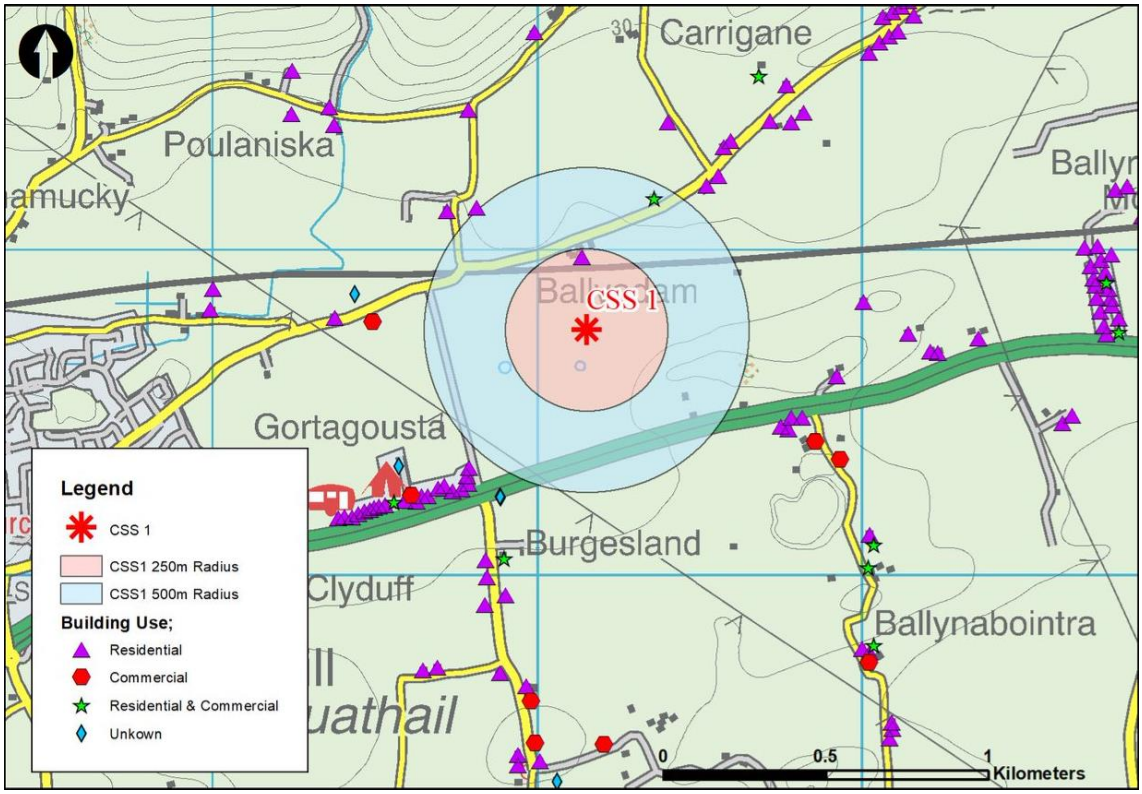
It is also considered that more significant civil engineering works would be required to develop a converter station at CSS 1 and its associated routing of the HVAC connection required to Knockraha then at other sites under consideration, resulting in higher volumes of construction phase traffic.

A **Moderate – High** ranking has therefore been assigned to CSS 1, in terms of traffic disruption and disturbance.

4.5.2 Noise

According to GeoDirectory data, the nearest residential property to the centre point of CSS 1 (refer to **Figure 14**), is located approximately 224m to the north. There are two residential properties located within 500m of the centre point and approximately 60 (the majority of which are residential) buildings within 1km of the centre point.

Figure 14: CSS 1 Nearest Sensitive Receptors



Source: Mott MacDonald

According to EPA mapping, noise levels along the N25 and the general area of CSS 1 are elevated with noise levels in the order of 53-55dB. Given the nature of the settlement patterns in the wider study area, scattered rural one-off housing, construction noise nuisance is likely to have a temporary adverse impact on noise sensitive receptors located along the existing road network. All construction related nuisances would be managed by a project-specific Construction Environmental Management Plan (CEMP). A construction Traffic Management Plan (TMP) will form part of this CEMP. An outline CEMP and TMP will be included with the planning applications for the proposed development.

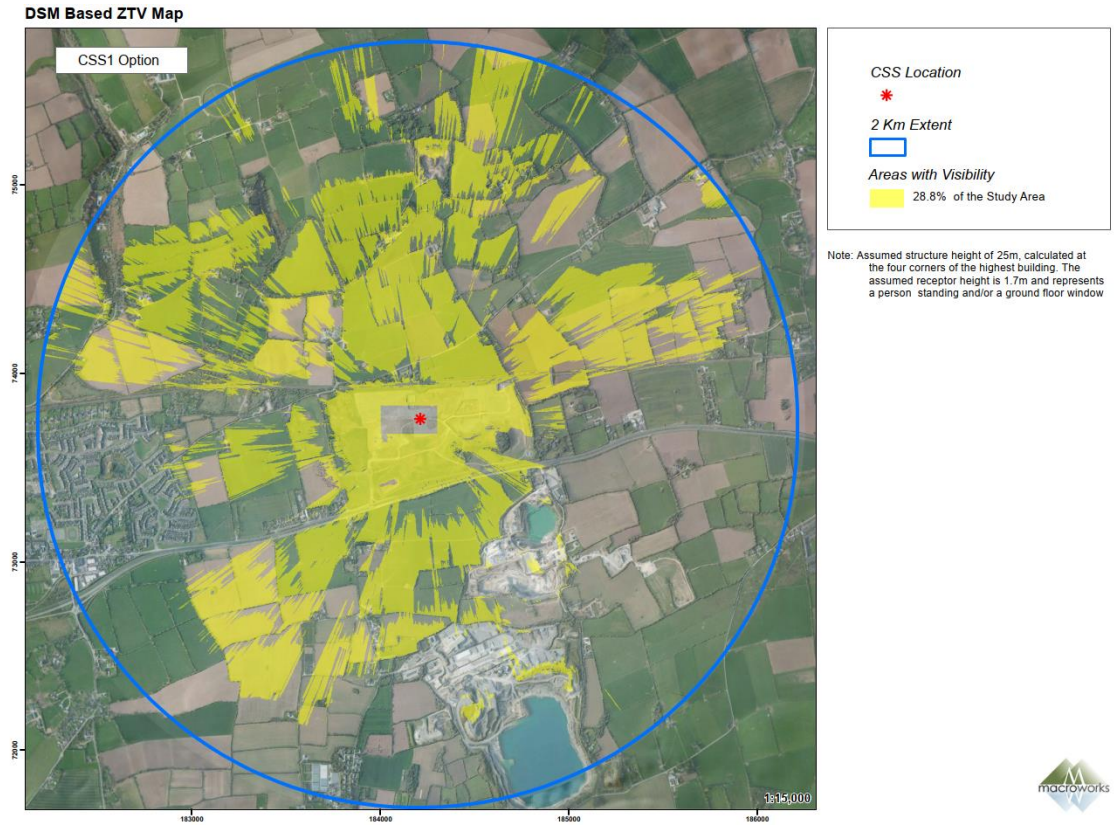
The site is remote from population centres, in terms of noise sensitive receptors. As noted above there is one sensitive receptor located within 250m of the proposed centre point of the converter station. Potential opportunities exist to minimise land take (meaning the loss of agricultural, forest and other semi-natural and natural land to urban and other artificial land development) following micro-siting and design optimisation. Due to existing background noise levels, CSS 1 performs well in terms of noise, a **Low** ranking has therefore been assigned.

4.5.3 Visual

Whilst the ZTV map for CSS 1 (refer to **Figure 15**) indicates that there is relatively extensive visibility in the area surrounding this site, much of it falls within unpopulated farmed fields. The most populated area is a residential housing development situated less than 2km to the west but the ZTV shows that existing vegetation is effective at screening views of the entirety of all the structures at CSS 1. A ranking of **Low-Moderate** has been assigned to CSS 1 as the

converter station would likely be viewed in the context of existing developments in the surrounding area.

Figure 15: CSS 1 ZTV



Source: MacroWorks

4.5.4 Combined Social Performance

The combined social performance of CSS 1 is ranked as **Low - Moderate** with the greatest anticipated impact considered to comprise temporary disturbance and disruption during the installation of the HVAC cable.

It is noted that CSLZ 1 (and thereby CSS 1) was identified to EirGrid by various stakeholders and the general public during consultation events. Therefore, while identified as Low-Moderate in terms of specific social performance, it can also be considered that the site performs favourably in terms of public preference regarding the siting of the planned converter station only (i.e. this does not consider the routing of the HVAC cable to Knockraha).

Option	Traffic	Noise	Visual	Combined Social Performance
CSS 1				

4.6 Technical Risks and Constraints

There has been no change from Step 3 regarding this criterion for CSS 1, and therefore remains as **Moderate.**

4.7 Deliverability Risks and Constraints

4.7.1 Design Complexity

HVDC Route

This route is generally narrow but constructible. There is a parallel water main along portions of the route that would need to be taken into account. Given the local residential nature of the supply, this is not expected to provide a challenging installation environment. The route requires the crossing of seven water courses. No information has been received to date on bridges along these roads, but it can reasonably be expected that these bridge crossings will be stone bridges or similar with insufficient deck space to install the cable ducts. As such, HDD would be required off-road for each of these crossings.

This route would also require the crossing of gas transmission pipelines twice along the route which would require detailed interaction with Gas Networks Ireland as well as careful planning and installation.

The route requires crossing the disused railway track near Foxborough which is within metres of a water course. While there is a bridge over the railway and water course, it is likely that there is insufficient cover to place the cable in the deck and therefore HDD will likely be required for the crossing. This railway crossing can be achieved at the same time as the water course crossing given their proximity. The depth of this crossing may be 4.5m or deeper depending on the depth of the water course.

The final approach of the route to the connection point requires crossing the existing operational railway between Midleton and Carrigtwohill. This will require careful management and planning. Iarnród Éireann has advised that the HV cables will need to be buried below the 2 metre zone allocated for signal cables. A vertical separation distance will also need to be maintained from this zone. This may impact the cable rating and further discussions will be required with Iarnród Éireann to agree a solution that satisfies both parties requirements.

Converter Station Site

This is a brownfield site located in a known karst region. This introduces a major risk for the construction of the converter station in terms of ground stability and potential flooding.

The converter station will require three High Voltage transformers and each one of these weighs approximately 300 tonnes. The civil design would be highly complex due to the karst and significant ground investigation surveys would need to be conducted to establish if a converter station could be accommodated at this location.

HVAC Route

The HVAC route is approximately 10km in length. Of the total distance, there is approximately 450m traversing parallel to a water main and no other parallel services. No water courses require crossing along this route.

The route crosses the existing operational railway between Midleton and Carrigtwohill with an overbridge. Investigation is required to determine whether there is sufficient cover for cable installation within the deck. If this is not the case, then HDD will be required. This will require careful management and planning. As noted above, Iarnród Éireann has advised that the HV cables will need to be buried below the 2 metre zone allocated for signal cables. A vertical separation distance will also need to be maintained from this zone. This may impact the cable rating and further discussions will be required with Iarnród Éireann to agree a solution.

The section north west of CSS 1 is narrow and with a length of 1.8km will require at least two joint bays for each set of phase cables. The width required in this case is in the order of 4m and may not be available within the roadway. All road sections require full closure while installation is taking place, subject always to maintaining continuous access for local residents and emergency services.

Due consideration should also be given to the width of the HVAC trench being a substantial fraction of the width of the road and issues with the stability of the roadway may arise as a result of installation.

Summary

The aspects raised above result in the Design Complexity risk of CSS 1 being assessed as **High** given the site ground conditions, deep railway crossings and a portion of the HVAC route length along very narrow roads**.**

4.7.2 Traffic Disturbance Impact

HVDC Route

Each section under construction would require closure, while at all times maintaining access for local residents. Diversions are available for all sections along this route.

Converter Station Site

Heavy/abnormal load vehicles are required to transport HV equipment such as transformers to the site. The site is accessible via the N25 providing access for Heavy/Abnormal load.

HVAC Route

Each section requires full closure during trench installation, requiring always that access is maintained for local residents. Suitable diversions for through-traffic are available along the length of the route. The substantial length of this route and the width of the required trench mean that a substantial number of trucks will be required for the excavation and removal of waste material and a similar number required for the importation of ready-made concrete.

Summary

The aspects raised above result in the Traffic Disturbance impact of CSS 1 being assessed as **Moderate.**

4.7.3 Dependence on other infrastructure projects

Neither the routes nor the converter station site have a dependence on other infrastructure projects, and is therefore ranked as **Low**.

4.7.4 Permits and wayleaves

HVDC Route

Two gas transmission crossings as well as 12 other services are applicable for this route and require permitting. Additional land and associated permitting and wayleaves will be required for the off-road HDD locations along this route. The route has four corners which have a bending radius of less than 20m which is the technical limit of the cable ducting. Cutting the corner at these locations will require wayleaves and landowner consent.

Converter Station Site

Permits will be required from the local council for the transportation of the transformers to site as these will be classified as abnormal loads.

HVAC Route

The route has four bends which are tighter than the minimum duct bending radius of 20m. Wayleaves would be required as well as landowner consent for each of these locations. Further, additional land parallel to the road is likely to be required north west of CSS 1 to accommodate the required trench width at joint bays.

Summary

The permits and wayleaves ranking is assessed to be **Moderate.**

4.7.5 Implementation timelines

HVDC Route

The route can be installed at a minimum rate of approximately 50m per crew per day, resulting in a timeline of approximately 52 crew-weeks.

Converter Station Site

From start of construction to final energisation of the converter station would typically take approximately 2 years, however additional time should be allowed at this site for significant foundation works due to the karst in the area.

Pre-construction surveys would be required and these have the potential to increase the implementation timelines compared to other sites with less challenging ground conditions. This would have the impact of delaying the start of construction. Additionally, given the karstic nature of the site, during construction there is also risk associated with the potential of finding site conditions which are substantially different to those suggested by the pre-construction surveys. This may have a direct impact on implementation timelines in that additional design may be required during the construction phase.

HVAC Route

At an installation rate of 25m per day, this route will take approximately 80 crew-weeks to install.

Summary

All aspects are not on the critical path for the project, however the potential for site investigation to extend the timeline results in a **Moderate-High** ranking.

4.7.6 Combined Deliverability Performance

The combined deliverability performance of CSS 1 is ranked as **High** due to the anticipated level of design complexity that the installation of the converter station and its associated cable route crossing under the live railway in particular presents as well as the uncertainty in implementation timelines.

Option	Design Complexity	Traffic Disturbance Impact	Dependence on other Infrastructure	Permits and Wayleaves	Implementation Timelines	**Combined Deliverability Performance**
CSS 1						

4.8 Economic Risks and Constraints

The estimated cost of the converter station, enabling works and associated HVDC and HVAC routes for **CSS 1** is 21% higher than for the lowest option, resulting in an assessment of **Moderate-High.** The high cost is attributable to the length of the AC route, and uncertainty in the ground conditions at the site.

4.9 Summary

There are significant uncertainties associated with the CSS 1 site in terms of groundwater pathways, flood risk and ground stability.

Due to the nature of Karst areas, there will be some uncertainty and unpredictability associated with the surveys. There is therefore a critical need for ongoing flexibility in reassessment of, and adaptation to, ground stability and environmental issues throughout the ground investigation and design stages of the project.

As detailed previously, the 2012 Carrigtohill Groundwater Flood Risk Assessment, carried out on behalf of Cork County Council, noted that a new sink hole formation was observed on the site in 2010, highlighting relatively rapid geomorphic change on the site and the potential for significant future ground instability.

The 2012 Carrigtohill Flood Risk Assessment Report referred to flooding events on the local road to the west of the site post groundworks, which including the infilling of a 'man-made lake' but most likely a turlough, or surface expression of subterranean karstic development. The report suggests that the attenuation pond developed to the south of the site, adjacent to the N25, was visited in 2010 and a new swallow hole was noted.

The subsurface drainage, and surface water / groundwater interactions in the area of CSS 1, are highly uncertain. This extends to groundwater and surface water flooding, the impact of quarry drainage, rerouting of site drainage, sink/spring connections, ground stability and many other key uncertainties. The CSS 1 site requires considerably more detailed and specialist characterisation than the alternative sites under consideration. The civil design would be highly complex and likely to require significant additional resources to support development on this site.

Overall, EirGrid notes that CSS 1 was identified by various stakeholders and the public during different consultation events to be a potential site for the converter station element of the overall project. However, notwithstanding this, it is considered that the challenges associated with CSS 1 to accommodate a critical element of the Celtic Interconnector - an infrastructure project of national importance – are reflected the overall performance matrix evaluation. The table below summarises the evaluation of CSS 1.

Option	Environmental	Social	Technical	Deliverability	Economic
CSS 1					

5 Converter Station Site 6

5.1 Identification of Converter Station Site 6

Converter Station Site 6 (CSS 6) was identified for further assessment having regard to the following site selection criteria.

- Feedback from Step 3 consultation
- Visual Impact
- Proximity to sensitive receptors
- Folio Size

5.1.1 Feedback from Consultation

Key concerns raised in relation to Converter Station Location Zone (CSLZ) 6 during Step 3 consultation period related to visual impact, traffic and noise, biodiversity and cultural heritage.

A visual screening assessment, ecological walkovers, ornithological surveys and a cultural heritage constraints study of the shortlisted CSLZs, including CSLZ 6, have informed this Step 4A Report.

5.1.2 Visual Impact

The area of CSLZ 6 is elevated. According to DTM data, the area to the west of the commercial forest is at an elevation of approximately 170m. The area of commercial forest appears to be relatively flat at an elevation of approximately 160m. The zone drops in elevation in a northerly direction from approximately 160m to 130m. The commercial forest and higher elevations to the west, may offer opportunities for some visual screening.

5.1.3 Proximity to Sensitive Receptors

The northern and western sections of CSLZ 6 are relatively sparsely populated with clusters of residential properties to the south west, south and east of CSLZ 6, with one off housing to the north west.

5.1.4 Folio Size

The commercial forest is of sufficient size to accommodate a converter station compound.

The following sections provide further detail regarding CSS 6 under the four aforementioned criteria. All distances referenced have been taken from the centre point of the asterisk presented in **Figure 16**.

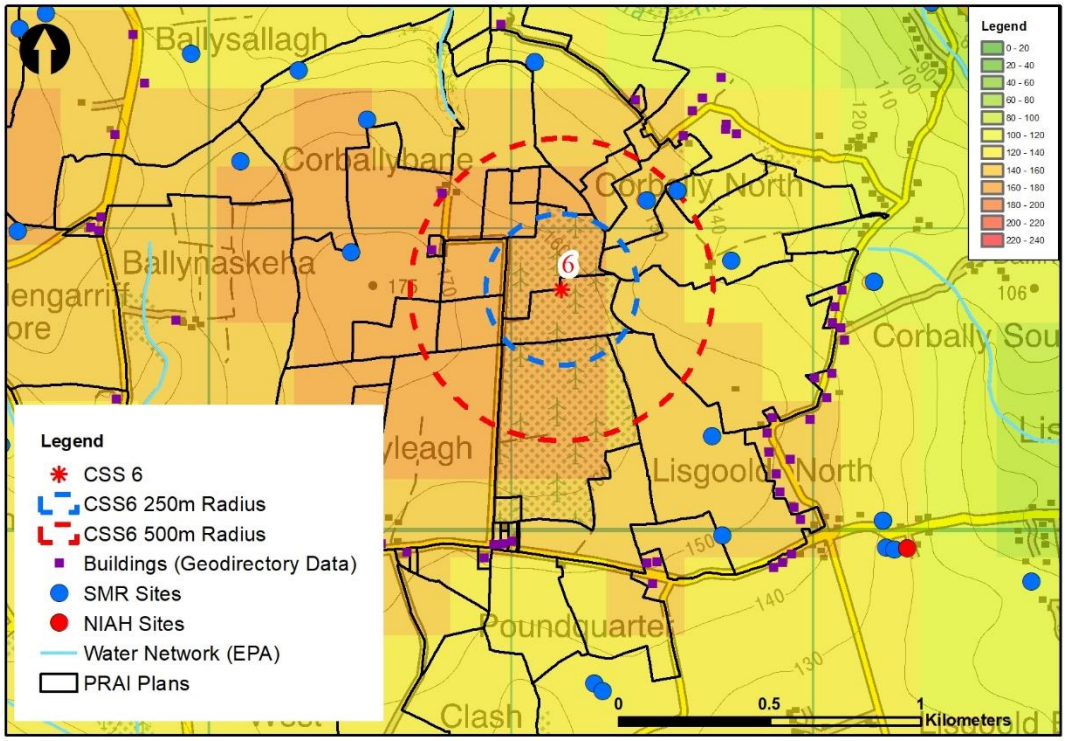
5.2 CSS 6

CSS 6 is located within an area of commercial forestry (Corbally), in the townland of Corballybane, appropriately 6km straight line distance from Knockraha 220 kV station.

According to GeoDirectory data, the nearest residential property is located approximately 448m to the northeast. There is one residential property located within 500m, and approximately 33 properties within 1km.

The site is relatively flat at an elevation of approximately 160m.

Figure 16: CSS 6



Source: Mott MacDonald

5.3 CSS 6 Route Options

5.3.1 HVDC Route

The HVDC route option follows the road north from Churchtown towards and until Ballyspillane, then west to East Cork Golf Club, south down Broomfield Ridge towards the R626, north along the R626 through to Lisgoold before turning west towards Leamlara and finally cross country directly north to the connection point.

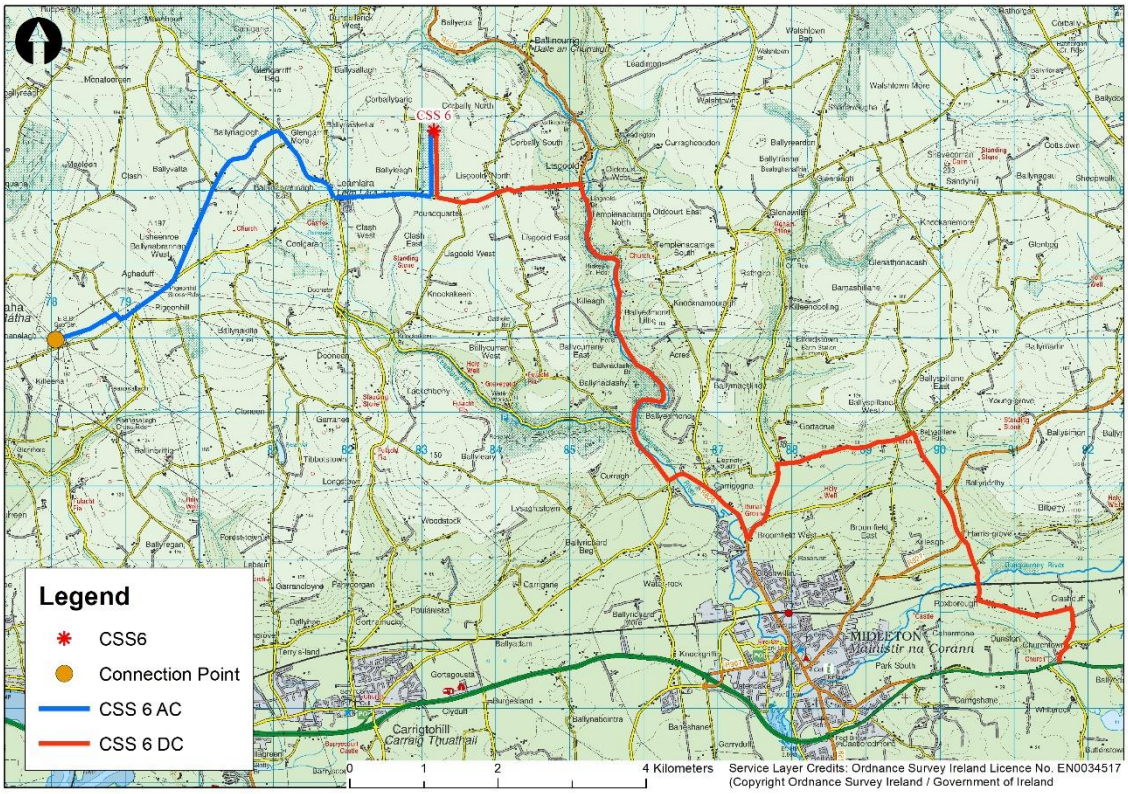
5.3.2 HVAC Route

The HVAC route option traverses south cross-country then follows the road west towards Leamlara, turning north and following the main road towards Watergrasshill, then west just after Glenariff More, continuing on that road until turning north-west for a short distance, and finally directly west cross-country to the connection point.

The deviation of this route from the natural choice of shortest path is due to there being a tight s-bend over a substantial water course in a densely forested area. The location of this point is shown on the map in **Figure 18**.

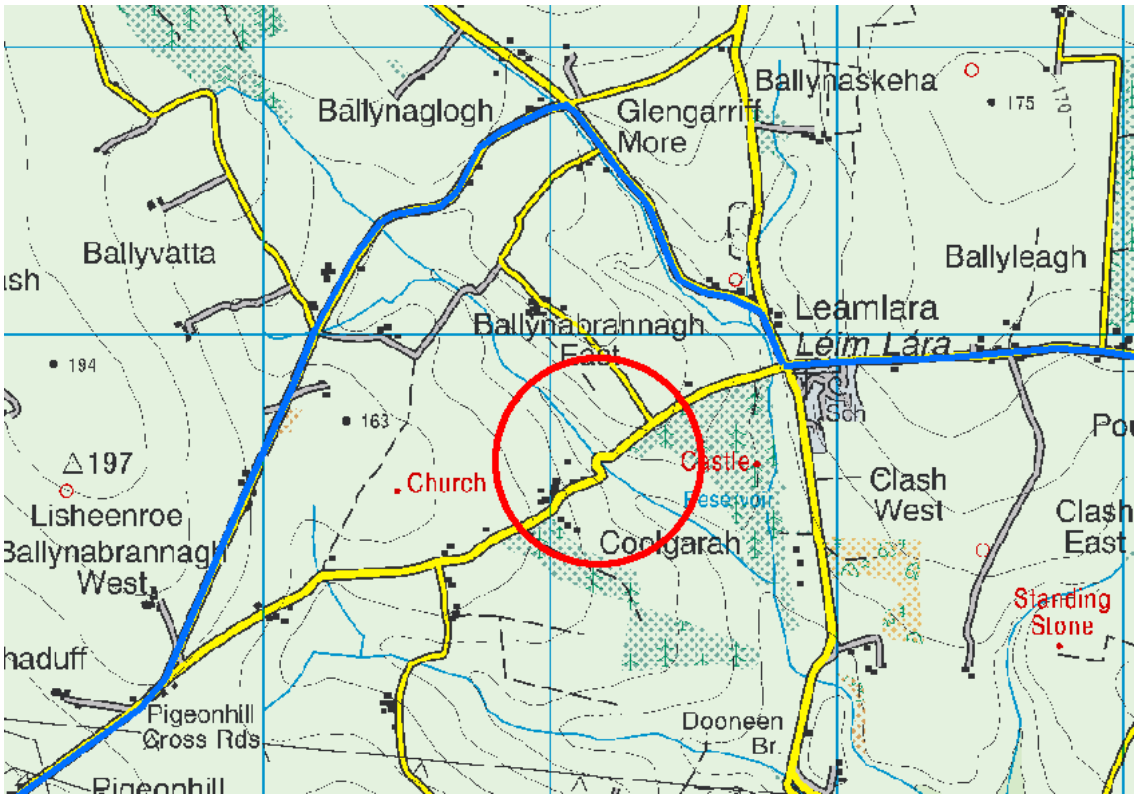
The following sections provide further detail regarding this site in line with the multi criteria analysis. All distances referenced have been taken from the centre point of the asterisk presented in **Figure 16**.

Figure 17: CSS 6: HVDC / HVAC route options from the common point of convergence at Churchtown



Source: Mott MacDonald

Figure 18: Tight S-bend in most direct route from CSS6 to Connection Point



Source: Mott MacDonald

5.4 Environmental Risks and Constraints

5.4.1 Land Use Planning

CSS 6 is situated within a commercial forest in a predominately rural location. The CDP outlines the importance of the Forestry sector being of economic importance.

Construction of the converter station at this site will result in tree felling to accommodate the compound and a permanent change in land use change from rural to utility use.

Overall the ranking can also be considered **Moderate**, in the context of a permanent change in land use in this rural location to an industrial use**.**

5.4.2 Soils and Geology

There are no known geological features or hazards located in proximity to CSS 6.

According to GSI mapping, CSS 6 is located within an area underlain by sandstone and mudstone. The site is underlain by a Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones of high groundwater vulnerability.

The construction works within an existing road present a lower risk of impact due to previous disturbance within the area. Significant dewatering works within the area are considered to be unlikely.

Groundwater vulnerability can in general be readily managed with the implementation of standard construction phase mitigation measures, a **Low-Moderate** ranking is assigned to this option.

5.4.3 Landscape and Visual

CSS 6 is located within Fissured Fertile Middleground Landscape Character Area. The site is not situated within any designated sensitive landscape areas and is characterised as having medium landscape sensitivity according to the CDP. The City Harbour and Estuary Landscape Character area (designated as a High Value Landscape) is located less than 2km to the south of the site. CSS 6 is situated on relatively flat land at an elevation of approximately 160m. There is a drop in elevation in a northerly direction from approximately 160m to 130m. The closest designated scenic landscape is the R626 Leamlara to Midleton S43 scenic route located approximately 1.7km to the east. This scenic route is low lying, following the course of the river valley and is enclosed by vegetation. There is a scenic route to the north east of the site (S44: Road between Ardglass and Monaleen Bridge - on the L3601 local road.) SR44 and although more elevated than SR43, is situated over 4km away from site.

The closest residential property to CSS 6 is located approximately 448m north east of the centre point of the asterisk. There are approximately 33 buildings within 1km of the centre point, 28 of which are residential properties.

CSS 6 is located entirely within a commercial forested area which has potential to offer some visual screening.

Overall the ranking can be considered **Low-Moderate.**

5.4.4 Biodiversity

CSS 6 is not located within the boundary of any site designated for the protection of biodiversity. The nearest protected areas to CSS 6 are the Blackwater River (Cork/Waterford) SAC, located approximately 5.2km north of the site, and Great Island Channel SAC, located approximately 8.3km south of the site. The Owenacurra River is located approximately 975m east and 700m north respectively of CSS6.The Owenacurra River flows into the Great Island Channel SAC and Cork Harbour SPA. Potential for effects on European sites have been taken into consideration in the evaluation of the converter station sites in the context of distance to potential sensitive receptors only. The next stage of assessment will consider the potential for significant effects on European Sites in the context of Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC). The need for measures to mitigate against significant effects will be determined.

A preliminary appraisal of the ecological potential of CSS 6 and the immediate surrounding area was made having carried out a site walkover in May 2019. The proposed CSS location is within an area of commercial conifer forestry: post-thicket sitka spruce (*Picea sitchensis*).

A juvenile badger (*Meles meles*) print was observed within a drain within the southern extent of the forestry. NPWS have records of common frog in the locality. Frog may utilise the drains within the forestry for breeding. Additionally, there are records for otter associated with the Owenacurra River.

Figure 19: Juvenile Badger Print

Source: Mott MacDonald, May 2019

Figure 20: Fox (*Vulpes vulpes*) Den

Source: Mott MacDonald, May 2019

Breeding bird surveys of the (Corbally) forest were carried out on 25th April and 5th June 2019. Nocturnal surveys were undertaken on 14th May, 31st May and 28th June 2019.

Table 8: Specially protected raptors noted at Corbally in Spring/Summer 2019

Species	Corbally	Corbally	Nocturnal Visit	Nocturnal Visit	Nocturnal Visit	Breeding status at the site
	25/04/19	05/06/19	14/05/19	31/05/19	28/06/19	
Common Buzzard	-	1	-	-	2	Confirmed Breeding

Two Buzzards were seen at Corbally during the preliminary visit on 20th April and a nest was discovered during the second breeding bird survey on 5th June. An adult and a nearly-fledged juvenile were seen at the nest on the evening of 28th June. Hen Harrier (*Circus cyaneus*), while associated with conifer plantation, was not observed during breeding bird surveys at Corbally.

The HVDC route option is within the local road network (R626), sections of which parallel the Owenacurra River, which is known to support a healthy salmonid population. The R626 passes through the Ballyedmond Wood which includes alluvial woodland (which is priority Annex I type habitat) and old oak woodland (recorded as long established woodland by NPWS, and is Annex I type habitat), which have been recorded to support species protected under the Wildlife Act and Habitats Directive such as stoat and otter.

The HVAC route option is within the local road, which is predominantly surrounded by agricultural land use, with some areas of forestry. The invasive species Japanese knotweed occurs at one location on the road margin along this route.

Ecological Evaluation

While the commercial forestry is botanically of low ecological value, badger is confirmed to use the forestry and buzzard is nesting in the site. Additionally, while the cable will be constructed

within the road, there is potential for indirect damage to or disturbance of protected habitats and species associated with the Owenacurra River, such as salmonids. The site is of **Local Importance (Higher Value)** as per the ecological evaluation examples prescribed in the NRA (2009) *Guidelines for Assessment of Ecological Impacts of National Roads Schemes.*

The **Low-Moderate** ranking would apply to this site.

5.4.5 Waterbodies, Drainage and Flood Risk

There are no known waterbodies within 500m proximity to CSS 6. There are two streams located within 1km of CSS 6 (EPA Codes; 19S44 and 19D49) both which are tributaries of the Owenacurra River located approximately 975m east and 700m north respectively of the site. The Owenacurra River is hydrologically connected to the Great Island Channel SAC [001058], Cork Harbour SPA [004060] and Great Island Channel pNHA [001058]. The proposed HVDC partially runs parallel to the Owenacurra River and will require approximately eight water crossings, including crossing the Owenacurra River and its tributaries. The Owenacurra River north of Midleton has been classified as having good general conditions under the Water Framework Directive status, whilst south of Midleton the river is noted at risk of not achieving good status.

The HVAC cable would be routed partially cross country and partially within the existing road network before connection to Knockraha Substation from the west, crossing a number of existing drainage ditches and approximately five streams.

There is no evidence of flood risk associated within CSS 6, following a review of CFRAM mapping.

Whilst details on the proposed crossing arrangements are not known at this stage, it is expected that sufficient capacity within the existing bridge arrangement is not likely, as such a trenchless construction will be required. However, any works that take place in close proximity to a water body has the potential to impact on the biology, water quality morphology and hydrology of the receiving watercourses. Having regard to the number of potential water crossings, a **Low-Moderate** ranking has been assigned.

5.4.6 Cultural Heritage (Archaeological and Architectural Heritage)

There are no recorded cultural heritage sites located within a 250m radius of the centre point of CSS 6 in **Figure 21**. The closest recorded cultural heritage site is located approximately 408m from the centre point. The nearest NIAH is located approximately 1.4km from the centre point.

The cultural heritage value of CSLZ 6, was raised by a number of respondents during Step 3 consultations and a cultural heritage constraints study by Rubicon Heritage Services Ltd of the shortlisted CSLZs was subsequently commissioned. A copy of the report is provided in Appendix D *Cultural Heritage Report*.

The siting of CSS 6 was selected having regard to the cultural heritage identified in the above referenced report, refer to **Figure 21**. A ranking of **Low-Moderate** has been assigned to CSS 6 due to the elevated nature of the sites and potential for views to and from cultural heritage sites.

5.4.7 Combined Environmental Performance

CSS 6 has a combined environmental performance of **Moderate**. The site is located within a forest and would require tree felling to accommodate the converter station. The site is within a rural setting with limited existing utility infrastructure. Given the elevated nature of the site it is considered that there is potentially limited opportunity for visual screening.

Option	Land Use Planning	Soils and Geology	Landscape and Visual	Biodiversity	Waterbodies, Drainage and Flood Risk	Cultural Heritage	**Combined Environmental Performance**
CSS 6							

5.5 Social Risks and Constraints

5.5.1 Traffic

CSS 6 site can be accessed from the L1540 and the Leamlara to Lisgoold road (L7694). The L1540 is the main route from Watergrasshill to Leamlara and provides relatively good access for construction traffic. The L7694 is a relatively straight local road and access to the site is just over 1km along this from the intersection with the L1540. There are several community facilities located along the local road network between Leamlara and Churchtown (the common point of convergence), education (Leamlara Montessori School and Bishop Aherne National School), religious (Sacred Heart Church & Grotto) and health services (Brookfield Care Centre), amenity areas (Water Rock Golf and East Cork Golf Course and Lisgoold GAA pitch).

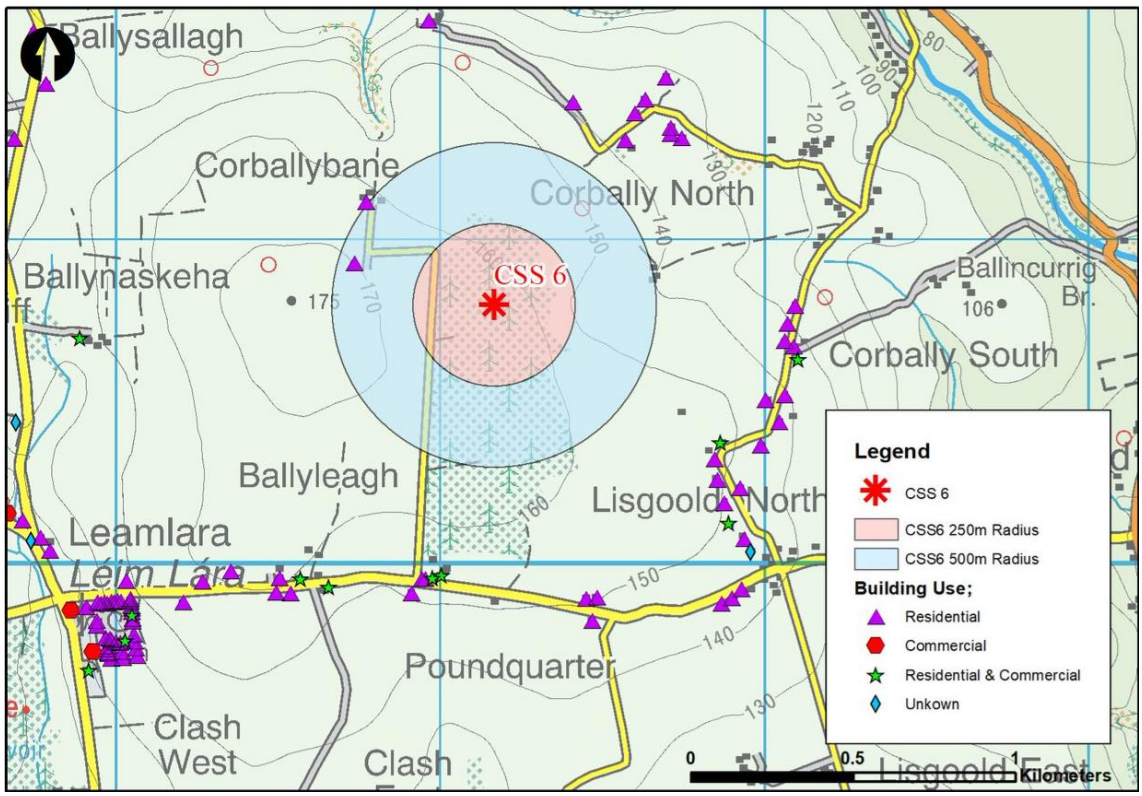
The construction of the converter station and the installation of the cables has the potential to result in temporary traffic disruption. Installation of the cables along roadways will be carried out in sections. The HVAC route option is along roads which are wide enough to accommodate the trench width as well as joint bays within the road. At an installation rate of 25m per day, the route can be installed in approximately 58 crew-weeks. An overall **Moderate** ranking has been assigned to CSS 6, in terms of traffic disruption and disturbance to the Leamlara area.

5.5.2 Noise

According to GeoDirectory data, there are no residential properties within 250m of the centre point of CSS 6 (refer to **Figure 16**).

The nearest residential property to the centre point of CSS 6 is located approximately 448m from the site. There is one residential property located within 500m of the centre point and approximately 33 (the majority of which are residential) buildings within 1km of the centre point. The proposed CSS 6 site is located approximately 1.4km north east of Leamlara village. There are a number of noise sensitive receptors scattered along the existing local road network.

Figure 21: CSS 6 Nearest Sensitive Receptors



Source: Mott MacDonald

The HVDC and HVAC options are routed through Leamlara Village. It is understood that the area immediately surrounding Leamlara is particularly sensitive to potential nuisance impacts with concerns having been raised previously by local community groups in relation to socio-economic impacts in particular associated with transmission infrastructure projects. There are a number of clustered noise sensitive receptors situated on the approach to the village including but not limited to the Leamlara Primary School, Brookfield Nursing Home and Leamlara Montessori. CSS 6 is sited within an area of commercial forestry and the site is relatively flat in elevation. As noted in **Figure 21**, there are a number of one-off rural housing along the existing road network. The proposed HVDC/HVAC will require works along the existing road network in proximity to a number of noise sensitive receptors. These works will result in temporary noise nuisance for the duration of the installation works. However, these works are transient in nature. Given the nature of the settlement patterns in the wider study area, there are scattered rural one-off housing, construction noise nuisance is likely to have a temporary adverse impact on noise sensitive receptors located along the existing road network. All construction related nuisances would be managed by a project-specific Construction Environmental Management Plan (CEMP). A construction Traffic Management Plan (TMP) will form part of this CEMP. An outline CEMP and TMP will be included with the planning applications for the proposed development.

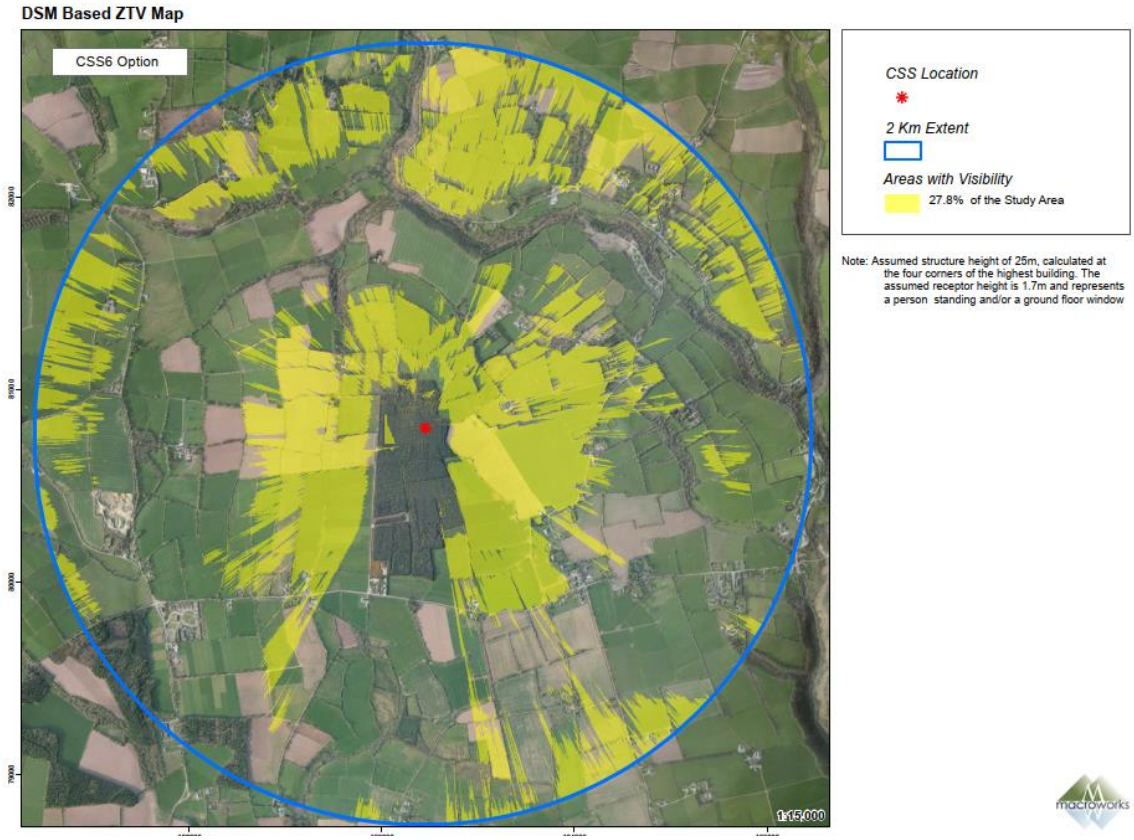
Due to the distance between CSS 6 and local noise sensitive receptors. However, the routing of the proposed HVDC and HVAC through Leamlara village, in terms of potential noise nuisance results in an overall assessment of **Moderate**.

5.5.3 Visual

The ZTV map indicates that although this site is contained within forestry, the height of the tallest structure (25m) is sufficient to rise above the tree tops and will be visible from much of the unforested landscape within 1km. The main groups of houses within this initial Zone of Theoretical Visibility (ZTV) pattern occur in dispersed rural settlements / housing clusters to the northeast and southeast. Low lying land between 1km and 1.5km reduces the potential for visibility within this concentric zone, which is associated with the river valley. Visibility re-emerges at the outer extents of the study area throughout the northern quarters where there is a scattering of houses that are likely to enjoy riverside visual amenity in the direction of the site.

A ranking of **Moderate** has been assigned to CSS 6.

Figure 22: CSS 6 ZTV



Source: MacroWorks

5.5.4 Combined Social Performance

Due to its rural setting, with limited existing utility infrastructure, CSS 6 has been assigned a combined social performance of **Moderate.** While identified as Moderate in terms of specific social performance, it can also be considered that the feedback from the public in relation to this location was not favourable having regard to the perceived nuisance associated with the project on the undisturbed rural environment.

Option	Traffic	Noise	Visual	**Combined Social Performance**
CSS 6				

5.6 Technical Risks and Constraints

There has been no change from Step 3 regarding this criterion for CSS 6, and therefore remains as **Moderate.**

5.7 Deliverability Risks and Constraints

5.7.1 Design Complexity

HVDC Route

This route is generally narrow but constructible. There is a parallel water main along portions of the route that would need to be taken into account. Given the local residential nature of the supply, this is not expected to provide a challenging installation environment and space within the roadway for the narrow HVDC trench is expected to be available.

The route requires the crossing of eight water courses. No information has been received to date on bridges along these roads, but it can reasonably be expected that a number of these crossings will be stone bridges or similar with insufficient deck space to install the cable ducts. As such, HDD would be required off-road for each of these crossings. This route would also require the crossing of Gas Transmission pipelines twice along the route, which would require detailed interaction with Gas Networks Ireland as well as careful planning and installation. It is likely that HDD would be required for crossing the Owenacurra River, and again to cross the Leamlara river.

There is a sewer pipeline which has received planning permission that will run along the length a section of the route. There appears to be sufficient space within the road to allow for both the sewer and the HVDC route, but interaction will be required with Irish Water with respect to routing and final location of the pipeline.

There are four locations on this route which have corners with a bending radius tighter than the 20m minimum for duct installation. This will require cutting the corner, or alternatively, micro-routing cross-country.

Converter Station Site

CSS 6 is located within the Coillte forest. This is a commercial forest and tree clearing would be required to accommodate the proposed works.

The site slopes to the north east and some site levelling will be required however no significant civil design challenges are perceived with this location.

There is an existing telecoms mast located at the southern end of the forest and the proposed converter station could block the path of radio signals. This will need to be investigated further should this option emerge as a best performing option.

HVAC Route

The route is approximately 7.2km in length along roads which are wide enough to accommodate the trench width as well as joint bays within the road.

There is a section of approximately 700m in length which runs parallel to a water main. Given the residential nature of this supply, route installation along this section is not considered onerous.

There are five water courses which require crossing, all of which likely requiring HDD for construction. Some crossings may be possible with a short off-road section and installation of a culvert in the waterway.

The route runs parallel to the proposed solar farm 110 kV cable for approximately 1.3km. While the road appears wide enough to accommodate both cable trenches, design and installation will be challenging along this section and will require detailed interaction with the solar plant to agree and determine the location of the 110 kV cable within the road. The length of the parallel section means that joint bays will be required for both cables. The HVAC route requires approximately 4m in width at a joint bay, and the 110kV cable is expected to require 2.5m in width. As such, staggering the joint bays within the road will be required.

Irrespective of the final location of the routes, the HVAC cable will need to cross the associated 110 kV underground cable serving the solar plant located to the east of Knockraha at least once before reaching the connection point.

Summary

The aspects raised above result in the Design Complexity ranking of CSS 6 to be **Moderate.**

5.7.2 Traffic Disturbance Impact

HVDC Route

Each section under construction would require closure, while at all times maintaining access for local residents. Suitable diversions are available for the other sections along this route.

Converter Station Site

The site can be accessed from the L1540 and the Leamlara to Lisgoold road (L7694). The L1540 is the main route from Watergrasshill to Leamlara and provides relatively good access for construction traffic. The L7694 is a relatively straight local road and access to the site is just over 1km along this from the intersection with the L1540.

HVAC Route

Each section under construction would require closure, while at all times maintaining access for local residents. Suitable diversions are available for the other sections along this route.

Summary

The aspects raised above result in the Traffic Disturbance ranking of CSS 6 being assessed as **Low-Moderate.**

5.7.3 Dependence on other infrastructure projects

HVDC Route

This route has a dependence on the final location of the sewer pipeline which has received planning permission along a section of the route. [Planning Reference Number: 176902].

Converter Station Site

There is no direct dependence on other infrastructure projects in relation to the converter station site.

HVAC Route

This route has a dependence on the associated 110 kV underground cable serving the solar plant located to the east of Knockraha substation, in that this cable will need to be installed in such a way as to facilitate installation of the HVAC cable.

Summary

The aspects raised above result in the Dependence on other Infrastructure ranking of CSS 6 being assessed as **Low-Moderate.**

5.7.4 Permits and Wayleaves

HVDC Route

The final approach to the converter station location would require landowner engagement and consent.

Permits from and significant interaction with Gas Networks Ireland will be required for crossing the gas transmission networks. There are two gas transmission crossings as well as five other service crossings which will require permits to either cross or divert for the first route.

Permits are also likely required for any crossings of the sewer pipeline. At this stage, as the pipeline has not been installed, it is unclear as to how many may be required.

Wayleaves and landowner consent will be required at the locations the route needs to cut the road corner or micro-route cross country.

Converter Station Site

Permits will be required for the delivery of abnormal loads however access routes are relatively good, thus reducing the risk of these being delayed/not granted.

HVAC Route

Wayleaves and landowner engagement will be required for the final approach to the connection point, as well as the initial parts of the route departing the converter station.

Landowner engagement will be required and off-road crossing of watercourses.

Summary

The aspects raised above result in the Permits and Wayleaves ranking of CSS 6 being assessed as **Moderate.**

5.7.5 Implementation Timelines

HVDC Route

The route can be installed at a minimum rate of approximately 50m per crew per day, resulting in a timeline of approximately 68 crew-weeks for the approximately 17km of the route, which is not on the critical path for this project.

Converter Station Site

It is estimated from start of construction to final energisation of the converter station will take approximately 2 years.

HVAC Route

At an installation rate of 25m per day, the 7.2km route can be installed in approximately 58 crew-weeks. This is not on the critical path of the project.

Summary

All aspects are not on the critical path for the project and is therefore considered a **Low** ranking.

5.7.6 Combined Deliverability Performance

The combined deliverability performance of CSS 6 is ranked as **Moderate** due to likely design complexity and anticipated wayleaves required for off-road micro-routing and HDD.

Option	Design Complexity	Traffic Disturbance Impact	Dependence on other Infrastructure	Permits and Wayleaves	Implementation Timelines	**Combined Deliverability Performance**
CSS 6						

5.8 Economic Risks and Constraints

The estimated cost of the converter station, enabling works and associated HVDC and HVAC routes for **CSS 6** is 17% higher than for the lowest option, resulting in an assessment of **Moderate.** The high cost is attributable to the length of the HVAC route as compared to the other routes associated with other CSS options.

5.9 Summary

CSS 6 is situated within a commercial forest in a predominately rural location with dispersed rural settlements / housing clusters in the surrounding areas. The undulating topography surrounding CSS 6 suggests that while visual screening potential is available between 1km and 1.5km of the site, visibility is likely to re-emerge thereafter.

The table below summarises the evaluation of CSS 6.

Option	Environmental	Social	Technical	Deliverability	Economic
CSS 6					

6 Converter Station Site 9A

6.1 Identification of Converter Station Site 9A

Converter Station Site 9A (CSS 9A) was identified for further assessment having regard to the following site selection criteria.

- Feedback from Step 3 consultation
- Visual Impact
- Proximity to sensitive receptors
- Folio Size

6.1.1 Feedback from Consultation

The cultural heritage value of the area of Knockraha, in the context of the War of Independence, was raised by a number of respondents during Step 3 consultations, a cultural heritage constraints study by Rubicon Heritage Services Ltd of the shortlisted CSLZs was subsequently commissioned having regard to undesignated (unrecorded) cultural heritage sites within CSLZ 9 and CSLZ 12, associated with the War of Independence. Avoidance of these sites informed the identification of CSS 9A, CSS 9B and CSS 12.

6.1.2 Visual Impact

Converter Station Location Zone 9, considered in Step 3 of EirGrid's six-step Framework for Grid Development, centred on the connection point, Knockraha 220 kV substation.

The connection point, and the associated overhead lines radiating from the substation, are established transmission infrastructure. The visual impact of a converter station in proximity to Knockraha substation would be considered in this context.

Knockraha substation is however, located on elevated lands with steep elevations to the east, west and south. The surrounding lands slope in a north easterly direction. This drop in elevation may offer some potential for natural local visual screening of the converter station.

6.1.3 Proximity to Sensitive Receptors

There is a population centre approximately 1km to the north west and a cluster of houses approximately 1km to the east of Knockraha substation. A number of houses are located along local roads and adjacent to the substation to the west. The area to the north of the substation is however sparsely populated.

6.1.4 Folio Size

CSS 9A is of sufficient size to accommodate a converter station compound. CSS 9A also avoids a number of physical obstacles, i.e. overhead lines.

Siting a converter station adjacent to Knockraha substation would also mitigate a number of constraints by avoidance, including those associated with installation of the HVAC cable.

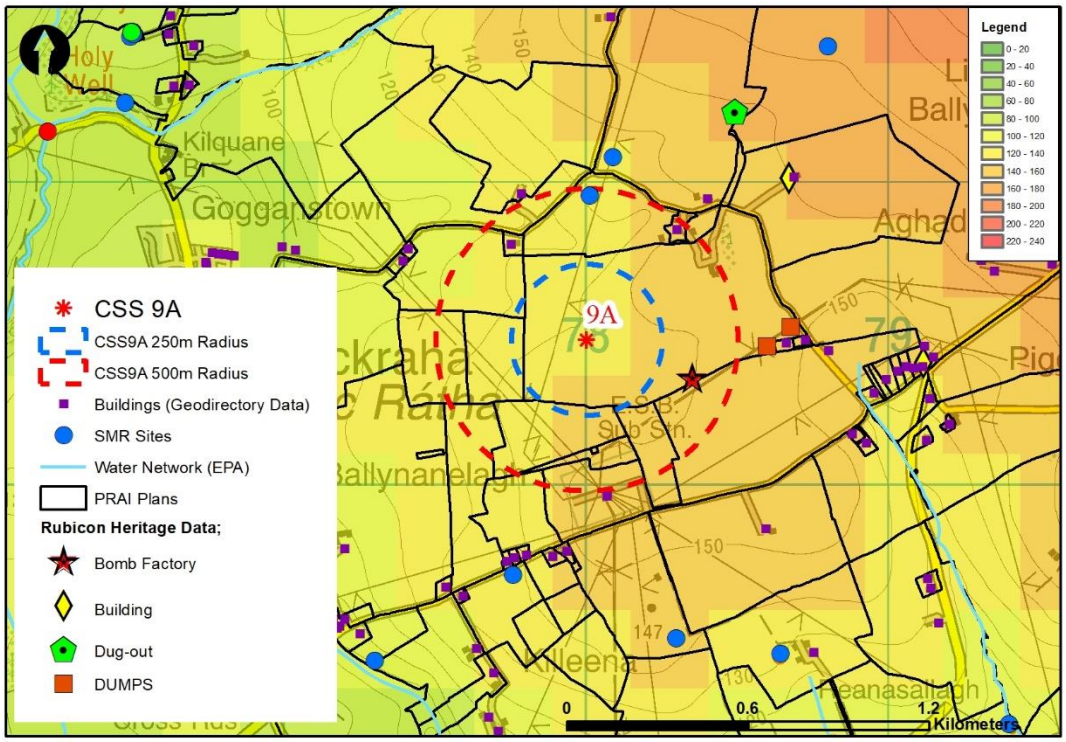
6.2 CSS 9A

CSS 9A is located directly north of the connection point, Knockraha 220 kV station, within the townland of Knockraha East, at a lower elevation than the existing substation.

The site is located within improved agricultural grassland and is surrounded by pasture and tillage.

According to GeoDirectory data, there are no residential properties within 250m of the centre point of CSS 9A (refer to **Figure 23**) the nearest residential property to the centre point of CSS 9A is located approximately 400m to the north. There are two residential properties located within 500m of the centre point and approximately 23 (the majority of which are residential) buildings within 1km of the centre point.

Figure 23: CSS 9A



Source: Mott MacDonald

6.3 CSS 9A Route Options

6.3.1 HVDC Route

The HVDC cable option would be installed in the public road. The route under consideration would follow the road north of Churchtown (the common point of convergence), to Ballyspillane cross roads, then west to East Cork Golf Club, south to Broomfield Ridge before joining the R626, travelling in a westerly direction via Water Rock Golf Course onwards to Carrigane Road until Ballyrichard then north-west past Kilgoura Quarry and turning west towards the road passing the front of Knockraha Substation, cross country, then north and finally cross country directly west to the connection point. The proposed HVDC cable would be routed through a rural countryside. There is a diversity of landscape types and uses across the study area. Data from Corine 2018 datasets indicate that there is a considerable high occurrence of pastures / arable

land with pockets of mixed and coniferous forestry plus made ground proximate to larger settlement areas.

Each section under construction would require closure, while at all times maintaining access for local residents. Diversions are available for all sections along this route.

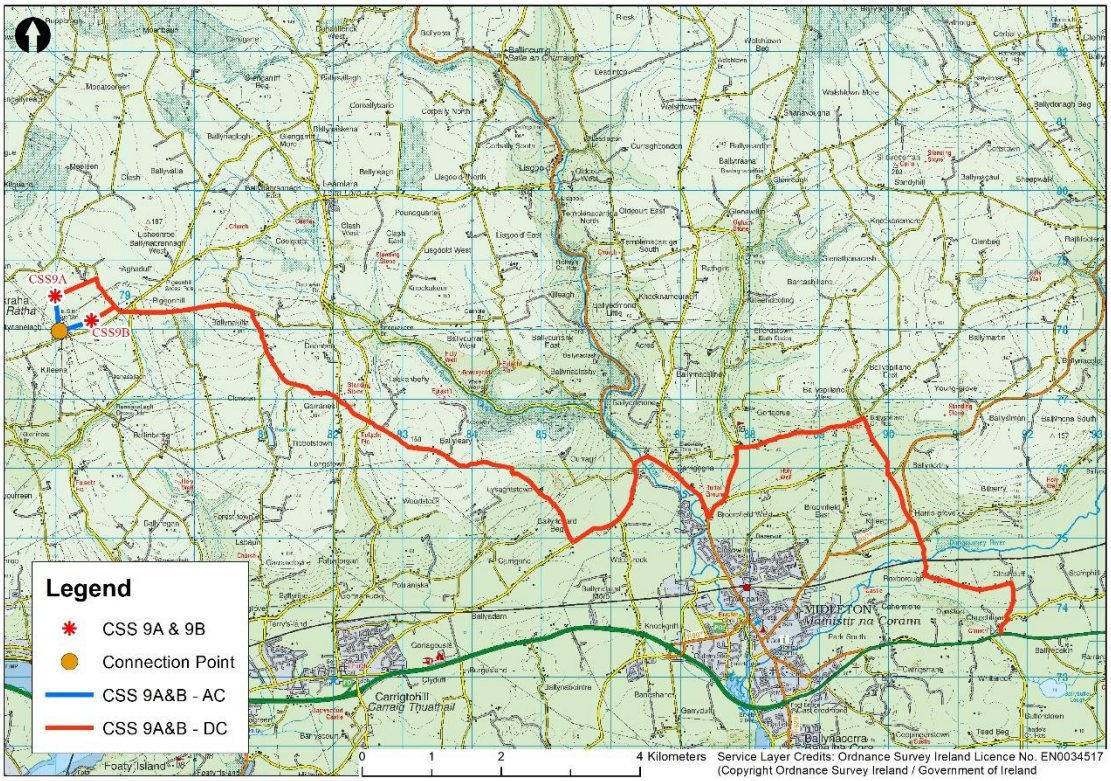
The route can be installed at a minimum rate of approximately 50m per crew per day, resulting in a minimum timeline of approximately 85 crew-weeks for the approximately 21km of the route.

6.3.2 HVAC Route

The HVAC cable option from CSS 9A would connect to Knockraha substation via a cross-country underground cable route of approximately 400m in length.

Locating the substation at CSS 9A would mitigate by avoidance those impacts associated with installation of the HVAC cable in the public road.

Figure 24: Proposed HVDC/HVAC route options from the common point of convergence at Churchtown



Source: Mott MacDonald

The following sections provide further detail regarding CSS 9A in line with the multi criteria analysis. All distances referenced have been taken from the centre point of the asterisk presented in **Figure 23**.

6.4 Environmental Risks and Constraints

6.4.1 Land Use Planning

Site CSS 9A is situated in a predominantly rural area directly north of an extensive electricity transmission substation with overhead lines radiating from the substation. The substation and CSS 9A are located outside of the Metropolitan Cork Green Belt but within the Rural Housing Control Zone.

Cork County Council recently refused planning permission for a dwelling in the townland of Ballynelagh, Knockraha adjacent to CSS 9A. The Council noted the rural area is identified in the 2014 County Development Plan as being an "Area Under Strong Urban Influence". It is the policy of the County Development Plan to discourage urban generated housing and for rural generated housing need criteria for a house in a rural location to be demonstrated. This is of note, as it suggests that the siting of a convertor station in CSS 9A will not of itself prohibit future urban-generated rural residential development in this particular area, as this already occurs by way of strong planning policies.

The existing substation was first constructed in the 1960's and there has been incremental growth since then. There are currently six 110 kV circuits and six 220 kV circuits running above ground into the substation which has subsequently resulted in a large quantity of overhead transmission infrastructure within the surrounding area. The installation of the converter station at Knockraha will result in the intensification of transmission infrastructure within the area. The construction of a converter station at this location will result in a change of land-use from agriculture to utility. Whilst, CSS 9A is proximate to Knockraha substation it would not be contiguous with the existing and associated established infrastructure. A **Moderate** ranking has therefore been assigned in terms of land-use planning.

6.4.2 Soils and Geology

The GSI quaternary mapping indicates that CSS 9A is located within sandstone with rock outcrops to the north and east. The site is underlain by a Locally Important Aquifer with bedrock which is Moderately Productive only in Local Zones of high vulnerability. There are also areas of extreme vulnerability corresponding to the rock outcrops.

The construction works within an existing road present a lower risk of impact due to previous disturbance within the area. Significant dewatering works within the area are considered to be unlikely.

Groundwater vulnerability can in general be readily managed with the implementation of standard construction phase mitigation measures, a **Low-Moderate** ranking is assigned to this option.

6.4.3 Landscape and Visual

CSS 9A is located within the 'Fissured Fertile Middleground' landscape character area and is defined as medium value landscape according to the CDP. The City Harbour and Estuary Landscape Character area (designated as a High Value Landscape) is located less than 2km to the south of the site. The site is elevated in relation to the surrounding rural area and there are several overhead lines leading from the existing Knockraha substation.

The site is not situated within any designated sensitive landscape areas and the landscape type is characterised as having medium landscape sensitivity. There are no designated scenic landscapes or prospects along the proposed cable route. The closest is scenic route S42 which

is located to the south of CSS 9A on a local Road at Forest-town, north-west of Carrigtwohill and Westwards to Caherlag.

The area contains a number of existing overhead transmission infrastructure, leading to the existing Knockraha substation. The addition of CSS 9A in this area may result in a minor intensification of infrastructure in the receiving landscape but conversely it would not be uncharacteristic in this area. In terms of the overall potential landscape impact, this option has a **Low-Moderate** ranking assigned.

6.4.4 Biodiversity

The proposed CSS 9A site is located in a rural area of east Cork. The site is not located within any sites designated for nature conservation nor does it directly adjoin one. Potential for effects on European sites have been taken into consideration in the evaluation of the converter station sites in the context of distance to potential sensitive receptors only. The next stage of assessment will consider the potential for significant effects on European Sites in the context of Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC). The need for measures to mitigate against significant effects will be determined.

A preliminary appraisal of the ecological potential of CSS 9A and the immediate surrounding area was made having carried out a site walkover in August 2019. The lands under consideration comprise improved agricultural grassland, dominated by rye grass (*Lolium perenne*). The lands comprise several fields separated by heavily managed hawthorn (*Crataegus monogyna*) hedge, with some areas of Leylands cypress *(Cuprocyparis leylandii)*. Rabbits (*Oryctolagus cuniculus*) are present in all hedgerows within the lands. There is a mature ash treeline along the western boundary with potential bat roost features. A large open field-drain traverses the agricultural grassland. The drain is surrounded by wet grassland. This area will not be affected by the project.

There are no records of protected flora or fauna within the locality.

Figure 25: Potential Bat Roost Feature

Source: Mott MacDonald (August 2019)

Figure 26: Wet Grassland Along Drain

Source: Mott Macdonald (August 2019)

Breeding bird surveys of lands at Knockraha Substation and surrounding area (including CSS 9A and CSS 9B) were carried out in April 2019 and June 2019. The results of the breeding bird surveys are presented below.

Table 9: Species of conservation concern recorded at Knockraha in Spring/Summer 2019

Species	Knockraha (23rd April 2019)	Knockraha (8th June 2019)	Breeding/Non-breeding at the site
Greenfinch	-	3	Confirmed breeding
Robin (*Erithacus rubecula)*	4	5	Confirmed breeding
Linnet	1	-	Possibly breeding
Yellowhammer (*Emberiza citronella*)	-	1	Possibly breeding

Note: Red and Amber colours are used to highlight species of conservation concern as per K. Colhoun & S. Cummins (2013) 'Birds of Conservation Concern in Ireland 2014–2019'. Irish Birds 9: 523-544 (2013)

The proposed HVDC cable will be routed along the existing road network, considerable sections along the route are narrow roads and bordered by treelines and hedgerows. In terms of biodiversity and local fauna and flora, the installation of the HVDC cable would require the removal of sections of treelines and hedgerows to provide clearance for the proposed joint bays. The removal of sections of linear habitat has the potential to result in habitat fragmentation and impacts on protected species such as badgers and bats. Route optimisation including the siting of joint bays would seek to minimise the loss of habitats where possible.

Ecological Evaluation

On the basis of the preliminary appraisal, the lands are classified as **Local Importance (lower value)** as per the ecological evaluation examples prescribed in the NRA (2009) *Guidelines for Assessment of Ecological Impacts of National Roads Schemes.*

There will be some temporary negative disturbance impacts to birds in the immediate locality during the construction phase of the proposed works. However, these impacts can be easily offset through route optimisation and appropriate ecological mitigation. Given the low ecological value of this option, a ranking of **Low** would apply to this option.

6.4.5 Waterbodies, Drainage and Flood Risk

There are no known waterbodies within CSS 9A. As noted above, a large open field-drain traverses the agricultural grassland. The drain is surrounded by wet grassland, there is potential for indirect impacts (runoff and dust) on the watercourse. According to the OSi mapping, the closest documented water body is a stream located approximately 750m west of the site (EPA code: IE_SW_19B060800), a tributary of the River Lee. The Butlerstown River has been classified as having good general conditions under this Water Framework Directive status.

There is no evidence of flood risk within site CSS 9A. CSS 9A occurs outside the CFRAM fluvial risk area. According to the CFRAM mapping a section of the proposed HVDC route north of Midleton is located within the Owenacurra catchment, the road is susceptible to flooding, and therefore presents a risk in terms of operational and maintenance access during the lifetime of the cable.

Any works that take place in close proximity to a water body has the potential to impact on the biology, water quality morphology and hydrology of the receiving watercourses. The proposed

HVDC cable will require crossing seven watercourses including crossing the Owenacurra River. North of Midleton, the Owenacurra River has been classified as having good general conditions under the Water Framework Directive (WFD) status, whilst south of Midleton the river is noted at risk under the WFD status. Whilst details on the proposed crossing arrangements are not known at this stage, it is expected that sufficient capacity within the existing bridge arrangement is not likely, as such a trenchless construction will be required. Having regard to the number of potential water crossing, the **Low – Moderate** ranking would apply.

6.4.6 Cultural Heritage (Archaeological and Architectural Heritage)

There are no recorded cultural heritage sites located within a 250m radius of the centre point of CSS 9A in **Figure 27**. The closest recorded cultural heritage site is located approximately 477m from the centre point. The nearest National Inventory of Architectural Heritage (NIAH) item is located approximately 1.9km from the centre point.

The cultural heritage value of the area of Knockraha, in the context of the War of Independence, was raised by a number of respondents during Step 3 consultations, a cultural heritage constraints study by Rubicon Heritage Services Ltd of the shortlisted CSLZs was subsequently commissioned having regard to undesignated cultural heritage sites within CSLZ 9 and CSLZ 12, associated with the War of Independence.

A copy of the report is provided in Appendix D Cultural Heritage Report, an Archaeological, Architectural and Cultural Heritage constraints study of the six Step 3 Short-listed CSLZ's prepared by Rubicon Heritage Services Ltd.

The siting of CSS 9A was selected having regard to the cultural heritage identified in the above referenced report, refer to **Figure 27**. A ranking of **Moderate** has been assigned to CSS 9A due to the elevated nature of the sites and potential for views to and from cultural heritage sites.

6.4.7 Combined Environmental Performance

CSS 9A has a combined environmental performance of **Moderate**. Whilst, CSS 9A is proximate to Knockraha substation it would not be contiguous with the existing and associated established infrastructure. Siting the converter station in proximity to Knockraha substation would however mitigate a number of environmental impacts by avoidance.

Option	Land Use Planning	Soils and Geology	Landscape and Visual	Biodiversity	Waterbodies, Drainage and Flood Risk	Cultural Heritage	**Combined Environmental Performance**
CSS 9A							

6.5 Social Risks and Constraints

6.5.1 Traffic

The siting of the converter station in proximity to Knockraha substation mitigates disturbance / disruption impacts on the local road network associated with the installation of the HVAC cable, as it would be installed cross country in agricultural lands.

There would however be localised but temporary traffic and road disruption associated with the construction of the converter station and installation of the HVDC cables.

A minimum estimated installation rate of approximately 50m per crew per day applies to the HVDC route, resulting in a timeline of approximately 85 crew-weeks for the approximately 21km of the route.

As with all of the converter station site options under consideration, it is anticipated that road closures, except for local access, will be required for all potential HVDC routes.

Data from Corine 2018 datasets indicates that there is a considerable high occurrence of pastures / arable with pockets of mixed and coniferous forestry plus made ground proximate to larger settlement areas along the HVDC cable route. The installation of the HVDC cable will result in temporary disturbance to agricultural land use practices. Any impact that restricts the movement of livestock to and from the farms plus movement of dairy lorries or machinery will have a medium potential to cause change. However, the appointed contractor will prepare a traffic management plan which will incorporate measures to minimise the potential temporary impact and facilitate the ongoing farming operations during the construction phase, these may include agreement to temporarily halt works or scheduling of works to avoid busy farming operations such as silage cutting season.

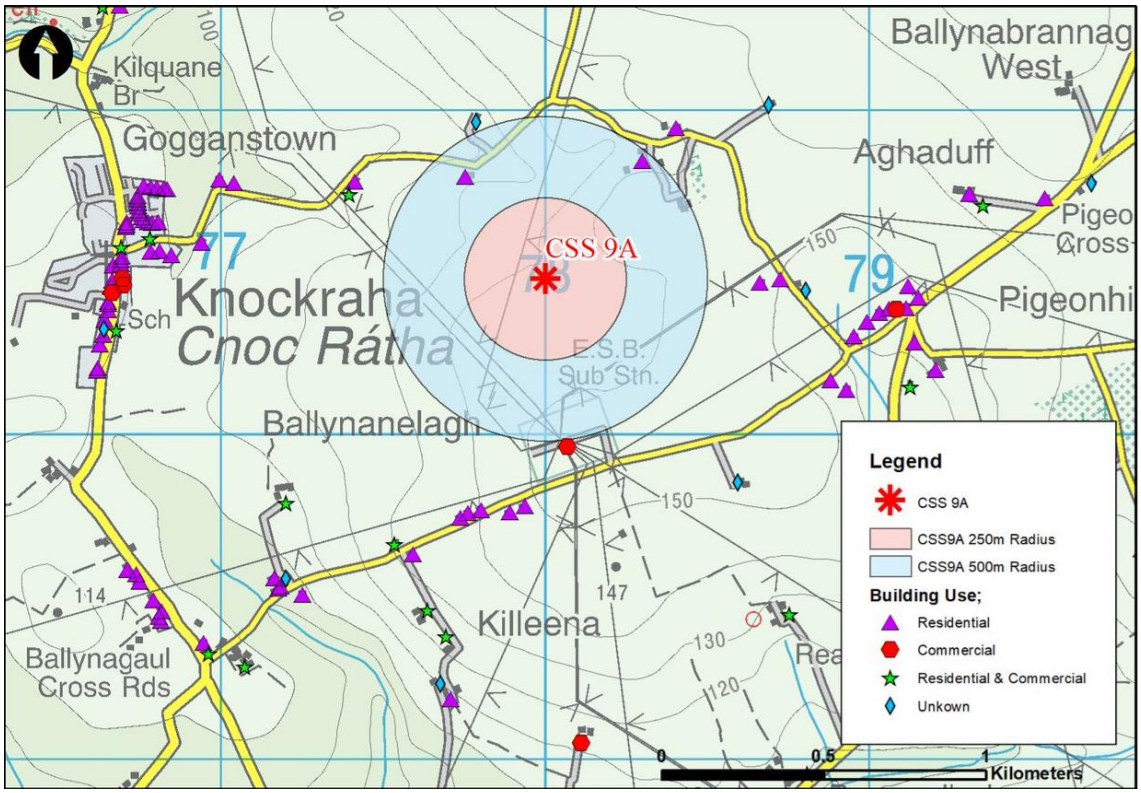
There are several community facilities located along the local road network between Knockraha and Churchtown (the common point of convergence). An increase of construction traffic on this route resulting from temporary diversions would have potential to have temporary adverse indirect impacts on these services in additional to those accessing these community facilities.

The installation of the HVDC cable has the potential to have temporary adverse impacts on the recreational value of the area during construction. The proposed HVDC will be routed adjacent to two golf courses. The identified option will result in traffic management constraints on the operation of these golf courses during construction. Having regard to the above, a **Low-Moderate** ranking has been assigned.

6.5.2 Noise

According to GeoDirectory data, there are no residential properties within 250m of the centre point of CSS 9A (refer to **Figure 27**) the nearest residential property to the centre point of CSS 9A is located approximately 400m to the north. There are two residential properties located within 500m of the centre point and approximately 23 (the majority of which are residential) buildings within 1km of the centre point.

Figure 27: CSS 9A Nearest Sensitive Receptors



Source: Mott MacDonald

According to the EPA mapping strategic noise mapping along major roads[1], noise levels along the N25 and M8 road corridors have elevated noise levels in the order of 55-60dB. The CSS 9A site is not located in proximity to a population centres and is remote from major road traffic noise, in terms of noise sensitive receptors. The potential for noise impacts were noted as a key concern raised by the Step 3 public consultation process. The public referenced concerns around noise pollution that could potentially be associated with the project, both during the construction phase and while the converter station is operational. It is understood that the area immediately surrounding the Knockraha substation is particularly sensitive to potential nuisance impacts with concerns having been raised previously by local community groups in relation to socio-economic impacts in particular associated with transmission infrastructure projects. There are no known community facilities situated within 500m of the site. All construction related nuisances would be managed by a project-specific Construction Environmental Management Plan (CEMP). A construction Traffic Management Plan (TMP) will form part of this CEMP. An outline CEMP and TMP will be included with the planning applications for the proposed development.

CSS 9A is sited at a lower elevation to surrounding lands and Knockraha substation. This dip in elevation may provide some potential for natural screening of the converter station. Due to existing topography and distance between the CSS 9A and local noise sensitive receptors, in-

[1] Cork County Council, Noise Action Plan 2018--2023

combination with potential site optimisation and micro-siting, a **Low-Moderate** ranking has been assigned.

6.5.3 Visual

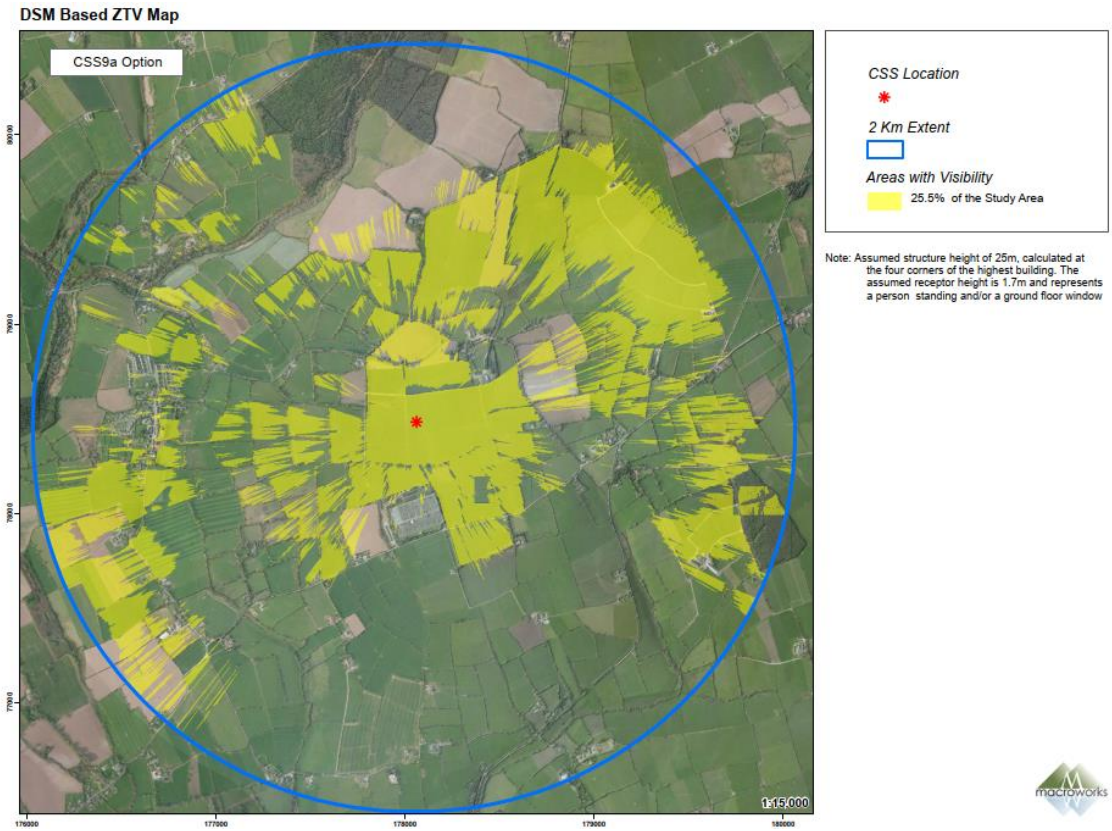
CSS 9A site is located north of the existing substation. Knockraha general environs has clustered residential development, particularly within its northern and western areas, with a well-defined social and community core made up of Knockraha National School, Knockraha community centre, St. Mary's Church and the Old School House Childcare Facility. There are no known community facilities situated within 500m of the site.

The Knockraha 220 kV substation is located to the south-east of the village along a local road that also accommodates scattered residential development with some in close proximity to the substation.

Most of the areas within the ZTV pattern (yellow areas) in **Figure 28** occur in uninhabited agricultural fields. A very high proportion of the dwellings benefit from screening provided by intervening vegetation.

In response to historic proposals to extend and modify the Knockraha substation and surrounding transmission infrastructure, the village, represented by Knockraha Community Association, has actively opposed further transmission development through written observations and appeals to Cork County Council and An Bord Pleanála. Due to the significance of Knockraha substation to the delivery of the Project, the Knockraha Community Association is a key stakeholder on this project. The proposed new converter station would result in an increase to the intensity of the existing electrical infrastructure, but as stated above the position of the converter station to the existing Knockraha substation and the potential siting of the station in a natural dip in the ground topography means there is an opportunity to minimise this visual risk by micro-siting the converter station as such the potential impact would be very localised in the context of proximity to existing transmission infrastructure. The proposed HVDC cable route would result in temporary visual disturbance. Having regard to the above a ranking of **Moderate** has been assigned.

Figure 28: CSS 9A ZTV



Source: MacroWorks

6.5.4 Combined Social Performance

CSS 9A has a combined social performance of **Moderate.** The key driver for this overall score relates to the localised visual impacts.

Option	Traffic	Noise	Visual	**Combined Social Performance**
CSS 9A				

6.6 Technical Risks and Constraints

There has been no change from Step 3 regarding this criterion for CSS 9A, and therefore remains as **Low-Moderate.**

6.7 Deliverability Risks and Constraints

6.7.1 Design Complexity

HVDC Route

This route is generally narrow but constructible. There is a parallel water main along portions of the route that would need to be taken into account. Given the local residential nature of the

supply, this is not expected to provide a challenging installation environment and space within the roadway for the narrow HVDC trench is expected to be available.

The route requires the crossing of seven water courses. No information has been received to date on bridges along these roads, but it can reasonably be expected that these bridge crossings will be stone bridges or similar with insufficient deck space to install the cable ducts. As such, HDD would be required off-road for each of these crossings. This route would also require the crossing of Gas Transmission pipelines twice along the route which would require detailed interaction with Gas Networks Ireland as well as careful planning and installation. It is likely that HDD would be required for crossing the Owenacurra River.

A solar plant has received planning consent near Lysaghstown, the site boundary for which straddles the road. While the road will still remain open and owned by Cork County Council, it can reasonably be expected that Medium Voltage (MV) cable will cross the road at a number of locations across the solar site. These crossings will be made at right angles and are not expected to be difficult to achieve with the HVDC cable.

A crossing under the associated 110 kV underground cable serving the solar plant located to the east of Knockraha substation would be required. This is not considered onerous but will require knowledge of the location and trench cross-section for the cable prior to finalising the route design.

There are eight locations on this route which have corners with a bending radius tighter than the 20m minimum for duct installation. This will require cutting the corner, or alternatively, micro-routing cross-country.

Converter Station Site

CSS 9A is located north of the existing Knockraha 220 kV substation. The site is agricultural land in pasture with well-drained soil. The site is gradually sloping northward downwards away from Knockraha Station.

The site is at a lower elevation at approx. 140m AOD to the neighbouring Knockraha station (147m AOD).

As the site is gradually sloped there will be some element of site levelling needed however this is not foreseen to present any significant design challenges with this location.

HVAC Route

There is no road network applicable for a HVAC route connecting CSS 9A to the substation. A cross-country route of approximately 400m directly south from CSS 9A connecting to the Substation is the considered option.

There are no crossings or other issues which may impact the design complexity.

Summary

The aspects raised above result in the Design Complexity ranking of CSS 9A being assessed as **Low-Moderate**.

6.7.2 Traffic Disturbance Impact

HVDC Route

Each section under construction would require closure, while at all times maintaining access for local residents. Diversions are available for the other sections along this route.

Converter Station Site

Heavy/abnormal load vehicles are required to transport HV equipment such as transformers to the site. Considering this site is adjacent to Knockraha station and that similar heavy/abnormal load vehicles have accessed the station it is assumed the road network leading to CSS 9A can accommodate these vehicles without significant additional civil works such as local road widening or bridge strengthening.

HVAC Route

The HVAC route has no traffic disturbance impact because the route is cross-country.

Summary

The aspects raised above result in the Traffic Disturbance ranking of CSS 9A being assessed as **Low-Moderate**.

6.7.3 Dependence on other infrastructure projects

Neither the routes nor the converter station site have a dependence on other infrastructure projects, and is therefore assessed to be a **Low** ranking.

6.7.4 Permits and wayleaves

HVDC Route

Two gas transmission crossings as well as 11 other services are applicable for this route and require agreement with asset owners. Additional land and associated permitting and wayleaves will be required for the off-road HDD locations along this route. The route has four corners which have a bending radius of less than 20m which is the technical limit of the cable ducting. Cutting the corner at these locations will require wayleaves and landowner consent.

A short cross-country section near Knockraha substation would require interaction with private landowners and obtaining of wayleaves for same. Additionally, the final approach to the converter station location would require landowner engagement and consent.

There is a solar plant which has received planning permission near Lysaghtstown, the boundary of which straddles the route. Interaction would be required with the plant owner to verify the locations and depth of any MV cable crossing the route section.

Wayleaves and landowner consent will be required where the route needs to cut the road corner or micro-route cross country.

Converter Station Site

Permits will be required from the local council for transporting the transformers to site as these will be classified as abnormal loads.

HVAC Route

There is expected to be minimal requirement for permits and wayleaves as the connection route traverses a short length of cross country land, parts of which would be within the converter station footprint and other parts within ESB ownership.

Summary

The permits and wayleaves risk is assessed to be **Moderate**.

6.7.5 Implementation timelines

HVDC Route

The route can be installed at a minimum rate of approximately 50m per crew per day, resulting in a timeline of approximately 85 crew-weeks for the approximately 21km of the route.

Converter Station Site

From start of construction to final energisation of the converter station will take approximately two years.

HVAC Route

At an installation rate of 25m per day, the route will take approximately three crew-weeks to install.

Summary

All aspects are not on the critical path for the project and is therefore considered a **Low** ranking.

6.7.6 Combined Deliverability Performance

The combined deliverability performance of CSS 9A is ranked as **Low-Moderate** with the dominating feature being the anticipated wayleaves required for off-road micro-routing.

Option	Design Complexity	Traffic Disturbance Impact	Dependence on other Infrastructure	Permits and Wayleaves	Implementation Timelines	**Combined Deliverability Performance**
CSS 9A						

6.8 Economic Risks and Constraints

The estimated cost of the converter station, enabling works and associated HVDC and HVAC routes for **CSS 9A i**s the lowest option and results in an assessment of **Low-Moderate.** Higher costs of the converter civil works as compared to other sites are due to the need for cut-and-fill, but in terms of the cable routes the site performs as well as CSS 9B and better by a substantial margin than the other sites.

6.9 Summary

While CSS 9A is proximate to Knockraha substation it would not be contiguous with the existing and associated established infrastructure. The table below summarises the evaluation of CSS 9A.

Option	Environmental	Social	Technical	Deliverability	Economic
CSS 9A					

7 Converter Station Site 9B

7.1 Identification of Converter Station 9B

Converter Station Site 9B (CSS 9B) was identified for further assessment having regard to the following site selection criteria.

- Feedback from Step 3 consultation;
- Visual Impact;
- Proximity to sensitive receptors; and
- Folio Size.

7.1.1 Feedback from Consultation

The cultural heritage value of the area of Knockraha, in the context of the War of Independence, was raised by a number of respondents during Step 3 consultations. A cultural heritage constraints study by Rubicon Heritage Services Ltd of the shortlisted CSLZs was subsequently commissioned having regard to undesignated cultural heritage sites within CSLZ 9 and CSLZ 12, associated with the War of Independence, avoidance of these sites informed the identification of CSS 9B.

7.1.2 Visual Impact

As detailed previously, locating the converter station adjacent to the connection point would mitigate a number of constraints by avoidance, in particular those associated with the installation of the HVAC cable.

While there is limited screening potential available directly adjacent to Knockraha substation, views of a converter station would be considered in the context of existing and long established transmission infrastructure, site and design optimisation of the station.

7.1.3 Proximity to Sensitive Receptors

There is a population centre approximately 1km to the north west. While there is a cluster of houses approximately 1km to the east of Knockraha substation, the lands directly east of the substation are sparsely populated.

7.1.4 Folio Size

CSS 9B is of sufficient size to accommodate a converter station compound. CSS 9B also avoids a number of physical obstacles, however a 110 kV overhead line may require diversion.

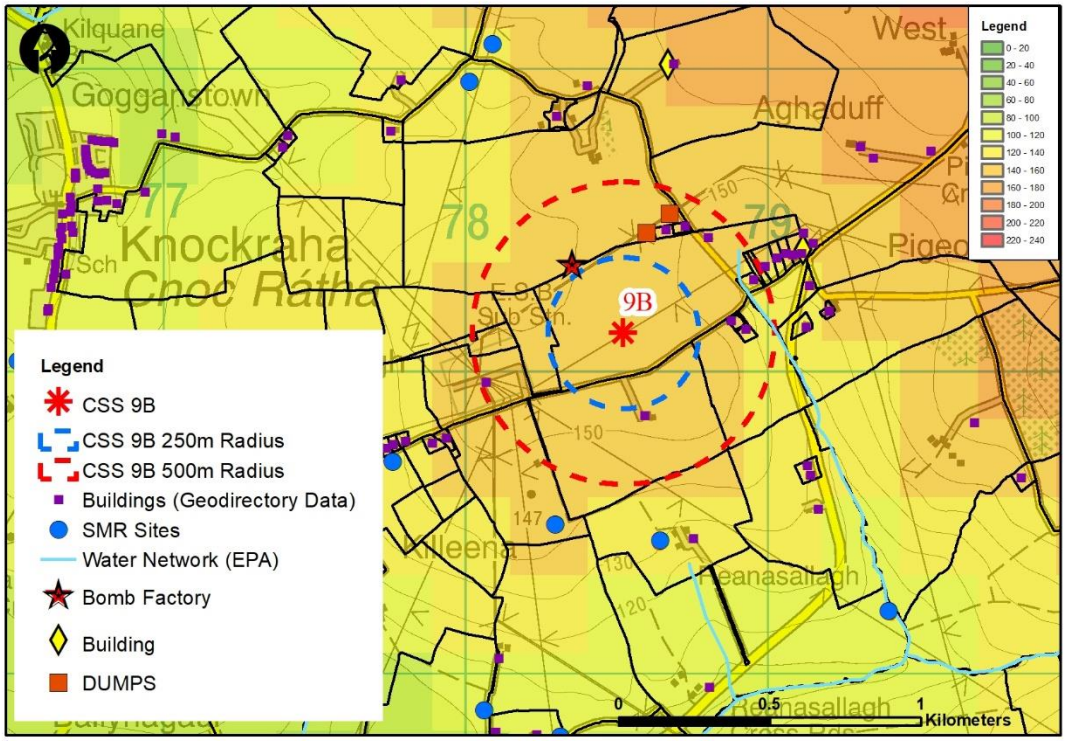
7.2 CSS 9B

CSS 9B is located directly east of the existing Knockraha 220 kV substation. The site is situated within the townland of Knockraha East within the Electoral Division of Knockraha.

CSS 9B is located on agricultural land and is surrounded by pasture and tillage.

Knockraha Village is located approximately 1.8km north west of the proposed site. According to GeoDirectory data, the nearest residential property is located approximately 283m to the south of the site. There are five residential properties within 500m of CSS 9B and approximately 24 residential properties within 1km of the site.

Figure 29: CSS 9B



Source: Mott MacDonald

7.3 CSS 9B Route Options

7.3.1 HVDC Route

The HVDC cable connection option would be installed in the public road. The route under consideration would follow the road north of Churchtown (the common point of convergence), to Ballyspillane cross roads, then west to East Cork Golf Club, south to Broomfield Ridge before joining the R626, travelling in a westerly direction via Water Rock Golf Course onwards to Carrigane Road until Ballyrichard then north-west past Kilgoura Quarry then turning west towards the road passing the front of Knockraha Substation, cross country for a section, then north and finally cross country directly west to the connection point.

The length of this route is approximately 21km.

Each section under construction would require closure, while at all times maintaining access for local residents. Diversions are available for the sections along this route.

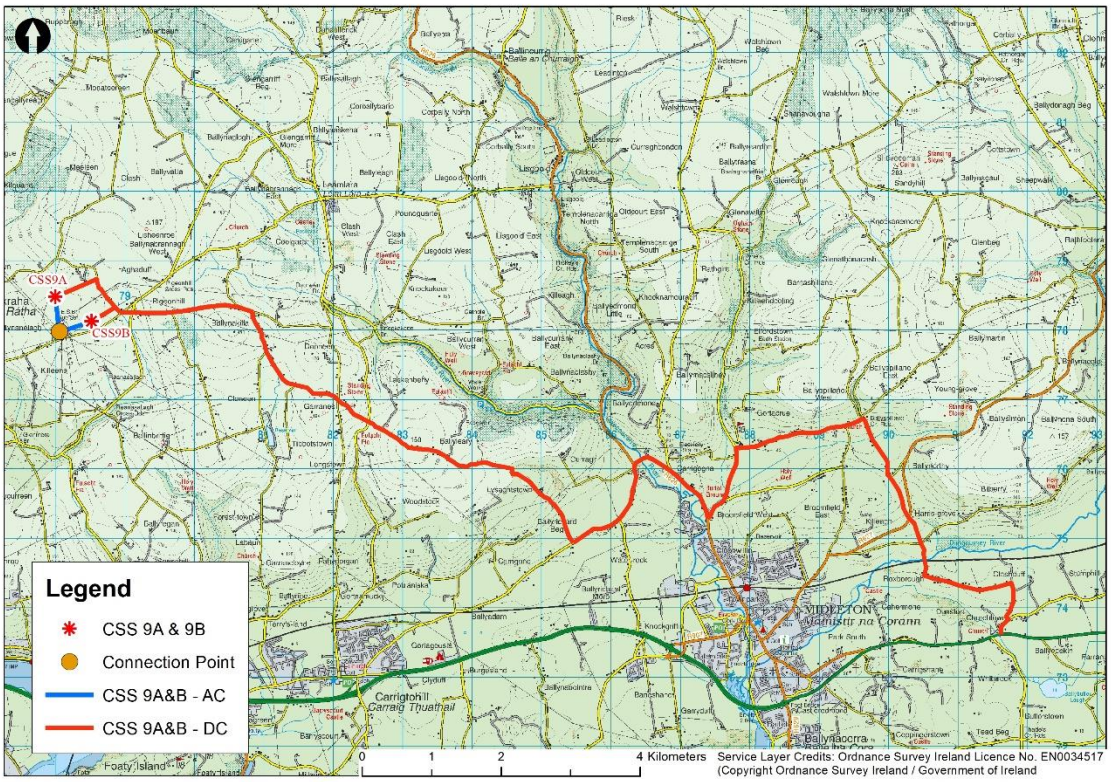
The route can be installed at a minimum rate of approximately 50m per crew per day, resulting in a timeline of approximately 85 crew-weeks for the approximately 21km of the route.

7.3.2 HVAC Route

The HVAC cable option from CSS 9B would connect to Knockraha substation via a cross-country underground cable route of approximately 400m in length.

Locating the substation at CSS 9B would mitigate by avoidance those impacts associated with installation of the HVAC cable in the public road.

Figure 30: Proposed HVDC/HVAC route options from the common point of convergence at Churchtown



Source: Mott MacDonald

The following sections provide further detail regarding CSS 9B in line with the multi criteria analysis. All distances referenced have been taken from the centre point of the asterisk presented in **Figure 29**.

7.4 Environmental Risks and Constraints

7.4.1 Land Use Planning

Site CSS 9B is situated in a predominantly rural area directly east of an long-established electricity transmission substation with overhead lines radiating from the substation. The substation and CSS 9B are located outside of the Metropolitan Cork Green Belt but within the Rural Housing Control Zone.

Cork County Council recently refused planning permission for a dwelling in the townlands of Ballynelagh, Knockraha adjacent to CSS 9B. The Council noted the rural area is identified in the 2014 County Development Plan as being an “Area Under Strong Urban Influence”. It is the policy of the County Development Plan to require that a need-criteria for rural generated housing in a rural location has been demonstrated. This is of note, as it suggests that the siting

of a convertor station in CSS 9A will not of itself prohibit future urban-generated rural residential development in this particular area, as this already occurs by way of strong planning policies.

As noted previously, there has been incremental growth within the existing substation since it was first constructed in the 1960's. The installation of the CSS 9B will result in the intensification of transmission infrastructure within the Knockraha area. The construction of a converter station at this location will result in a change of land use from agriculture to utility.
Overall the risk can also be considered **Low-Moderate** as the CSS 9B is in close proximity to the existing Knockraha Substation.

7.4.2 Soils and Geology

According to GSI mapping, CSS 9B is located within an area of sandstone. The site is underlain by a Locally Important Aquifer Bedrock which is Moderately Productive only in Local Zones. The groundwater is of Extreme vulnerability in proximity to the substation.

The construction works within an existing road present a lower risk of impact due to previous disturbance within the area. Significant dewatering works within the area are considered to be unlikely.

Groundwater vulnerability can in general be readily managed with the implementation of standard construction phase mitigation measures, a **Low-Moderate** ranking is assigned to this option.

7.4.3 Landscape and Visual

CSS 9B is located within the 'Fissured Fertile Middleground' landscape character area and is defined as medium value landscape according to the CDP. The City Harbour and Estuary Landscape Character area (designated as a High Value Landscape) is located less than 2km to the south of the site. The site is elevated in relation to the surrounding rural area.

The site is not situated within any designated sensitive landscape areas and the landscape type is characterised as having medium landscape sensitivity. The closest designated scenic landscape or prospect is scenic route S42 located to the south on a local Road at Forest-town, north-west of Carrigtwohill and Westwards to Caherlag.

The area contains a number of existing overhead transmission structures, leading to the existing Knockraha substation.

In terms of the overall potential landscape impact, this option has a **Low-Moderate** ranking assigned.

7.4.4 Biodiversity

CSS 9B is not located within any sites designated for nature conservation nor does it directly adjoin one. Potential for effects on European sites have been taken into consideration in the evaluation of the converter station sites in the context of distance to potential sensitive receptors only. The next stage of assessment will consider the potential for significant effects on European Sites in the context of Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC). The need for measures to mitigate against significant effects will be determined.

A preliminary appraisal of the ecological potential of CSS 9B and the immediate surrounding area was made having carried out a site walkover in July 2019. The site is located within lands comprising improved agricultural grassland and hedgerows. There are no records of protected flora or fauna within the locality.

Figure 31: Typical agricultural grassland and hedgerows encountered

Source: Mott MacDonald (July 2019)

Mammal tracks were recorded adjacent to a number of the hedgerows, and the hedgerows are likely to support small mammals. There was no supporting habitat for otter recorded. The trees within the hedgerows surrounding CSS 9B site had negligible bat potential. The hedgerows have potential to support small mammals.
The HVDC cable will be routed along the existing road network, considerable sections along the route are narrow roads and bordered by treelines and hedgerows. In terms of biodiversity and local fauna and flora, the installation of the HVDC would require the removal of sections of treelines and hedgerows to provide clearance for the proposed joint bays. The removal of sections of linear habitat has the potential to result in habitat fragmentation and impacts on protected species such as badgers and bats. Route optimisation including the siting of joint bays would seek to minimise the loss of habitats where possible.

Breeding bird surveys of lands at Knockraha Substation and the surrounding area (including CSS 9A and CSS 9B) were carried out in April 2019 and June 2019.

Table 10: Species of conservation concern) recorded at Knockraha in Spring/Summer 2019

Species	Knockraha (23rd April 2019)	Knockraha (8th June 2019)	Breeding/Non-breeding at the site
Greenfinch	-	3	Confirmed Breeding
Robin	4	5	Confirmed Breeding
Linnet	1	0	Possibly breeding
Yellowhammer	-	1	Possibly breeding

Note: Red and Amber colours are used to highlight species of conservation concern as per K.Colhoun & S.Cummins (2013) 'Birds of Conservation Concern in Ireland 2014–2019'. Irish Birds 9: 523-544 (2013)

Ecological Evaluation

On the basis of the preliminary appraisal, the site is classified as of **Local Importance (lower value)** as per the ecological evaluation examples prescribed in the NRA (2009) *Guidelines for Assessment of Ecological Impacts of National Roads Schemes.*

CSS 9B site is positioned on habitats not considered to be of significant ecological value. There will be localised negative impacts to habitats of low ecological value. There will also be some temporary negative disturbance impacts to fauna in the immediate locality during the construction phase of the proposed works. However, both of these impacts can be easily offset through route optimisation and appropriate ecological mitigation. Given the low ecological value of this option, a ranking of **Low** would apply to this option.

7.4.5 Waterbodies, Drainage, Flood Risk

There are no known waterbodies within CSS 9B. The closest water body is a stream located approximately 400m east of the site (EPA code: IE_SW_19B060800) and is tributary of the Owenacurra River. There is potential for indirect impacts (runoff and dust) on the watercourse. The Butlerstown River has been classified as having good general conditions under this Water Framework Directive status.

There is no evidence of flood risk within CSS 9B. CSS 9B occurs outside the CFRAM fluvial risk area.

Any works that take place in close proximity to a water body has the potential to impact on the biology, water quality morphology and hydrology of the receiving watercourses. The proposed HVDC cable will required the crossing of seven watercourses including crossing the Owenacurra River and its tributaries. North of Midleton, the Owenacurra River is classified as having good status under the Water Framework Directive, whilst south of Midleton the river is noted as being at risk. Whilst details on the proposed crossing arrangements are not known at this stage, it is expected that sufficient capacity within the existing bridge arrangement is not likely, as such a trenchless construction will be required.

Having regard to the number of potential water crossing, the **Low-Moderate** ranking would apply.

7.4.6 Cultural Heritage (Archaeological and Architectural Heritage)

There are no recorded cultural heritage sites located within a 250m radius of the centre point of the asterisk presented in **Figure 32**. The closest recorded cultural heritage site is located approximately 673m from the centre point. The nearest NIAH is located approximately 2.5 km from the centre point.

The cultural heritage value of the area of Knockraha, in the context of the War of Independence, was raised by a number of respondents during Step 3 consultations. A cultural heritage constraints study by Rubicon Heritage Services Ltd of the shortlisted CSLZs was subsequently commissioned having regard to undesignated cultural heritage sites within CSLZ 9 and CSLZ 12, associated with the War of Independence.

A copy of the report is provided in Appendix D *Cultural Heritage Report,* an Archaeological, Architectural and Cultural Heritage constraints study of the six Step 3 Short-listed CSLZ's prepared by Rubicon Heritage Services Ltd.

The siting of CSS 9B was selected having regard to the cultural heritage identified in the above referenced report, refer to **Figure 32**. A ranking of **Low – Moderate** has been assigned to CSS 9B.

7.4.7 Combined Environmental Performance

CSS 9B has a combined environmental performance of **Low – Moderate**. The site is located within a rural setting but with an established and existing utility use. Siting the converter station in proximity to Knockraha substation would mitigate a number of environmental impacts by avoidance.

Option	Land Use Planning	Soils and Geology	Landscape and Visual	Biodiversity	Waterbodies, Drainage and Flood Risk	Cultural Heritage	**Combined Environmental Performance**
CSS 9B							

7.5 Social Risks and Constraints

7.5.1 Traffic

The siting of the converter station in proximity to Knockraha substation mitigates disturbance / disruption impacts on the local road network associated with the installation of the HVAC cable, as it would be installed cross country in agricultural lands.

There would however be localised but temporary traffic and road disruption associated with the construction of the converter station and installation of the HVDC cables.

A minimum estimated installation rate of approximately 50m per crew per day applies to the HVDC route, resulting in a timeline of approximately 85 crew-weeks for the approximately 21km of the route.

As with all of the converter station site options under consideration, it is anticipated that road closures, except for local access, will be required for all potential HVDC routes.

Data from Corine 2018 datasets indicates that there is a considerable high occurrence of pastures / arable land with pockets of mixed and coniferous forestry plus made ground proximate to larger settlement areas along the HVDC cable route. The installation of the HVDC cable will result in temporary disturbance to agricultural land use practices. Any impact that restricts the movement of livestock to and from the farms plus movement of dairy lorries or machinery will have a medium potential to cause change. However, the appointed contractor will prepare a traffic management plan which will incorporate measures to minimise the potential temporary impact and facilitate the ongoing farming operations during the construction phase, these may include agreement to temporarily halt works or scheduling of works to avoid busy farming operations such as silage cutting season and to accommodate movement of milk collection lorries.

There are several community facilities located along the local road network between Knockraha and Churchtown (the common point of convergence). An increase of construction traffic on this route resulting from temporary diversions would have potential to have temporary adverse indirect impacts on these services in additional to those accessing these community facilities.

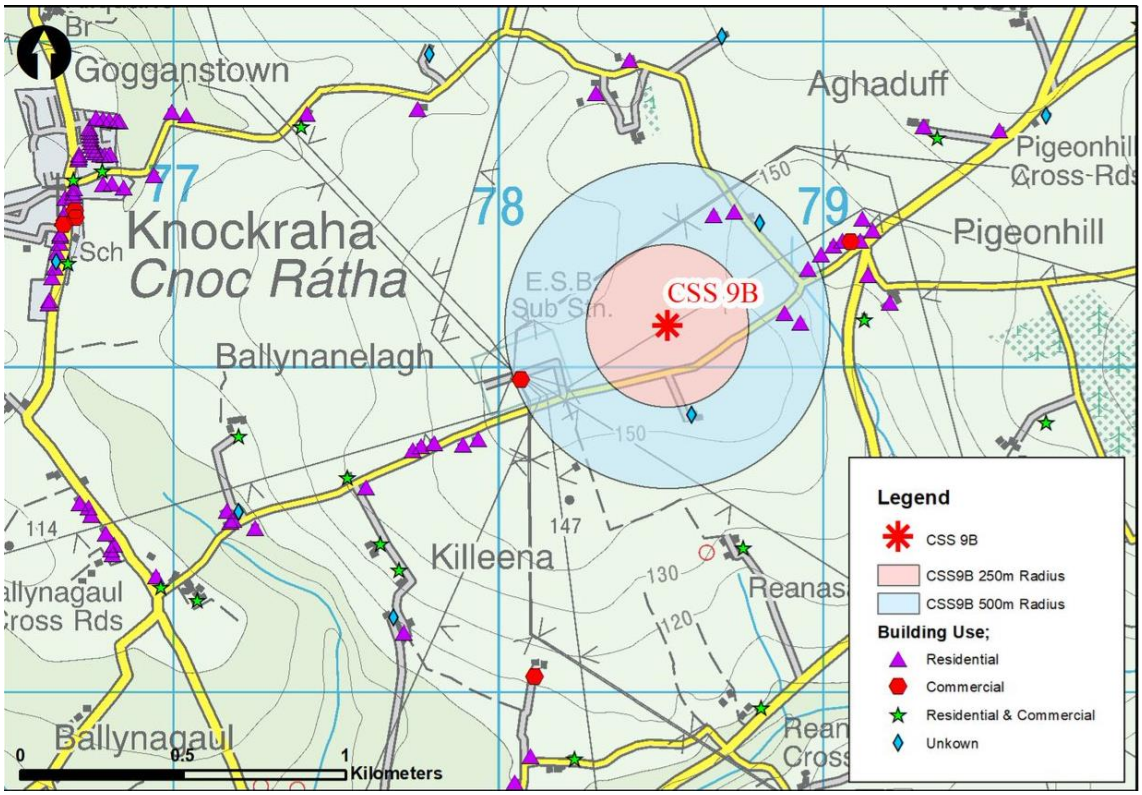
The installation of the HVDC cable has the potential to have temporary adverse impacts on the recreational value of the area during construction. The proposed HVDC cable will be routed adjacent to two golf courses. The identified option will result in traffic management constraints

on the operation of these golf courses during construction. Having regard to the above, a **Low-Moderate** ranking has been assigned.

7.5.2 Noise

According to GeoDirectory data, there are no residential properties within 250m of the centre point of CSS 9B (refer to **Figure 32**) the nearest residential property to the centre point of CSS 9B is located approximately 283m to the north. There are five residential properties located within 500m of the centre point and approximately 31 (the majority of which are residential) buildings within 1km of the centre point.

Figure 32: CSS 9B Nearest Sensitive Receptors



Source: Mott MacDonald

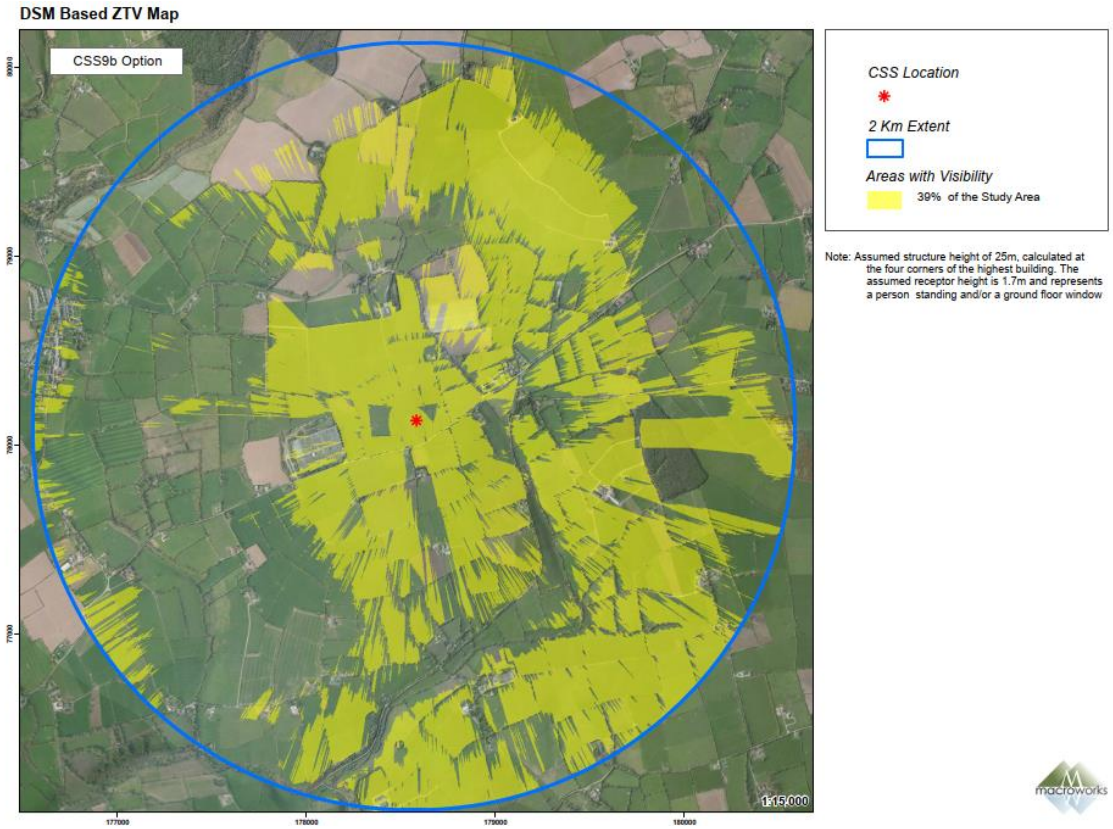
The CSS 9B site is remote from population centres and major road traffic noise, in terms of noise sensitive receptors. There are no known community facilities situated within 500m of the site. The potential for noise impacts were noted as a key concern raised by the Step 3 public consultation process. The public referenced concerns around noise pollution that could potentially be associated with the project, both during the construction phase and while the converter station is operational. It is understood that the area immediately surrounding the Knockraha substation is particularly sensitive to potential nuisance impacts with concerns having been raised previously by local community groups in relation to social impacts in particular associated with transmission infrastructure projects. Potential opportunities exist to minimise potential significant adverse noise impacts following micro-siting and design optimisation including layout optimisation. All construction related nuisances would be managed by a project-specific Construction Environmental Management Plan (CEMP). A construction Traffic Management Plan (TMP) will form part of this CEMP. An outline CEMP and TMP will be

included with the planning applications for the proposed development. As noted in **Figure 32**, there are a cluster of one-off rural housing located the local road network on the approach to the proposed CSS 9B site and having regard to the higher natural elevation, a **Moderate** ranking has been assigned.

7.5.3 Visual

Most of the areas within the ZTV pattern (yellow areas) in **Figure 33** occur in agricultural fields. A very high proportion of the dwellings in the area benefit from screening provided by intervening vegetation. Comparison of the ZTV for CSS 9A with the ZTV for CSS 9B shows that CSS 9B will be more visible from a larger percentage of the respective study area but the higher density population area of the settlement Knockraha will be marginally less exposed to views. Having regard to the elevated nature of CSS 9B, a ranking of **Moderate** has been assigned.

Figure 33: CSS 9B ZTV



Source: MacroWorks

7.5.4 Combined Social Performance

CSS 9B has a combined social performance of **Moderate.** The key drivers for this overall score relate to the localised visual impacts and the proximity of sensitive receptors.

Option	Traffic	Noise	Visual	**Combined Social Performance**
CSS 9B				

7.6 Technical Risks and Constraints

There has been no change from Step 3 regarding this criterion for CSS 9B, and therefore remains as **Low-Moderate.**

7.7 Deliverability Risks and Constraints

7.7.1 Design Complexity

HVDC Cable Route

This route is generally narrow but constructible. There is a parallel water main along portions of the route that would need to be taken into account. Given the local residential nature of the supply, this is not expected to provide a challenging installation environment and space within the roadway for the narrow HVDC trench is expected to be available.

The route requires the crossing of seven water courses. No information has been received to date on bridges along these roads, but it can reasonably be expected that these bridge crossings will be stone bridges or similar with insufficient deck space to install the cable ducts. As such, HDD would be required off-road for each of these crossings. This route would also require the crossing of Gas Transmission pipelines twice along a section of the route, which would require detailed interaction with Gas Networks Ireland as well as careful planning and installation. It is likely that HDD would be required for crossing the Owenacurra River.

A solar plant has received planning consent near Lysaghstown on part of the route, the site boundary for which straddles the road. While the road will still remain open and owned by Cork County Council, it can reasonably be expected that 38 kV cable will cross the road at a number of locations across the solar site. These crossings will be done at right angles and are not expected to be difficult to achieve with the HVDC cable.

A crossing under the associated 110 kV underground cable serving the solar plant located to the east of Knockraha. This is not considered onerous but will require knowledge of the location and trench cross-section for the cable prior to finalising the route design.

There are eight locations on this route which have corners with a bending radius tighter than the 20m minimum for duct installation. This will require cutting the corner, or alternatively, micro-routing cross-country.

Converter Station Site

CSS 9B is located due east of the existing Knockraha 220 kV substation. The site is agricultural land in pasture with well-drained soil. The site rises to the east away from Knockraha Station. The highest point on the site is approximately 5m higher than the nominal height at the existing station.

As the site is gradually sloped there will be some element of site levelling needed however this is not foreseen to present any significant design challenges with this location.

A 110 kV OHL traverses the area and this may need to be diverted if it conflicts with the final converter station location.

HVAC Route

There is no road network applicable for an HVAC cable route connecting the converter station to the substation. A cross-country route of approximately 400m directly west from the converter station connecting to the substation is the proposed option.

Summary

The aspects raised above result in the Design Complexity risk of CSS 9B being assessed as **Low-Moderate**.

7.7.2 Traffic Disturbance Impact

HVDC Route

Each section under construction would require closure, while at all times maintaining access for local residents. Diversions are available for the other sections along this route.

Converter Station Site

Heavy / abnormal load vehicles are required to transport HV equipment such as transformers to the site. Considering this site is adjacent to Knockraha substation and that similar heavy / abnormal load vehicles have accessed the substation it is assumed the road network leading to the proposed CSS can accommodate these vehicles without significant additional civil works such as local road widening or bridge strengthening.

HVAC Route

The HVAC cable route has no traffic disturbance impact because the route is cross-country.

Summary

The aspects raised above result in the Traffic Disturbance impact of CSS 9B being assessed as **Low-Moderate.**

7.7.3 Dependence on other infrastructure projects

Neither of the routes site have a dependence on other infrastructure projects, while the converter station may have a requirement for the relocation of a 110 kV transmission line. Because this is within EirGrid's control and outages can be managed, this is considered to be **Low**.

7.7.4 Permits and wayleaves

HVDC Route

Two gas transmission crossings as well as 11 other services are applicable for this route and require agreements to be put in place. Additional land and associated permitting and wayleaves will be required for the off-road HDD locations along this route. The route has four corners which have a bending radius of less than 20m which is the technical limit of the cable ducting. Cutting the corner at these locations will require wayleaves and landowner consent.

A short cross-country section would require interaction with private landowners and obtaining of wayleaves for that section. Additionally, the final approach to the CSS would require landowner engagement and consent, portions of this are expected to be owned by the project.

There is a solar plant which has received planning permission near Lysaghtstown, the boundary of which straddles the route. Interaction would be required with plant owner to verify the locations and depth of any 38 kV cable crossing the route section.

Wayleaves and landowner consent will be required at the locations the route needs to cut the road corner or micro-route cross country.

Converter Station Site

Permits will be required from the local council for the transporting the transformers to site as these will be classified as abnormal loads.

There will be OHL easements associated with the nearby 110 kV lines. These may need to be altered if the associated line is diverted.

HVAC Route

There is expected to be minimal requirement for permits and wayleaves as the connection route traverses land that would already be purchased for the purposes of constructing the converter station, or through ESB-owned land which would need permitting irrespective of which CSS is chosen.

Summary

The permits and wayleaves risk is ranked as **Moderate**.

7.7.5 Implementation timelines

HVDC Route

The route can be installed at a minimum rate of approximately 50m per crew per day, resulting in a timeline of approximately 85 crew-weeks for the approximately 21km of the route.

Converter Station Site

From start of construction to final energisation of the converter station will take approximately two years. A 110 kV OHL may need to be locally diverted however we expect that this could be completed without affecting the construction timelines.

HVAC Route

At an installation rate of 25m per day, the route will take approximately three crew-weeks to install.

Summary

All aspects are not on the critical path for the project and is therefore considered a **Low** ranking.

7.7.6 Combined Deliverability Performance

The combined deliverability performance of CSS 9B is ranked as **Low-Moderate** with the dominating feature being the anticipated wayleaves required for off-road micro-routing.

Option	Design Complexity	Traffic Disturbance Impact	Dependence on other Infrastructure	Permits and Wayleaves	Implementation Timelines	**Combined Deliverability Performance**
CSS 9B						

7.8 Economic Risks and Constraints

The estimated cost of the converter station, enabling works and associated HVDC and HVAC routes for **CSS 9B** is nearly as low as CSS9A, resulting in an assessment of **Low-Moderate.** The higher cost of the converter civil works as compared to other sites is attributable to the need for relocating a 110kV transmission line but in terms of the cable routes the site performs as well as CSS 9A and better by a substantial margin than the other sites.

7.9 Summary

CSS 9B is in close proximity to established and existing infrastructure and would arguably result in an intensification of existing infrastructure. A number of potential environmental impacts would also be mitigated by avoidance. Much of the visibility from CSS 9B would fall on agricultural fields with a very high proportion of the local dwellings potentially benefiting from screening provided by intervening vegetation. Due to the building elements of the converter station, there are also opportunities available for noise screening. The table below summarises the evaluation of CSS 9B.

Option	Environmental	Social	Technical	Deliverability	Economic
CSS 9B					

8 Converter Station Site 10

8.1 Identification of Converter Station Site 10

Converter Station Site 10 (CSS 10) was identified for further assessment having regard to the following site selection criteria:

- Feedback from Step 3 consultation;
- Visual Impact;
- Proximity to sensitive receptors; and
- Folio Size.

8.1.1 Feedback from Consultation

Feedback on the Step 3 public consultation on CSLZ 10 pertained mainly to visual impacts and the potential impact on agricultural farming operations including potential impacts resulting from traffic disruptions.

8.1.2 Visual Impact

Converter Station Location Zone 10, considered in Step 3 of EirGrid's six-step Framework for Grid Development is located approximately 1km east (straight line distance) of the existing Knockraha substation. The forested area and the elevated lands to the east may offer some potential for visual screening.

8.1.3 Proximity to Sensitive Receptors

The area of CSLZ 10 is relatively sparsely populated with one-off housing along local the local road network.

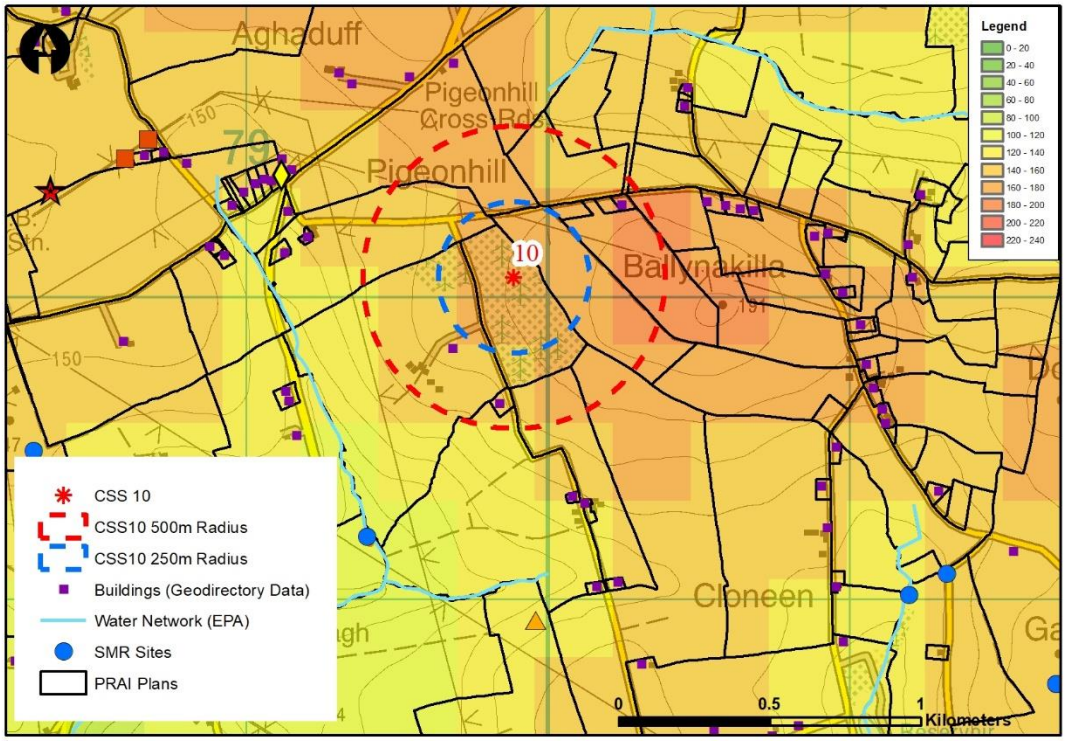
8.1.4 Folio Size

CSS 10 is located within an area of forestry, however, development of adjacent lands to the east may be required to optimise visual screening potential.

8.2 CSS 10

CSS 10 is located within a commercial forest (Pigeon Hill), within the townland of Cloneen (Knockraha ED), approximately 1.7km straight line distance east of the existing Knockraha 220 kV substation. It is anticipated that access to the site would be gained via the local road to the north. Development of adjacent lands to the east may also be required to facilitate siting at this location.

Figure 34: CSS 10



Source: Mott MacDonald

8.3 CSS 10 Route Options

8.3.1 HVDC Route

The HVDC cable connection option would be installed in the public road. The route under consideration follows the road north of Churchtown (the common point of convergence), to Ballyspillane cross roads, then west to East Cork Golf Club, south to Broomfield Ridge before joining the R626, travelling in a westerly direction via Water Rock Golf Course onwards to Carrigane Road until Ballyrichard then north-west past Kilgoura Quarry turning west towards the road passing the front of Knockraha Substation, and finally cross country south to the connection point.

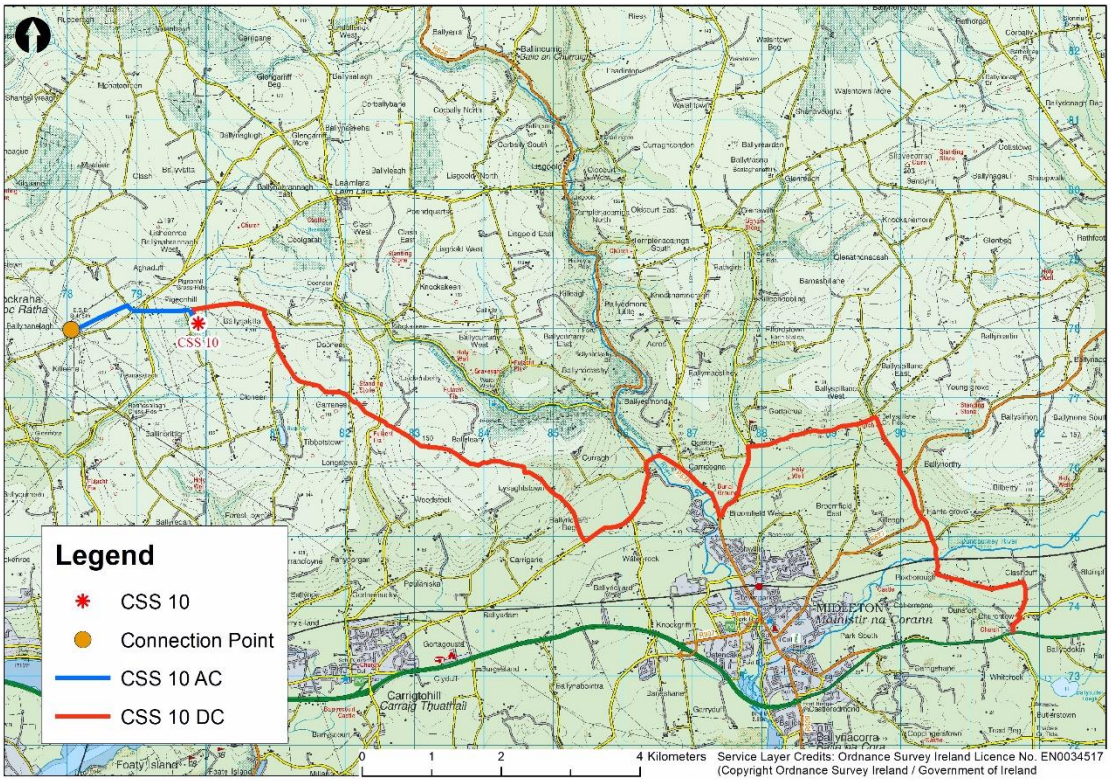
The length of this route option is approximately 17.5km and each section under construction would require closure, while at all times maintaining access for local residents. Diversions are available for the sections along this route option.

The route could be installed at a minimum rate of approximately 50m per crew per day, resulting in a timeline of approximately 70 crew-weeks.

8.3.2 HVAC Route

The HVAC route option under consideration would depart the converter station directly north to then pick up the road west, it will then travel cross-country for a short distance, before turning north-west on local roads and finally cross country directly west to the connection point.

Figure 35: Proposed HVDC/HVAC route options from the common point of convergence at Churchtown for CSS 10



Source: Mott MacDonald

The following sections provide further detail regarding CSS 10 in line with the multi criteria analysis. All distances referenced have been taken from the centre point of the asterisk presented in **Figure 34**.

8.4 Environmental Risks and Constraints

8.4.1 Land Use Planning

CSS 10 is situated within a commercially forested area in a predominately rural location. The CDP outlines the importance of the Forestry sector as of economic importance. Development of adjacent agricultural lands to the east may also be required to facilitate development at CSS 10.

CSS 10 is located outside of the Metropolitan Greenbelt Area and is located within an Area Under Strong Urban Influence.

The construction works associated with the converter station will result in permanent land use change from rural use to utility. The HVAC cable will connect to the existing Knockraha substation partially via a cross country route which may result in a permanent track.

Overall the ranking can be considered **Moderate**, in the context of land use planning**.** Whilst the proposed converter station is in proximity to existing overhead transmission line and is less than 1.8km from the existing Knockraha substation, it would result in intensification of transmission infrastructure within a predominantly rural area that is not contiguous with the substation.

8.4.2 Soils and Geology

There are no known geological features or hazards located within proximity to the CSS 10.

According to GSI quaternary mapping, CSS 10 is located within an area of sandstone, mudstone and siltstone. The site is underlain by a Locally Important Aquifer with bedrock which is Moderately Productive only in Local Zones of high vulnerability. There are areas of extreme vulnerability corresponding to the rock outcrops located to the east of the site.

Groundwater vulnerability can in general be readily managed with the implementation of standard construction phase mitigation measures, a **Low-Moderate** ranking is assigned to this option.

8.4.3 Landscape and Visual

CSS 10 is situated within the Fissured Fertile Middleground Landscape Character Area. The City Harbour and Estuary Landscape Character area (designated as a High Value Landscape) is located to the south of the site. The site is not situated within any designated sensitive landscape areas and the landscape type is characterised as having medium landscape sensitivity according to the CDP. There is a scenic route (S42: Road at Cashnagarriffe, N.W.Carrigtwohill and Westwards to Caherlag) to the south and south east of the site. The nearest (north-south) section of this scenic route is quite enclosed by roadside vegetation with glimpses views to the south and south west being the most notable attraction.

CSS 10 is identified within a forested area. The commercial forest has potential to offer visual screening of the substation as does the area to the east of the site which is elevated to approximately 180m.

The area of commercial forestry has potential to offer visual screening but the ZTV pattern indicates that the effect of this will be limited. This is a consequence of the topography in the area. Most of the areas within the ZTV pattern (refer to **Figure 37**) are agricultural fields. There are a number of dwellings a short distance to the south west of CSS 10 that are within ZTV pattern.

The area of commercial forestry has some potential to offer visual screening and a ranking of **Low-Moderate** has therefore been assigned.

8.4.4 Biodiversity

CSS 10 is not located within any sites designated for nature conservation nor does it directly adjoin one. Potential for effects on European sites have been taken into consideration in the evaluation of the converter station sites in the context of distance to potential sensitive receptors only. The next stage of assessment will consider the potential for significant effects on European Sites in the context of Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC). The need for measures to mitigate against significant effects will be determined.

A preliminary appraisal of the ecological potential of CSS 10 and the immediate surrounding area was made having carried out a site walkover in July 2019.

The forested area comprises commercially planted sitka spruce (*Picea sitchensis*).

The age structure of Pigeon Hill forest is predominantly post-thicket with no shrub or ground layers. There is a clear-felled section in the northwest. Grey Willow and Gorse are plentiful along the two tracks together with small numbers of Alder, Rowan and Sycamore. Willow, Alder and Sycamore are plentiful along the western boundary.

NPWS protected species records for the area include common frog and stoat.

The drainage ditch to the south had no flow at the time of the walkover, however some standing water was recorded. The drain has potential to support amphibians.

Mammal tracks were recorded adjacent to a number of the hedgerows. Rabbit warrens were recorded within the treelines. No signs of badger were recorded. There was no supporting habitat for otter recorded. The trees within the hedgerows had negligible bat potential but have potential to support other protected mammal species.

Breeding bird surveys of Pigeon Hill were carried out on 24th April and 3rd June 2019. Nocturnal surveys were carried out on 18th May, 13th June and 25th June 2019. A total of 18 species was recorded during the various surveys at this site.

Table 11: Species of conservation concern recorded at Pigeonhill in Spring/Summer 2019

Species	Pigeonhill	Pigeonhill	Nocturnal Visit	Nocturnal Visit	Nocturnal Visit	Breeding status at the site
	24/04/19	03/06/19	18/05/19	13/06/19	25/06/19	
Meadow Pipit	-	1	-	-	-	Confirmed breeding
Linnet	-	1	-	-	-	Possibly breeding

Note: Red and Amber colours are used to highlight species of conservation concern as per K.Colhoun & S.Cummins (2013) 'Birds of Conservation Concern in Ireland 2014–2019'. Irish Birds 9: 523-544 (2013)

A single Meadow Pipit was seen in the clear-felled section in the north-western corner on 3rd June and the bird was seen to be carrying food and landed at a likely nest site. A Linnet was seen also on 3rdJune and breeding is likely, possibly on Gorse in the margins of the clear-felled section.

Hen Harrier, while associated with conifer plantation, was not observed during breeding bird surveys.

A single Long-eared Owl (*Asio otus*) chick was heard calling repeatedly during the nocturnal visits on June 13th and June 25th.

Ecological Evaluation

On the basis of the preliminary appraisal, the site is classified as of **Local Importance (higher value)** as per the ecological evaluation examples prescribed in the NRA (2009) *Guidelines for Assessment of Ecological Impacts of National Roads Schemes.* Given the Low ecological value of the site, a ranking of **Low** would apply to this site.

8.4.5 Waterbodies, Drainage and Flood Risk

The closest waterbody to CSS 10 is a stream (EPA_Code: 19A13) a tributary of the River Owenacurra located approximately 600m to the north.. The Owenacurra River is classified as 'Good' status under the Water Framework Directive. Another stream (EPA_Code: 19L40) is located approximately 720m west of the site, flows in a southerly direction and is a tributary of the Butlerstown River. The Butlerstown River is classified as being of 'High' status and as having good general conditions under this Water Framework Directive status.

The proposed HVDC cable route traverses six watercourses, including the Owenacurra River and its tributaries.

The Owenacurra River is hydrologically connected to Great Island Channel SAC [001058], Cork Harbour SPA [004060] and Great Island Channel pNHA [001058]. The Butlerstown River is hydrologically connected to Cork Harbour SPA [004030] and Glanmire Wood pNHA [001054] and Dunkettle Shore pNHA [001082].

Any works that take place in close proximity to a water body has the potential to impact on the biology, water quality morphology and hydrology of the receiving watercourses. The proposed HVDC cable route will need to cross six watercourses including crossing the Owenacurra River and its tributaries. North of Midleton, the Owenacurra River has been classified as having good general conditions under the Water Framework Directive status, whilst south of Midleton the river is noted at risk.

There is no evidence of flood risk within CSS 10 as the site occurs outside the CFRAM fluvial risk area.

Whilst details on the proposed crossing arrangements are not known at this stage, it is expected that sufficient capacity within the existing bridge arrangement is not likely, as such a trenchless construction will be required. A **Low-Moderate** ranking has been assigned.

8.4.6 Cultural Heritage (Archaeological and Architectural Heritage)

There are no recorded cultural heritage sites within a 500m radius of the centre point of the asterisk in **Figure 36**. The closest recorded cultural heritage site is a holy well (Reference no: CO064-079----) located approximately 987m south west of the centre point. The closest NIAH is Aghnahan Bridge (Reg. no: 20906407) located approximately 2.5km from the centre point.

A cultural heritage constraints study by Rubicon Heritage Services Ltd of the shortlisted CSLZs is provided in Appendix D *Cultural Heritage Report.*

In terms of cultural heritage, a ranking of **Low-Moderate** ranking has been assigned to CSS 10.

8.4.7 Combined Environmental Performance

CSS 10 has a combined environmental performance of **Moderate**. The site is located within a rural setting with potential for some visual screening within the commercial forestry. The siting the converter station at CSS 10 would mitigate a number of environmental impacts associated with the installation of the HVAC cable because it would be less than 2km in length, of which no more than half would be on the existing road network.

Option	Land Use Planning	Soils and Geology	Landscape and Visual	Biodiversity	Waterbodies, Drainage and Flood Risk	Cultural Heritage	**Combined Environmental Performance**
CSS 10							

8.5 Social Risks and Constraints

8.5.1 Traffic

CSS 10 is located approximately 1.7km east of the existing Knockraha 220 kV substation. The HVAC cable route departs the converter station directly north to then pick up the road west. it will then travel cross-country for a short distance, before turning north-west along local roads and finally cross country directly west to the connection point.

The disruption to traffic will be associated with the local road west. It will be avoided, in general at the cross-country sections. This however will be temporary and localised.

As with all of the converter station site options under consideration, it is anticipated that road closures, except for local access, will be required for all potential HVDC cable routes.

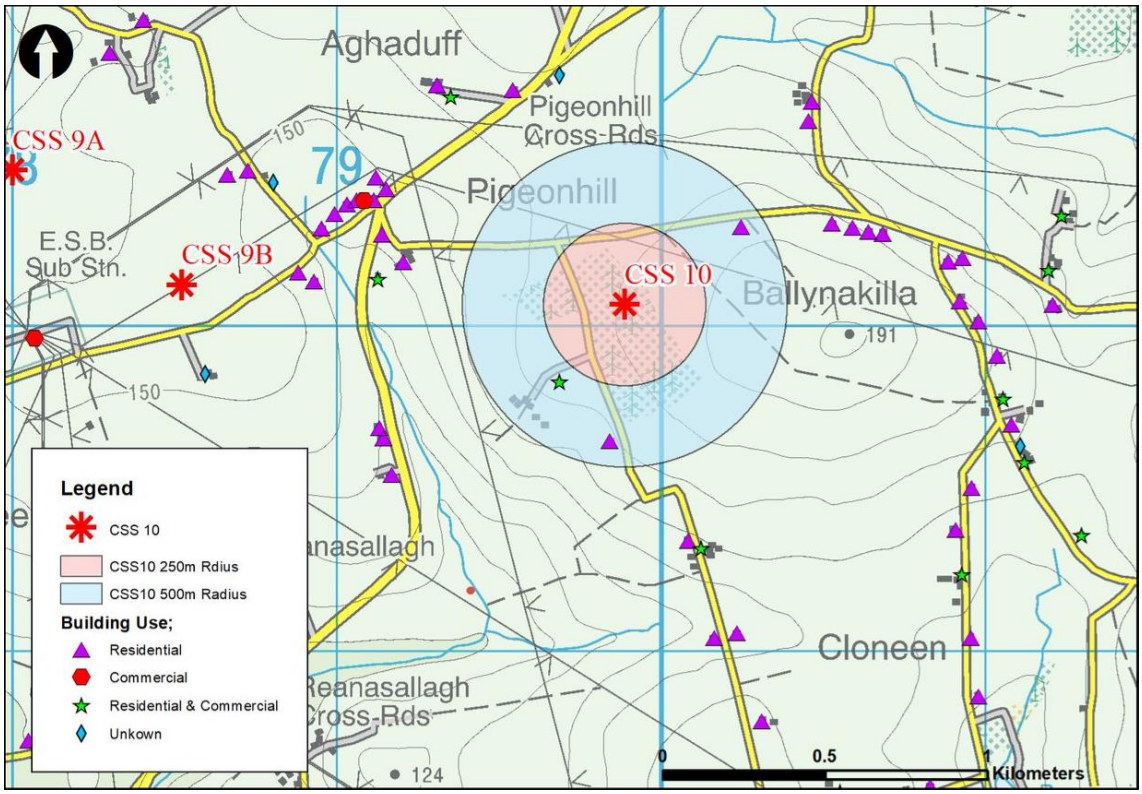
Corine 2018 datasets indicates that there is a considerable high occurrence of pastures / arable with pockets of mixed and coniferous forestry plus made ground proximate to larger settlement areas along the HVDC route. The installation of the HVDC cable will result in temporary disturbance to agricultural land use practices. Any impact that restricts the movement of livestock to and from the farms plus movement of dairy lorries or machinery will have a medium potential to cause change. However, the appointed contractor will prepare a traffic management plan which will incorporate measures to minimise the potential temporary impact and facilitate the ongoing farming operations during the construction phase, these may include agreement to temporarily halt works or scheduling of works to avoid busy farming operations such as silage cutting season and to accommodate movement of milk collection lorries.

As with all of the routes under consideration, there are several community facilities located along the local road network between CSS 10 and Churchtown (the common point of convergence). An increase of construction traffic on this route resulting from temporary diversions would have potential to cause temporary disturbance / disruption to these services, in addition to those accessing these community facilities. The installation of the HVDC cable has the potential to cause temporary disturbance / disruption to the recreational and amenity value of the area during construction. The proposed HVDC cable will be routed adjacent to two golf courses (namely Water Rock Golf Course and East Cork Golf Club). The identified option will result in traffic management constraints on the operation of these golf courses during construction. Having regard to the above, a **Low-Moderate** ranking has been assigned.

8.5.2 Noise

According to GeoDirectory data, there are no residential properties within 250m of the centre point of CSS 10 (refer to **Figure 36**) the nearest residential property to the centre point of CSS 10 is located approximately 310m. There are three residential/commercial properties located within 500m of the centre point and approximately 24 (the majority of which are residential) buildings within 1km of the centre point.

Figure 36: CSS 10 Nearest Sensitive Receptors



Source: Mott MacDonald

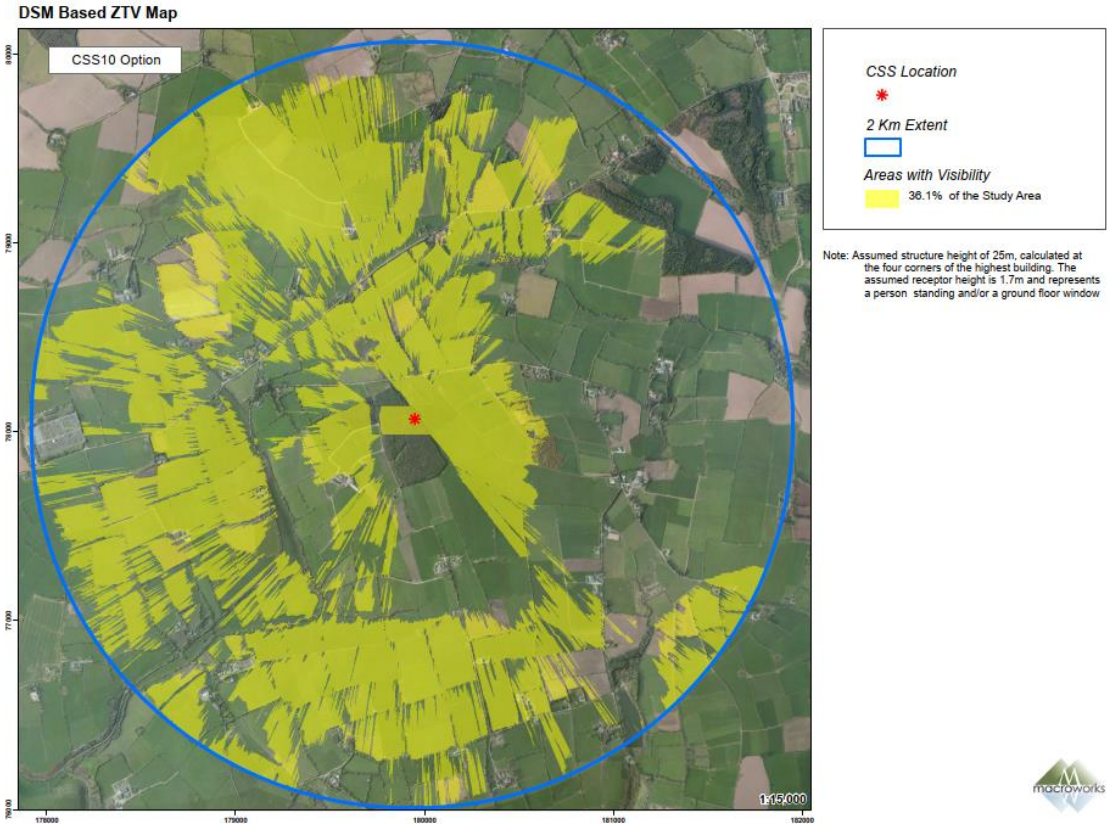
The CSS 10 site is remote from population centres and major road traffic noise, in terms of noise sensitive receptors. There are no known community facilities located within 500m of the site. As noted in **Figure 36**, there are a number of one-off rural housing along the existing road network. The proposed HVDC/HVAC cable will require works along the existing road network in proximity to a number of noise sensitive receptors. These works will result in temporary noise nuisance for the duration of the installation works. However, these works are transient in nature. Given the nature of the settlement patterns in wider study area, there are scattered rural one-off housing, construction noise nuisance is likely to have a temporary adverse impact on noise sensitive receptors located along the existing road network. All construction related nuisances would be managed by a project-specific Construction Environmental Management Plan (CEMP). A construction Traffic Management Plan (TMP) will form part of this CEMP. An outline CEMP and TMP will be included with the planning applications for the proposed development. CSS 10 is sited within a commercial forestry at a distance from noise sensitive receptors. A **Low** ranking has therefore been assigned.

8.5.3 Visual

The ZTV pattern indicates relatively extensive visibility across the study area despite the site being substantially contained within a forestry block. This is due to the height of the tallest proposed structure (25m) relative to the current height of the tree tops. Nonetheless, the vast majority of visibility falls on uninhabited farmed fields with dwellings generally afforded reasonable screening from intervening hedgerows.

While there is potential for a development at this site to be more extensively visible from lands to the south, the converter station would be seen as a relatively small-scale feature within broader views. There are no community facilities in the site although Brookfield Care Centre is within 1km of the area. Having regard to the above a ranking of **Moderate** has been assigned.

Figure 37: CSS 10 ZTV



Source: Macro-Works

8.5.4 Combined Social Performance

Converter site 10 has a combined social performance of **Moderate**. The key driver for this overall score is associated with the potential for impacts under the heading visual.

Option	Traffic	Noise	Visual	Combined Social Performance
CSS 10				

8.6 Technical Risks and Constraints

There has been no change from Step 3 regarding this criterion for CSS 10, and therefore remains as **Low-Moderate.**

8.7 Deliverability Risks and Constraints

8.7.1 Design Complexity

HVDC Route

This route is generally narrow but constructible. There is a parallel water main along portions of the route that would need to be taken into account. Given the local residential nature of the supply, this is not expected to provide a challenging installation environment and space within the roadway for the narrow HVDC trench is expected to be available.

The route requires the crossing of seven water courses. No information has been received to date on bridges along these roads, but it can reasonably be expected that these bridge crossings will be stone bridges or similar with insufficient deck space to install the cable ducts. As such, HDD would be required off-road for each of these crossings. This route would also require the crossing of Gas Transmission pipelines twice along the route, which would require detailed interaction with Gas Networks Ireland as well as careful planning and installation. It is likely that HDD would be required for crossing the Owenacurra River.

A solar plant has received planning consent near Lysaghstown, the site boundary for which straddles the road. While the road will still remain open and owned by Cork County Council, it can reasonably be expected that 38 kV cables will cross the road at a number of locations across the solar site. These crossings will be done at right angles and are not expected to be difficult to achieve with the HVDC cable.

There are eight locations on this route which have corners with a bending radius tighter than the 20m minimum for duct installation. This will require cutting the corner, or alternatively, micro-routing cross-country.

Converter Station Site

The site is centred on a commercial forest. Development of adjacent agricultural lands to the east may be required as the site is gradually sloped there will be some element of site levelling needed however this is not foreseen to present any significant design challenges with this location.

Site access will most likely be from the local road which bounds the site to the north. The forest road which provides access to the site from the west may also be an option but will need to be upgraded to provide access to the site for heavy / abnormal load vehicles.

The local road network leading to the site is narrow and will need upgrading such as road widening to accommodate abnormal load deliveries.

HVAC Route

A crossing under the associated 110 kV underground cable serving the solar plant located to the east of Knockraha. This is not considered onerous but will require knowledge of the location and trench cross-section for the cable prior to finalising the route design.

Summary

The design complexity risk is ranked as **Low-Moderate**.

8.7.2 Traffic Disturbance Impact

HVDC Route

Each section under construction would require closure, while at all times maintaining access for local residents. Diversions are available for the sections along this route.

Converter Station Site

Traffic disturbance such as restrictions for construction deliveries and one-way construction traffic restrictions may be required.

HVAC Route

There will be low traffic disturbance impact because the route is less than 2km in length, of which no more than half will be on the road network.

Summary

The traffic disturbance risk is ranked as **Low- Moderate**.

8.7.3 Dependence on other infrastructure projects

Neither the routes nor the CSS has a dependence on other infrastructure projects and is therefore assessed to be **Low**.

8.7.4 Permits and wayleaves

HVDC Route

A short cross-country section at the final approach to the converter station location would require landowner engagement and consent.

There is a solar plant which has received planning permission near Lysaghtstown, the boundary of which straddles the road. Interaction would be required with plant owner to verify the locations and depth of any MV cable crossing the route section.

Wayleaves and landowner consent will be required at the locations the route needs to cut the road corner or micro-route cross country.

Converter Station Site

Depending on final arrangements, wayleave access through the forest may be required.

HVAC Route

There is some requirement for permits and wayleaves as land owner engagement and consent would be required for the portions of the cross-country route.

Summary

The permits and wayleaves risk is ranked as **Moderate**.

8.7.5 Implementation Timelines

HVDC Route

The route can be installed at a minimum rate of approximately 50m per crew per day, resulting in a timeline of approximately 70 crew-weeks for the approximately 17.5km of the route, which is not on the critical path for this project.

Converter Station Site

It is estimated from start of construction to final energisation of the converter station will take approximately 2 years.

HVAC Route

At an installation rate of 25m per day, the 2km route can be installed in a timeline of approximately 16 crew-weeks which is not on the critical path for this project.

Summary

All aspects are not on the critical path for the project and is therefore considered a **Low** ranking.

8.7.6 Combined Deliverability Performance

The combined deliverability performance of CSS 10 is ranked as **Low-Moderate** with the dominating feature being the anticipated wayleaves required for off-road micro-routing.

Option	Design Complexity	Traffic Disturbance Impact	Dependence on other Infrastructure	Permits and Wayleaves	Implementation Timelines	**Combined Deliverability Performance**
CSS 10						

8.8 Economic Risks and Constraints

The estimated cost of the converter station, enabling works and associated HVDC and HVAC routes for **CSS 10** is 5% more than the lowest option, resulting in an assessment of **Low-Moderate.** The site performs relatively well as compared to other sites in terms of both converter civils and cable routes.

8.9 Summary

CSS 10 is located within a rural setting. However, siting the converter station at CSS 10 would mitigate a number of environmental impacts associated with the installation of the HVAC cable. Due to the current height of the tree tops views of the converter station would be relatively extensive.

The table below summarises the evaluation of CSS 10.

Option	Environmental	Social	Technical	Deliverability	Economic
CSS 10					

9 Converter Station Site 12

9.1 Identification of Converter Station Site 12

Converter Station Site 12 (CSS 12) was identified for further assessment having regard to the following site selection criteria.

- Feedback from Step 3 consultation;
- Visual Impact;
- Proximity to sensitive receptors; and
- Folio Size.

9.1.1 Feedback from Consultation

The cultural heritage value of the area of Knockraha was raised by a number of respondents during Step 3 consultations, in particular information pertaining to the use of 'The Rea', now under commercial forestry (Kilquane Forest), as an execution site and burial ground during the War of Independence.

A cultural heritage constraints study by Rubicon Heritage Services Ltd of the shortlisted CSLZs was subsequently commissioned having regard to undesignated (unrecorded) cultural heritage sites within CSLZ 9 and CSLZ 12, associated with the War of Independence. Avoidance of these sites informed the identification of CSS 9A, CSS 9B and CSS 12.

9.1.2 Visual Impact

Converter Station Location Zone 12, considered in Step 3 of EirGrid's six-step Framework for Grid Development, centred on an area of forestry (conifer plantation), surrounded by agricultural lands. Lands to the east of the forest are elevated. Siting a converter station between the forest and the elevated lands offers visual screening potential.

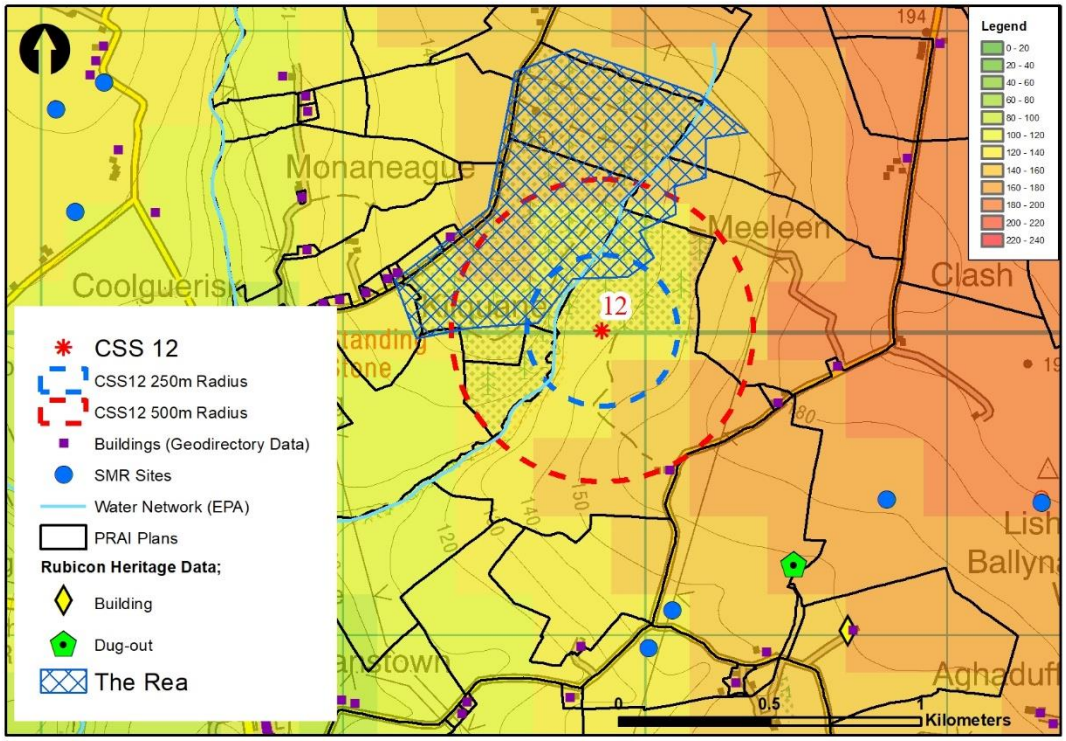
9.1.3 Proximity to Sensitive Receptors

There is a population centre directly south west of the Kilquane Forest. A number of houses are also located along local roads to the west of the forest. The area to the east of the forest is however sparsely populated and includes a residence including a dog training centre and boarding kennel.

9.1.4 Folio Size

CSS 12 is of sufficient size to accommodate a converter station compound.

Figure 38: CSS 12



Source: Mott MacDonald

9.2 CSS 12

CSS 12 is located to the east of a commercial forest, within the townland of Meeleen (Knockraha ED), approximately 2km straight line distance north of Knockraha 220 kV substation.

The lands comprise improved agricultural grassland, bound to the north and west by commercial forestry (Kilquane Forest, areas of which have been recently clear-felled).

Construction phase access to CSS 12 from the local road to the east would likely necessitate road widening works, including additional land take (refer to section 9.3 below) resulting in significant, but temporary, local traffic disruption / disturbance. Construction phase access may therefore access the site via Kilquane forest as an alternative to the local roads to the east of the site. Further studies will however be required to determine the most appropriate access route.

9.3 CSS 12 Route Options

9.3.1 HVDC Route

The HVDC cable connection option would be installed in the public road. The route under consideration follows the road north of Churchtown (the common point of convergence), to Ballyspillane cross roads, then west to East Cork Golf Club, south to Broomfield Ridge before joining the R626, travelling in a westerly direction via Water Rock Golf Course onwards to

Carrigane Road until Ballyrichard then north-west past Kilgoura Quarry turning west towards the road passing the front of Knockraha substation, cross country for a section, then north-west and finally cross country north-west to the Converter Station Site.

A minimum estimated installation rate of approximately 50m per crew per day applies to the HVDC route, resulting in a timeline of approximately 88 crew-weeks for the approximately 22km of the route.

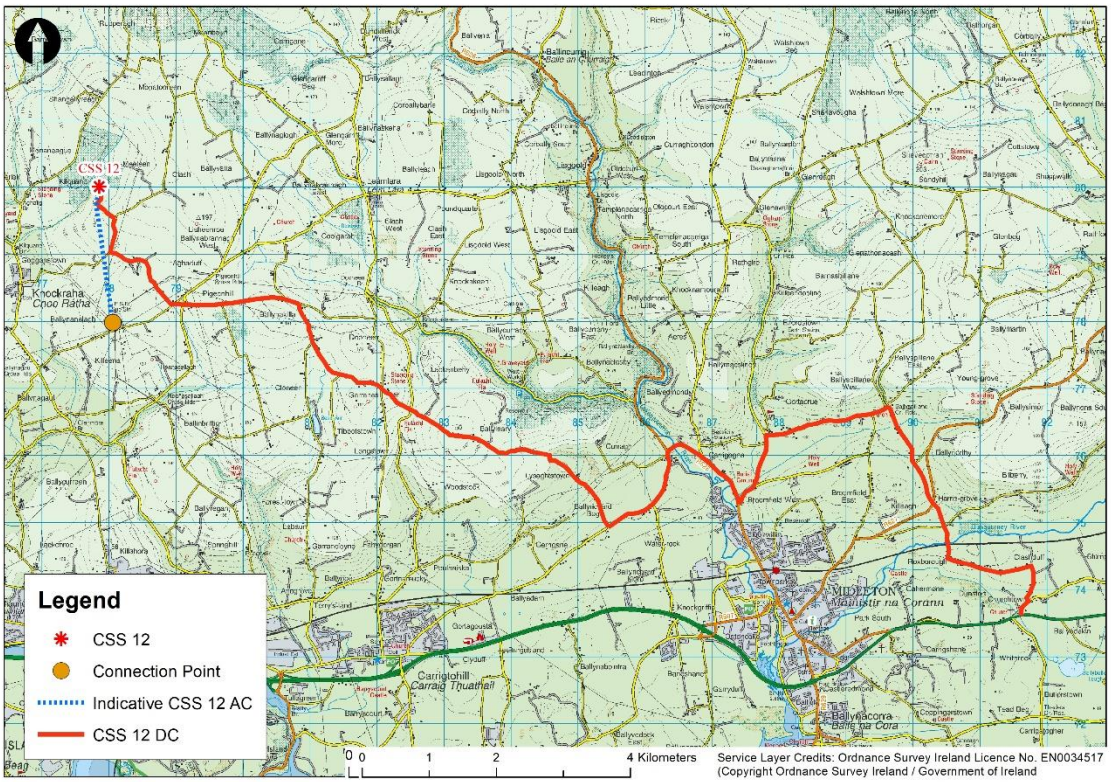
9.3.2 HVAC Route

In Step 3, CSS 12 performed relatively poorly in terms of the HVAC route which followed the available road network in the area in accordance with EirGrid's approach to cable route design. This included the need to construct a 2m trench through Knockraha village. The assessment of that route's performance was informed by its length, complexities associated with construction, and the need for additional equipment. However, given the proximity of CSS 12 to the connection point this Step 4A assessment of the site has considered a cross country route which mitigates the aforementioned issues by avoidance.

The route is approximately 2km in length and is expected to be reasonably direct. The route is shown as an indicative dashed straight line in **Figure 39** because the final alignment has not been decided at this stage. It should not therefore be taken to be an identified alignment.

The following sections provide further detail regarding CSS 12 in line with the multi criteria analysis. All distances referenced have been taken from the centre point of the asterisk presented in **Figure 38**.

Figure 39: Proposed HVDC/HVAC route options from the common point of convergence at Churchtown



Source: Mott MacDonald

9.4 Environmental Risks and Constraints

9.4.1 Land Use Planning

Site CSS 12 is situated in a predominantly rural area adjacent to a commercial forest.

CSS 12 is located outside of the Metropolitan Cork Green Belt but within the Rural Housing Control Zone, approximately 2km to the north of an established electricity transmission substation with overhead lines radiating from the substation.

In November 2017, consent was granted for the construction of a 48.4ha Solar Farm, approximately 1km north east of CSS 12, (planning Reference 175370). The grid connection is to be provided via an underground cable route which will be located along the unnamed local road in Lisheenroe south to Knockraha substation.

Construction of the converter substation at this site will result in permanent land use change from agricultural to utility.

Overall the risk can also be considered **Moderate**, in the context of land use planning**.** Whilst the proposed converter station is in proximity to existing and proposed electricity infrastructure, it would result in intensification of transmission infrastructure within a predominantly rural area.

9.4.2 Soils and Geology

There are no known geological features or hazards located in proximity to CSS 12.

According to GSI mapping, CSS 12 is located within an area underlain by sandstones and mudstone. The site is underlain by a Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones of high groundwater vulnerability.

Groundwater vulnerability can in general be readily managed with the implementation of standard construction phase mitigation measures, a **Low-Moderate** ranking is assigned to this option.

9.4.3 Landscape and Visual

CSS 12 is located within the Fissured Fertile Middleground Landscape Character Area.

The site is not situated within any designated sensitive landscape areas and the landscape type is characterised as having medium landscape sensitivity according to the CDP. The closest designated scenic landscape or prospect is scenic route S42 located to the south on a local Road at Forest-town, north-west of Carrigtwohill and Westwards to Caherlag.

Two overhead transmission lines cross north and south of the forested area.

The ZTV shows that the area of commercial forestry and surrounding topography offers substantial visual screening from nearby roads and residences. For these reasons a ranking of **Low** has been assigned.

9.4.4 Biodiversity

CSS 12 is not located within any sites designated for nature conservation nor does it directly adjoin one. Potential for effects on European sites have been taken into consideration in the evaluation of the converter station sites in the context of distance to potential sensitive receptors only. The next stage of assessment will consider the potential for significant effects on European Sites in the context of Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC). The need for measures to mitigate against significant effects will be determined.

A preliminary appraisal of the ecological potential of CSS 12 and the immediate surrounding area was made having carried out a site walkover in June 2019. The lands under consideration comprise improved agricultural grassland, bound to the north and west by commercial forestry (Kilquane Forest, areas of which had been recently clear-felled). There are records for common frog and otter in the vicinity (source NPWS data).

At the time of the walkover survey a portion of the agricultural lands were mown, while other areas were unmown.

A stream (waterbody segment code: 19_1475) flows in a southerly direction along the western boundary of the lands under consideration (between the field and the forestry). An area of mature mixed broadleaf woodland occurs on either side of the stream. The forestry on the eastern bank of the stream has a corridor through it which has been cleared of trees and comprises grassland. This forms a natural dark corridor, providing connectivity to adjoining habitats. The corridor had a significant number of mammal paths through it. There are records of badger, red squirrel and otter in the locality, and the habitats within and adjacent to the site are likely to provide habitat for these species, as well as other protected mammal species. Several potential bat roost features are present within the broadleaved woodland.

A drain runs in an east-westerly direction through the lands under consideration and discharges to the stream. This is suitable amphibian habitat. An active badger sett was identified on site (through camera survey, licence No 111/2019) in the field adjacent to CSS 12. A mammal path leads directly from the sett through the site, towards the stream.

The stream comprises approximately 40% cobble substrate and 60% fine gravel and *sand. This habitat may support juvenile and adult river and brook lamprey. Figure 43 Potential Lamprey Redd* shows a disturbed area of the stream bed which appears to have been a recent redd.

Figure 40: Proposed site location within agricultural grassland with forestry in background

Source: Mott MacDonald June 2019

Figure 41: Dark corridor through woodland

Source: Mott MacDonald June 2019

Figure 42: Stream including cobble and fine gravel/sand substrate

Source: Mott MacDonald June 2019

Figure 43: Potential lamprey redd

Source: Mott MacDonald June 2019

Kilquane Forest (to the west of CSS 12) was surveyed for breeding birds on 23rd April and 3rd June 2019. Three nocturnal surveys were carried out on 13th May, 29th May and 20th June 2019. A total of 26 species was recorded at Kilquane.

Table 12: Species of conservation concern, and specially protected bird species recorded at Kilquane in Spring/Summer 2019

Species	Kilquane	Kilquane	Nocturnal Visit	Nocturnal Visit	Nocturnal Visit	Breeding status at the site
	23/04/19	03/06/19	13/05/19	29/05/19	20/06/19	
Common Buzzard	1	1	-	-	-	Breeding
Sparrowhawk (*Accipiter nisus*)	-	1	-	-	-	Possibly breeding
Long-Eared Owl	-	-	-	3-4	2	Breeding
Spotted Flycatcher (*Muscicapa striata*)	-	1	-	-	-	Possibly breeding

Note: Red and Amber colours are used to highlight species of conservation concern as per K.Colhoun & S.Cummins (2013) 'Birds of Conservation Concern in Ireland 2014–2019'. Irish Birds 9: 523-544 (2013)

Hen harrier survey was carried out at Kilquane in 2019. Species recorded during the surveys are presented below. No Hen Harrier were observed.

Table 13: Bird species of conservation concern, and specially protected raptor species recorded at Kilquane during Hen Harrier surveys in Spring/Summer 2019

Species	Kilquane	Kilquane	Kilquane
	23/04/19	03/06/19	24/06/19
Common Buzzard	-	2	2
Sparrowhawk	-	1	-
Meadow Pipit	-	-	-
Stonechat (*Saxicola rubicola*)	-	-	-
Mistle Thrush (*Turdus viscivorus*)	-	1	-
Linnet	-	-	-

Ecological Evaluation

On the basis of the preliminary appraisal, the site is classified as of **Local Importance (higher value)** as per the ecological evaluation examples prescribed in the NRA (2009) *Guidelines for Assessment of Ecological Impacts of National Roads Schemes.* In terms of biodiversity the overall ecological evaluation for this option is ranked as **Low-Moderate**.

9.4.5 Waterbodies, Drainage and Flood Risk

There are two known waterbodies in proximity to CSS 12. A stream, a tributary of the Butlerstown River (IE_SW_19O030050), which is classified as being of High status and has been classified as having good general conditions under the Water Framework Directive status. The stream flows along the conifer plantation in a southerly direction and is located approximately 180m west of CSS 12. An unnamed, small stream, likely to also be a tributary of the Butlerstown River (EPA_Code: 19B06), flows in a westerly direction as it traverses the HVAC route. The Butlerstown River is hydrologically connected to Cork Harbour SPA [004030] and Glanmire Wood pNHA [001054] and Dunkettle Shore pNHA [001082].

There is no evidence of flood risk within CSS 12 as the site occurs outside the CFRAM fluvial risk area.

The proposed HVDC will require crossing seven watercourses including crossing the Owenacurra River and its tributaries. North of Midleton, the Owenacurra River has been classified as having good general conditions under the Water Framework Directive status, whilst south of Midleton the river is noted at risk of not achieving good status. The HVAC cable would be routed cross country crossing a number of existing drainage ditches and an unnamed stream, which flows in westerly direction.

Any works that take place in close proximity to a water body have the potential to impact on the biology, water quality morphology and/or hydrology of the receiving watercourses. Access to CSS 12 may be gained via a new bridge or culvert over the stream.

A ranking of **Moderate** ranking has been assigned to CSS 12 in terms of watercourses.

9.4.6 Cultural Heritage (Archaeological and Architectural Heritage)

There are no recorded cultural heritage sites located within a 500m radius of the centre point of the asterisk presented in **Figure 38**. The closest recorded cultural heritage site is located approximately 953m from the centre point. The nearest NIAH is located approximately 1.84km from the centre point.

Information relating to the use of the area of the commercial forest (Kilquane), formerly known as 'The Rea', as an execution site and burial ground during the War of Independence, was provided by a number of respondents during Step 3 consultations. The Rea was subsequently avoided when selecting CSS 12.

A cultural heritage constraints study by Rubicon Heritage Services Ltd of the shortlisted CSLZs was commissioned having regard to undesignated (unrecorded) cultural heritage sites within CSLZ 9 and CSLZ 12, associated with the War of Independence, such as 'The Rea' , and the area of bog identified in historical mapping. A watching brief should be implemented for any groundworks on the site, given its proximity to The Rea.

A ranking of **Moderate** has been assigned to CSS 12 in terms of cultural heritage.

9.4.7 Combined Environmental Performance

CSS 12 has a combined environmental performance of **Moderate**. The site is located within a rural setting with potential for visual screening. While siting the converter station at CSS 12 would mitigate a number of environmental impacts associated with the installation of the HVAC cable, it would require additional mitigation relating to cultural heritage and the watercourse.

Option	Land use Planning	Soils and Geology	Landscape and Visual	Biodiversity	Waterbodies	Cultural Heritage	**Combined Environmental Performance**
CSS12							

9.5 Social Risks and Constraints

9.5.1 Traffic

CSS 12 is located approximately 2km north of Knockraha substation. Disturbance / disruption on the local road network associated with the installation of the HVAC cable will, in general, be avoided if the route is cross country in agricultural lands. The route crosses one local road north of the existing substation which may require closure during installation.

There would however be localised but temporary traffic and road disruption associated with the construction of the converter station and the installation of the HVDC cable. Due to the HVDC route, it should be noted that construction access may be routed along existing roads within Kilquane commercial forest. The stream, to the east of the forest, would be crossed either via a culvert or a new bridge.

A minimum estimated installation rate of approximately 50m per crew per day applies to the HVDC route, resulting in a timeline of approximately 88 crew-weeks for the approximately 22km of the route.

As with all of the converter station site options under consideration, it is anticipated that road closures, except for local access, will be required for all potential HVDC routes.

Data from Corine 2018 datasets indicates that there is a considerable high occurrence of pastures / arable land with pockets of mixed and coniferous forestry plus made ground proximate to larger settlement areas along the HVDC route. The installation of the HVDC cable will result in temporary disturbance to agricultural land use practices. Any impact that restricts the movement of livestock to and from the farms plus movement of dairy lorries or machinery will have a medium potential to cause change. However, the appointed contractor will prepare a traffic management plan which will incorporate measures to minimise the potential temporary impact and facilitate the ongoing farming operations during the construction phase, these may include agreement to temporarily halt works or scheduling of works to avoid busy farming operations such as silage cutting season.

As with all of the routes under consideration, there are several community facilities located along the local road network between CSS 12 and Churchtown (the common point of convergence). An increase of construction traffic on this route resulting from temporary diversions would have potential to cause temporary disturbance / disruption to these services, in additional to those accessing these community facilities. The installation of the HVDC cable has the potential to cause temporary disturbance / disruption to the recreational value of the area during construction. The proposed HVDC cable will be routed adjacent to two golf courses. The identified option will result in traffic management constraints on the operation of these golf courses during construction.

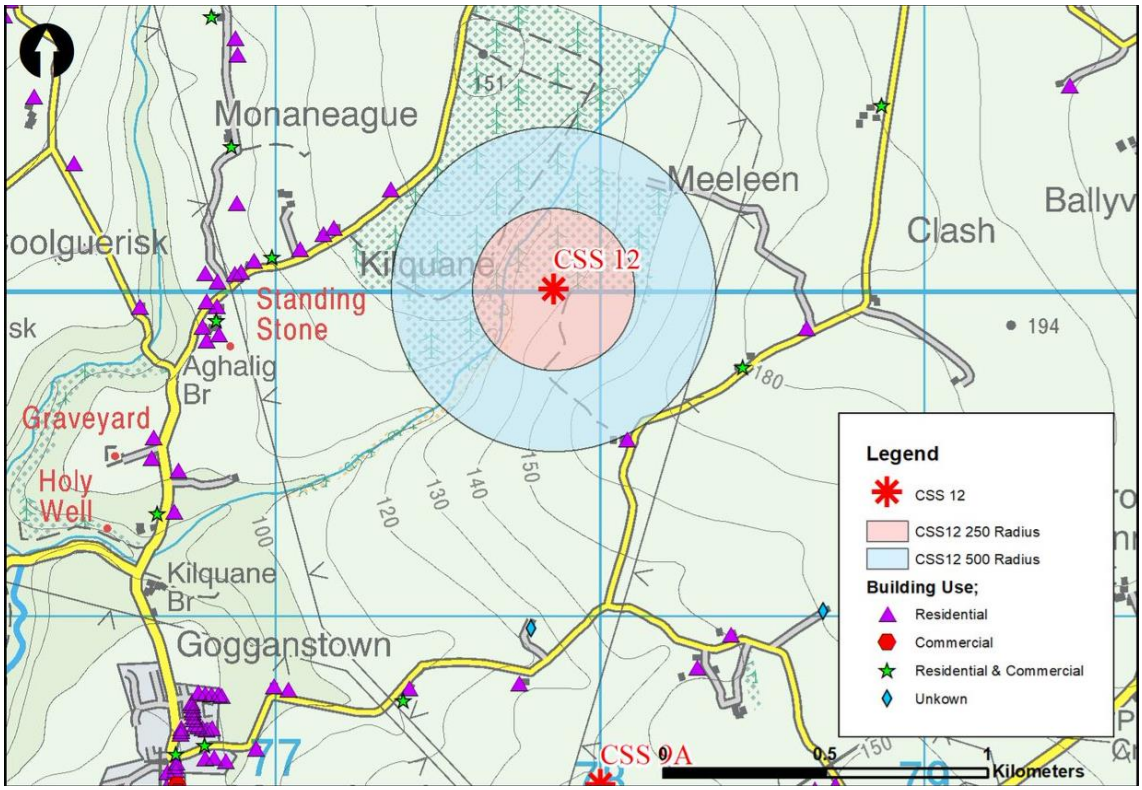
Having regard to the above, a **Low-Moderate** ranking has been assigned, based on construction phase access via Kilquane Forest.

It should be noted that access from local roads to the east would likely result in significant, temporary disruption / disturbance impacts.

9.5.2 Noise

According to GeoDirectory data, there are no residential properties within 500m of the centre point of CSS 12 (refer to **Figure 44**) the nearest residential property to the centre point of CSS 12 is located approximately 513m to the south east. There are 11 (the majority of which are residential) buildings within 1km of the centre point. A residential / commercial property including a dog training centre and boarding kennel is also located to the east of the forest.

Figure 44: CSS 12 Nearest Sensitive Receptors



Source: Mott MacDonald

CSS 12 is remote from population centres and major road traffic noise, in terms of noise sensitive receptors. There are approximately 9 residential properties within 1km of the site. The potential for noise impacts was noted as a key concern raised by the Step 3 public consultation process. The public referenced concerns around noise pollution that could potentially be associated with the project, both during the construction phase and while the converter station is operational. There are no known community facilities located within 500m of the site. As noted in **Figure 44**, there are a number of one-off rural houses along the existing road network.

The proposed HVDC cable will require works along the existing road network in proximity to a number of noise sensitive receptors. These works will result in temporary noise nuisance for the duration of the installation works. However, these works are transient in nature.

The location of the converter station site is such that a HVAC route along the road network performs poorly under assessment. Therefore, an underground cable following a cross country route has been considered. Given the nature of the settlement patterns in wider study area, (there are low numbers of scattered rural one-off houses), construction noise nuisance is likely to have a temporary adverse impact on noise sensitive receptors located along the existing road network. All construction related nuisances would be managed by a project-specific Construction Environmental Management Plan (CEMP). A construction Traffic Management Plan (TMP) will form part of this CEMP. An outline CEMP and TMP will be included with the planning applications for the proposed development).

CSS 12 is sited at a lower elevation to surrounding lands to the east at a distance from noise sensitive receptors. This dip in elevation, may provide some potential for natural screening of

the converter station, as will the forested area. In terms of noise, a **Low** ranking has been assigned.

9.5.3 Visual

According to GeoDirectory data, the closest residential property to CSS 12 is located approximately 513m south east of the site. There are no residential properties within 500m, and approximately 9 residential properties within 1km of the site as shown in **Figure 44**.

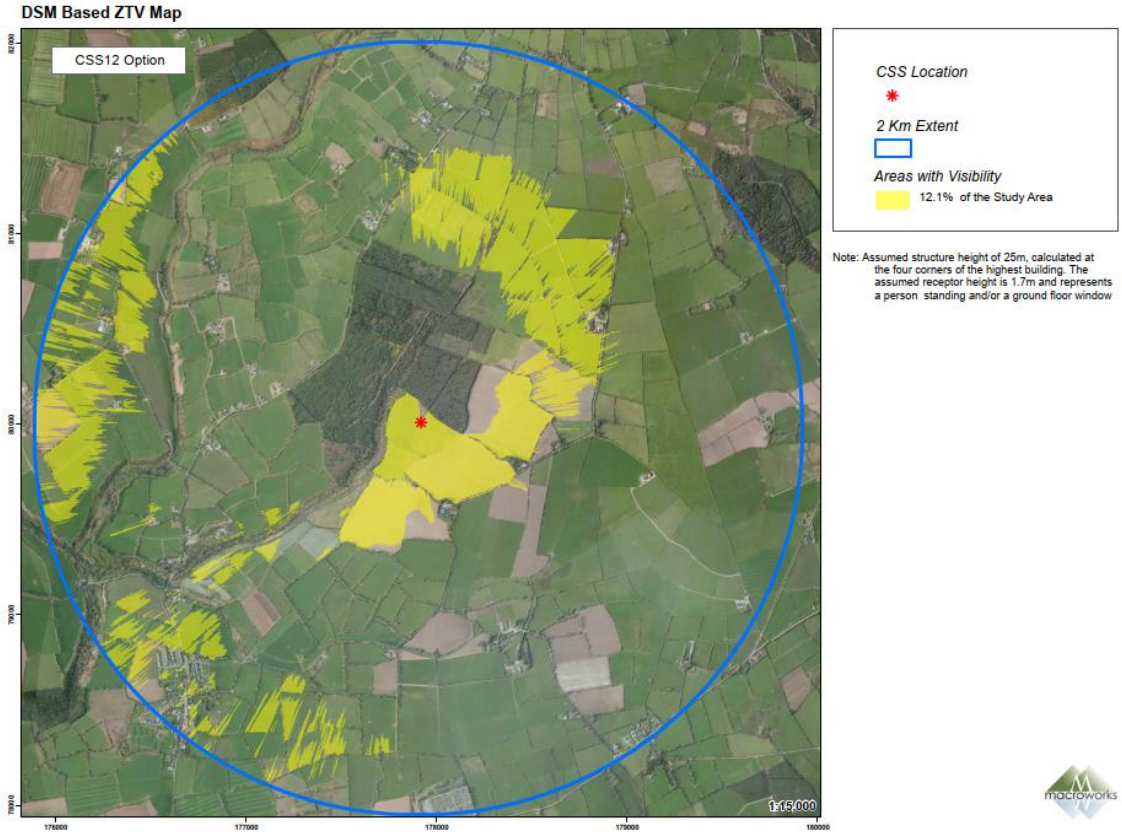
CSS 12 is located between the forest and the elevated lands which offers substantial visual screening from residences.

CSS 12 is located approximately 2km north of the existing substation and approximately 1.7km from Knockraha Village. Knockraha general environs has clustered residential development, particularly within its northern and western areas, with a well-defined social and community core made up of Knockraha National School, Knockraha community centre, St. Mary's Church and the Old School House Childcare Facility. There are no known community facilities situated within 500m of the site.

The ZTV map indicates a high degree of screening is afforded for this site due to a combination of the mature forest plantation that backs it to the north and elevated terrain a short distance to the southeast. The visibility pattern generally falls on uninhabited farmland in the outer western portions of the study area, however, there will be some potential visibility afforded to the settlement of Knockraha nearly 2km to the southwest.

Having regard to the above a ranking of **Low** has been assigned.

Figure 45: CSS 12 ZTV



Source: MacroWorks

9.5.4 Combined Social Performance

CSS 12 has a combined social performance of **Low** due to the high degree of screening is afforded for this site due to a combination of the mature forest plantation that backs it to the north and elevated terrain a short distance to the southeast.

Option	Traffic	Noise	Visual	Combined Social Performance
CSS 12				

9.6 Technical Risks and Constraints

The HVAC route for CSS 12 is shorter than that considered in Step 3, and no longer requires additional equipment to implement. The technical risk for CSS 12 has therefore been reduced from Moderate in Step 3 to **Low-Moderate** in Step 4A**.**

9.7 Deliverability Risks and Constraints

9.7.1 Design Complexity

HVDC Route

This cable route is generally narrow but constructible. There is a parallel water main along portions of the route that would need to be taken into account. Given the local residential nature of the supply, this is not expected to provide a challenging installation environment and space within the roadway for the narrow HVDC trench is expected to be available.

The route requires the crossing of 8 water courses. No information has been received to date on bridges along these roads, but it can reasonably be expected that these bridge crossings will be stone bridges or similar with insufficient deck space to install the cable ducts. As such, HDD would be required off-road for each of these crossings. This route would also require the crossing of Gas Transmission pipelines twice along the route, which would require detailed interaction with Gas Networks Ireland as well as careful planning and installation. It is likely that HDD would be required for crossing the Owenacurra River.

A solar plant has received planning consent near Lysaghstown on a section of the, the site boundary for which straddles the road. While the road will still remain open and owned by Cork County Council, it can reasonably be expected that 38 kV cables will cross the road at a number of locations across the solar site. These crossings will be done at right angles and are not expected to be difficult to achieve with the HVDC cable.

A crossing under the associated 110 kV underground cable serving the solar plant located to the east of Knockraha along a section of the route would be required. This is not considered onerous but will require knowledge of the location and trench cross-section for the cable prior to finalising the route design.

There are nine locations on this route which have corners with a bending radius tighter than the 20m minimum for duct installation. This will require cutting the corner, or alternatively, micro-routing cross-country.

Converter Station Site

The site is agricultural land in pasture with well-drained soil. As the site is gradually sloped there will be some element of site levelling needed however this is not foreseen to present any significant design challenges with this location.

Site access may be from the north via the forest road, in which case a permanent culvert / bridge will need to be constructed over the stream that bounds the site northern boundary of the site.

HVAC Route

There is one crossing of a substantial waterway that will likely require HDD for installation. It may also be possible to culvert the waterway. The cross-country nature of the route assessed means that it is anticipated that there are no underground services to cross.

Summary

The aspects raised above result in the Design Complexity risk of CSS 12 being assessed as **Low-Moderate**.

9.7.2 Traffic Disturbance Impact

HVDC Route

Each section under construction would require closure, while at all times maintaining access for local residents. Diversions are available for the sections along this route.

Converter Station Site

Heavy / abnormal load vehicles are required to transport HV equipment such as transformers to the site. As the local roads are quite narrow, widening or bridge strengthening may be required.

HVAC Route

The route option assessed is cross-country and crosses one local road north of Knockraha which may require closure during installation. This will take very little time and will therefore have a minimal traffic disturbance impact.

Summary

The aspects raised above result in the Traffic Disturbance associated with CSS 12 being assessed as **Low-Moderate.**

9.7.3 Dependence on other infrastructure projects

Neither the routes nor the converter station site have dependence on other infrastructure projects and is therefore assessed as **Low**.

9.7.4 Permits and wayleaves

HVDC Route

A short cross-country section would require interaction with private landowners and obtaining of wayleaves for that section. Additionally, the final approach to the converter station location would require landowner engagement and consent.

There is a solar plant which has received planning permission near Lysaghtstown, the boundary of which straddles a section of the route. Interaction would be required with plant owner to verify the locations and depth of any MV cable crossing the route section.

Wayleaves and landowner consent will be required at the locations the route needs to cut the road corner (to achieve the required bending radius) or micro-route cross country.

Converter Station Site

Wayleave access through forest will be required and a permit to construct a permanent culvert over the stream if this is the eventual construction access point.

HVAC Route

Permits and wayleaves as well as engagement with local landowners will be required for the full length of the 2km route.

Summary

The permits and wayleaves risk is ranked as **Moderate**.

9.7.5 Implementation Timelines

HVDC Route

The route can be installed at a minimum rate of approximately 50m per crew per day, resulting in a timeline of approximately 88 crew-weeks for the approximately 22km of the route, which is not on critical path for this project.

Converter Station Site

It is estimated from start of construction to final energisation of the converter station will take approximately 2 years.

HVAC Route

At an installation rate of 25m per day, this route can be installed at a minimum rate of approximately 16 crew-weeks which is not on the critical timeline for the project.

Summary

All aspects are not on the critical path for the project and is therefore considered a **Low** ranking.

9.7.6 Combined Deliverability Performance

The combined deliverability performance of CSS 12 is ranked as **Low-Moderate** with the dominating feature being the anticipated wayleaves required for off-road micro-routing.

Option	Design Complexity	Traffic Disturbance Impact	Dependence on other Infrastructure	Permits and Wayleaves	Implementation Timelines	**Combined Deliverability Performance**
CSS 12						

9.8 Economic Risks and Constraints

The estimated cost of the converter station, enabling works and associated HVDC and HVAC routes for **CSS 12** is 6% higher than the lowest option, resulting in an assessment of **Low-Moderate.** The site performs relatively well in terms of both converter civils and cable routes. Higher costs for converter station civil works are expected due to the need for cut-and-fill.

9.9 Summary

CSS 12 offers a high degree of visual screening due to a combination of the mature forest plantation that backs it to the north and elevated terrain a short distance to the southeast

The table below summarises the evaluation of CSS 12.

Option	Environmental	Social	Technical	Deliverability	Economic
CSS 12					

10 Converter Station Site 14

10.1 Identification of Converter Station Site 14

Converter Station Site 14 (CSS 14) was identified for further assessment having regard to the following site selection criteria.

- Feedback from Step 3 consultation;
- Visual Impact;
- Proximity to sensitive receptors; and
- Folio Size.

10.1.1 Feedback from Consultation

Key concerns raised related to visual impact, traffic and noise, biodiversity and cultural heritage.

A visual screening assessment, ecological walkovers, ornithological surveys and a cultural heritage constraints study of the shortlisted CSLZs, including CSLZ 14, have informed this Step 4A Report.

10.1.2 Visual Impact

Converter Station Location Zone 14, considered in Step 3 of EirGrid's six-step Framework for Grid Development, includes elevated lands to the west and commercial forested areas to the north and south that may offer visual screening potential.

10.1.3 Proximity to Sensitive Receptors

CSLZ 14 is relatively sparsely populated with one-off housing along the local road network.

10.1.4 Folio Size

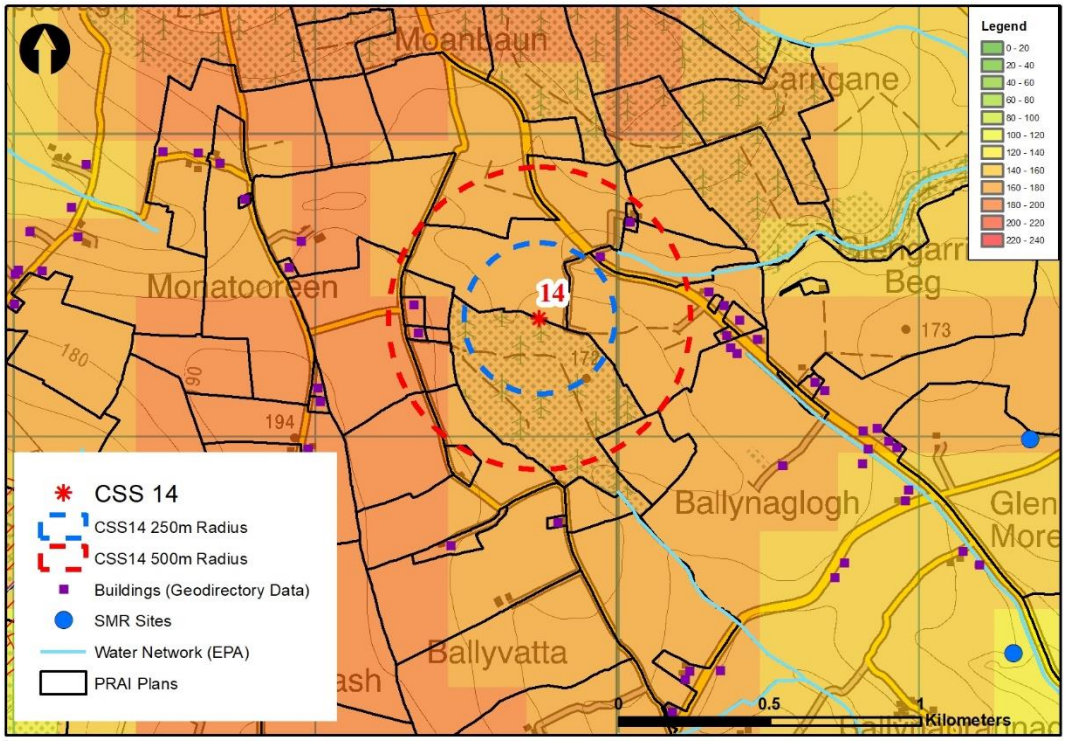
CSS 14 is of sufficient size to accommodate a converter station compound, although development in lands to the north of the (Ballyvatta) forest may optimise visual screening potential.

10.2 CSS 14

CSS 14 is located within an area of commercial forestry (Ballyvatta), in the townland of Ballyvatta, appropriately 4km straight line distance from Knockraha 220 kV station.

According to GeoDirectory data, there are no residential properties within 250m of the centre point of CSS 14 (refer to **Figure 46**) the nearest residential property to the centre point of CSS 14 is located approximately 286m from the site. There are 21 (the majority of which are residential) buildings within 1km of the centre point.

Figure 46: CSS 14



Source: Mott MacDonald

10.3 CSS 14 Route Options

10.3.1 HVDC Route

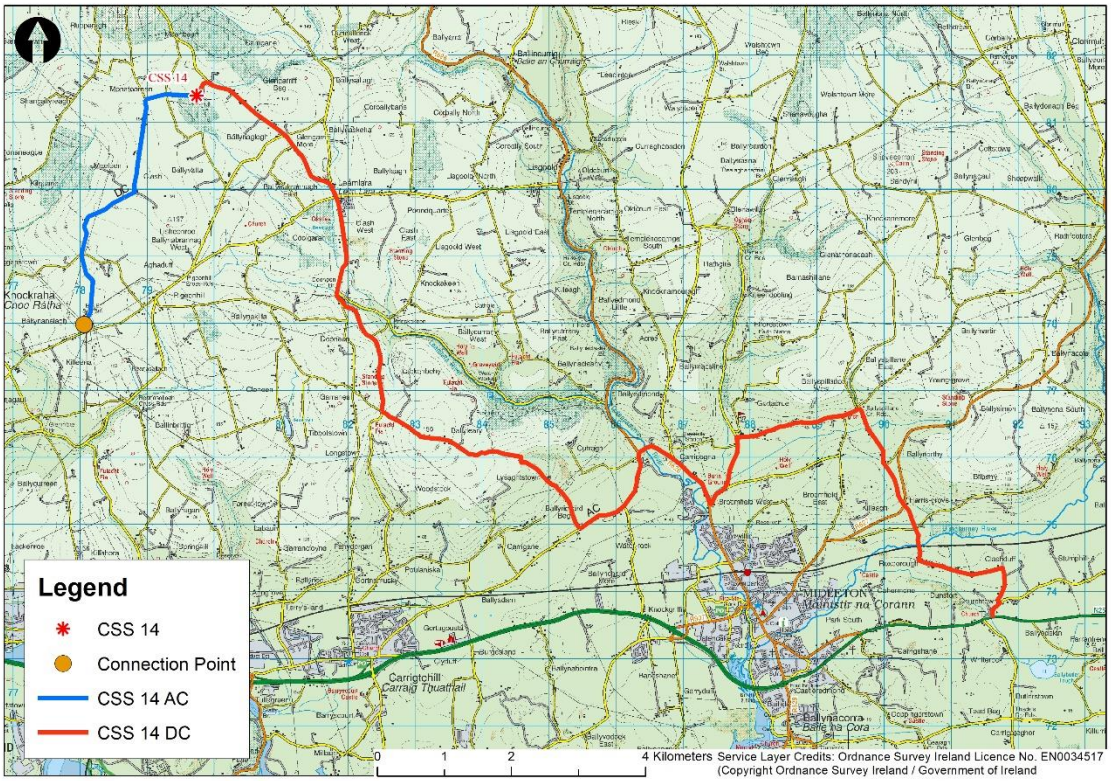
The HVDC cable route assessed is north from Churchtown towards and until Ballyspillane, then west to East Cork Golf Club, south down Broomfield Ridge towards the R626, south down Carrigane Road until Ballyrichard then north-west past Kilgoura Quarry and turning north on the main road to Watergrasshill then finally cross-country west to the connection point.

10.3.2 HVAC Route

The HVAC route option is west cross-country then south along the local road and finally directly south cross-country to the connection point.

The following sections provide further detail regarding CSS 14 in line with the multi criteria analysis. All distances referenced have been taken from the centre point of the asterisk presented in **Figure 46**.

Figure 47: Proposed HVDC/HVAC route options from the common point of convergence at Churchtown for CSS 14



Source: Mott MacDonald

10.4 Environmental Risks and Constraints

10.4.1 Land Use Planning

CSS 14 is located within the townland of Ballyvatta.

CSS 14 is situated within a commercially forested area in a predominately rural location. The County Development Plan (CDP) 2014 outlines the economic importance of the Forestry sector in County Cork.

In November 2017 consent was granted for the construction of a 48.4ha Solar Farm adjacent to the Ballyvatta Forest, (planning Reference 175370). The grid connection is to be provided via an underground cable route which will be located along the unnamed local road in Lisheenroe south to Knockraha substation.

Construction of the converter substation at this site would result in permanent land use change from forestry to utility. Overall the risk can also be considered **Moderate**, in the context of land use planning**.** The development of the CSS 14 would result in an intensification of transmission infrastructure located in close proximity to a solar farm development within a predominantly rural area.

10.4.2 Soils and Geology

There are no known geological features or hazards located in proximity to CSS 14.

The GSI quaternity mapping indicates that CSS 14 is located within sandstone and mudstone with rock outcrops located north and south of the forested area. CSS 14 is underlain by a Locally Important Aquifer with bedrock which is Moderately Productive in Local Zones and is of high vulnerability. There are also areas of extreme vulnerability corresponding to the rock outcrops north and south of the site.

Groundwater vulnerability can in general be readily managed with the implementation of standard construction phase mitigation measures, a **Low-Moderate** ranking is assigned to this option.

10.4.3 Landscape and Visual

CSS 14 is located within a commercial forested area on Landscape Character Type Fissured Fertile Middleground. Development of adjacent lands to the east may also be required to facilitate siting at this location. It is understood that areas of the forest have recently been felled.

The site is not situated within any designated sensitive landscape areas and the landscape type is characterised as having medium landscape sensitivity according to the CDP. The closest designated scenic landscape is the R626 Leamlara to Midleton S43 scenic route located to the south east.

Moanbaun is a Coillte managed woodland to the north of the site that is publicly accessible for recreational uses. It contains several trails / paths. There are two look out points / viewpoints but both are situated on the far side of the forest and are orientated away from the site. Otherwise, the enclosed nature of the woodland limits views of the surrounding landscape.

The area of commercial forestry would offer notable visual screening however views are likely to be afforded from some nearby dwellings and roads, consequently a ranking of **Low-Moderate** been assigned.

10.4.4 Biodiversity

CSS 14 is not located within any sites designated for nature conservation nor does it directly adjoin one. Potential for effects on European sites have been taken into consideration in the evaluation of the converter station sites in the context of distance to potential sensitive receptors only. The next stage of assessment will consider the potential for significant effects on European Sites in the context of Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC). The need for measures to mitigate against significant effects will be determined.

A preliminary appraisal of the ecological potential of CSS 14 and the immediate surrounding area was made having carried out a site walkover in August 2019.

Ballyvatta Forest is dominated by Sitka Spruce and Lodgepole Pine with a small Alder plantation on the southwest perimeter. The age structure is largely uniform and most of the trees are in the mature stages of growth apart from one area of pre-thicket Sitka Spruce in the north of the wood. There is no shrub or ground layer within the forest. The interior tracks are quite broad (8-10 m) but broadleaf trees are very scarce with only occasional Grey Willows and a few Alders and Rowans. The shrub layer along the tracks is also limited and Bramble is scarce.

The lands directly north of the forest comprise a mosaic of semi-improved acid grassland and wet grassland. The low-lying area of the site is wetter and includes species which might be

associated with the Annex I habitat *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]. However, further botanical assessment is necessary to determine any relationship to Annex I habitat.

The field boundaries are overgrown with gorse and hawthorn scrub and have no batroost potential. A treeline occurs along the eastern boundary of the site and has moderate to high bat roost potential. These areas are likely to support small mammals.

A small stream flows in an east-west direction through the site and is partially concealed by dense bankside willow scrub.

Abundant devil's-bit scabious (*Succisa pratensis)*, the foodplant of the Annex IV protected Marsh Fritillary butterfly, occurs within the lands. Marsh Fritillary can use varying sites year-on-year for breeding and therefore marsh fritillary absence in one year does rule out presence.

Common frog (*Rana temporaria*) was recorded within the site and is likely to spawn and hibernate in the area. There are several NPWS records for common frog in the locality. There are no other protected species records in the locality.

Mammal paths occur along the field margins and include signs of badger (snuffle holes and droppings). The treeline along the eastern boundary of the site hosts a badger sett (given the density of overgrowth only one entrance could be seen, however on the basis of the level of activity into and out of the sett, this is likely to be a main sett).

Figure 48: *Molinia* in wet low-lying area of the site

Source: Mott MacDonald August 2019

Figure 49: *Scabious* – foodplant of Marsh Fritillary

Source: Mott MacDonald August 2019

Figure 50: Common Frog

Source: Mott MacDonald August 2019

Figure 51: Mammal Path (badger)

Source: Mott MacDonald August 2019

An ornithological survey of Ballyvatta Forest was carried out on 24th April and 5th June 2019. Nocturnal surveys were carried out on 23rd May, 7th June and 16th June 2019. A total of 20 species was recorded in the forest and none of these is of conservation concern in Ireland. Several species of note were recorded in the heathland adjacent to the northern perimeter of the forest and these included Meadow Pipit, Stonechat, Whitethroat, Linnet and Reed Bunting.

A Hen Harrier survey was also carried out in 2019. Species recorded during the survey are presented hereunder. No hen harrier were observed.

Table 14: Species of conservation concern and specially protected raptors at Kilquane during Hen Harrier surveys in Spring/Summer 2019

Species	Ballyvatta	Ballyvatta	Ballyvatta
	25/04/19	05/06/19	24/06/19
Common Buzzard	1	-	1
Sparrowhawk	-	-	-
Meadow Pipit	-	2	-
Stonechat	-	1	-
Mistle Thrush	-	-	-
Linnet	1	2	-

Note: Red and Amber colours are used to highlight species of conservation concern as per K.Colhoun & S.Cummins (2013) 'Birds of Conservation Concern in Ireland 2014–2019'. Irish Birds 9: 523-544 (2013)

Ecological Evaluation

The proposed CSS 14 comprises potential Annex I grassland habitat which supports / has potential to support several protected species including birds of conservation concern, Common

Frog, and Badger. The site has potential to support Marsh Fritillary (an Annex IV listed species under the EU Habitats Directive). On the basis of the preliminary appraisal, the site is classified as being of at least **County Importance** as per the ecological evaluation examples prescribed in the NRA (2009) *Guidelines for Assessment of Ecological Impacts of National Roads Schemes.*

Given the ecological value of this option, a ranking of **Moderate-High** would apply.

10.4.5 Waterbodies, Drainage and Flood Risk

There are three known waterbodies in proximity to CSS 14. All three streams are tributaries of the Owenacurra River (IE_SW_19O030400). The Owenacurra River is classified as having good general conditions North of Midleton and is noted at risk of not achieving good status South of Midleton under the Water Framework Directive status. The closest stream (EPA_Code: 19M21) is located approximately 300m north east of the site. The Great Island Channel SAC [001058], Cork Harbour SPA [004060] and Great Island Channel pNHA [001058] are located approximately 16.5km downstream of this waterbody. The two other unnamed streams are also hydrologically connected to these Natura 2000 sites as well as Leamlara Wood pNHA [001064] approximately 4.5km downstream.

Any works that take place in close proximity to a water body has the potential to impact on the biology, water quality morphology and hydrology of the receiving watercourses.

The proposed HVDC cable will require crossing of 11 watercourses including crossing the Owenacurra River and its tributaries. The HVAC cable would be routed cross in existing roads and cross country in the last section before connection to Knockraha Substation from the north, crossing a 5 watercourses and a number of existing drainage ditches.

There is no evidence of flood risk within CSS 14 as the site occurs outside the CFRAM fluvial risk area. As noted, a section of the HVDC route north of Midleton is traverses the Owenacurra catchment, the road is susceptible to flooding, and therefore presents a risk in terms of operational and maintenance access during the lifetime of the cable. Having regard to the number of potential water crossings, a **Low-Moderate** ranking has been assigned.

10.4.6 Cultural Heritage (Archaeological and Architectural Heritage)

There are no recorded cultural heritage sites located within a 500m radius of the centre point of CSS 14 in **Figure 52**. The closest recorded cultural heritage site is located approximately 1.5km from the centre point. The nearest NIAH is located approximately 2.5km from the centre point.

A cultural heritage constraints study by Rubicon Heritage Services Ltd of the shortlisted CSLZs is provided in Appendix D *Cultural Heritage Report.* A ranking of **Low-Moderate** has been assigned to CSS 14 in terms of cultural heritage.

10.4.7 Combined Environmental Performance

CSS 14 has a combined environmental performance of **Moderate-High**. The site is located within a rural setting with potential for visual screening potential Annex 1 habitat.

Option	Land use Planning Overview	Soils and Geology	Landscape and Visual	Biodiversity	Waterbodies	Cultural Heritage	**Combined Environmental Performance**
CSS14							

10.5 Social Risks and Constraints

10.5.1 Traffic

There are a number of single residential properties scattered along the existing local road network. Disturbance / disruption on the local road network associated with the installation of the HVAC cable will, in general, be avoided as it would be installed cross country in agricultural lands. The route crosses one local road north of existing substation which will require temporary closure during installation. The local road is a main thoroughfare for HGVs and commercial trucks joining the M8 at Watergrasshill and would therefore be directly affected during construction along these route sections.

As with all of the converter station site options under consideration, it is anticipated that road closures, except for local access, will be required for all potential HVDC routes.

Data from Corine 2018 datasets indicates that there is a considerable high occurrence of pastures / arable land with pockets of mixed and coniferous forestry plus made ground proximate to larger settlement areas along the HVDC route. The installation of the HVDC cable will result in temporary disturbance to agricultural land use practices. Any impact that restricts the movement of livestock to and from the farms plus movement of dairy lorries or machinery will have a medium potential to cause change. However, the appointed contractor will prepare a traffic management plan which will incorporate measures to minimise the potential temporary impact and facilitate the ongoing farming operations during the construction phase, these may include agreement to temporarily halt works or scheduling of works to avoid busy farming operations such as silage cutting season.

As with all of the routes under consideration, there are several community facilities located along the local road network between CSS 14 and Churchtown (the common point of convergence). The proposed HVDC cable will be routed through Leamlara village. There are a number of community facilities located within the village including the local church and Brookfield Care Centre on the approach to the village. The installation of the HVDC cable has the potential to cause temporary disturbance / disruption to the amenity value of the area during construction. The proposed CSS 14 is situated south of Moanbaun Woods, a popular local amenity area and associated trails. The proposed CSS will not directly impact on this amenity however, there may be temporary disruption to access the woods via the local road during the installation of the proposed HVDC cable.

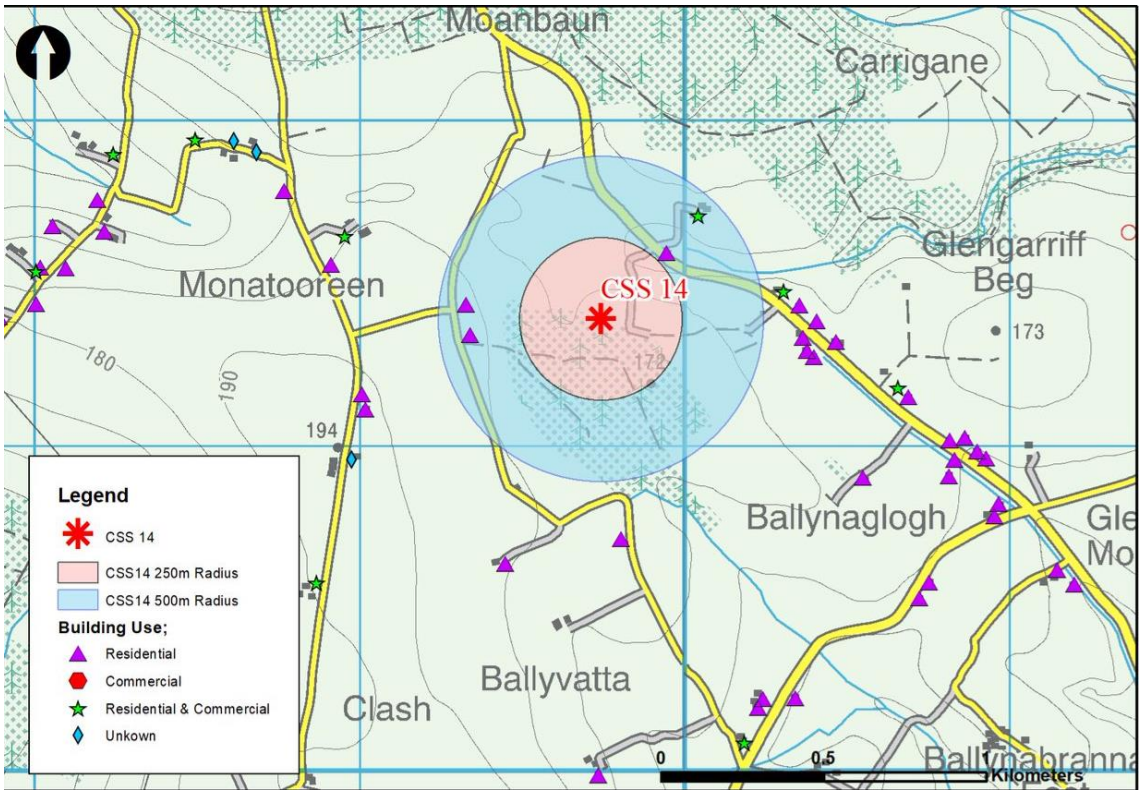
The proposed HVDC cable will be routed adjacent to two golf courses. The identified option will result in traffic management constraints on the operation of these golf courses during construction.

Having regard to the above, a **Low-Moderate** ranking has been assigned.

10.5.2 Noise

According to GeoDirectory data, there are no residential properties within 250m of the centre point of CSS 14 (refer to **Figure 52**) the nearest residential property to the centre point of CSS 14 is located approximately 286m from the site. There are 21 (the majority of which are residential) buildings within 1km of the centre point.

Figure 52: CSS 14 Nearest Sensitive Receptors



Source: Mott MacDonald

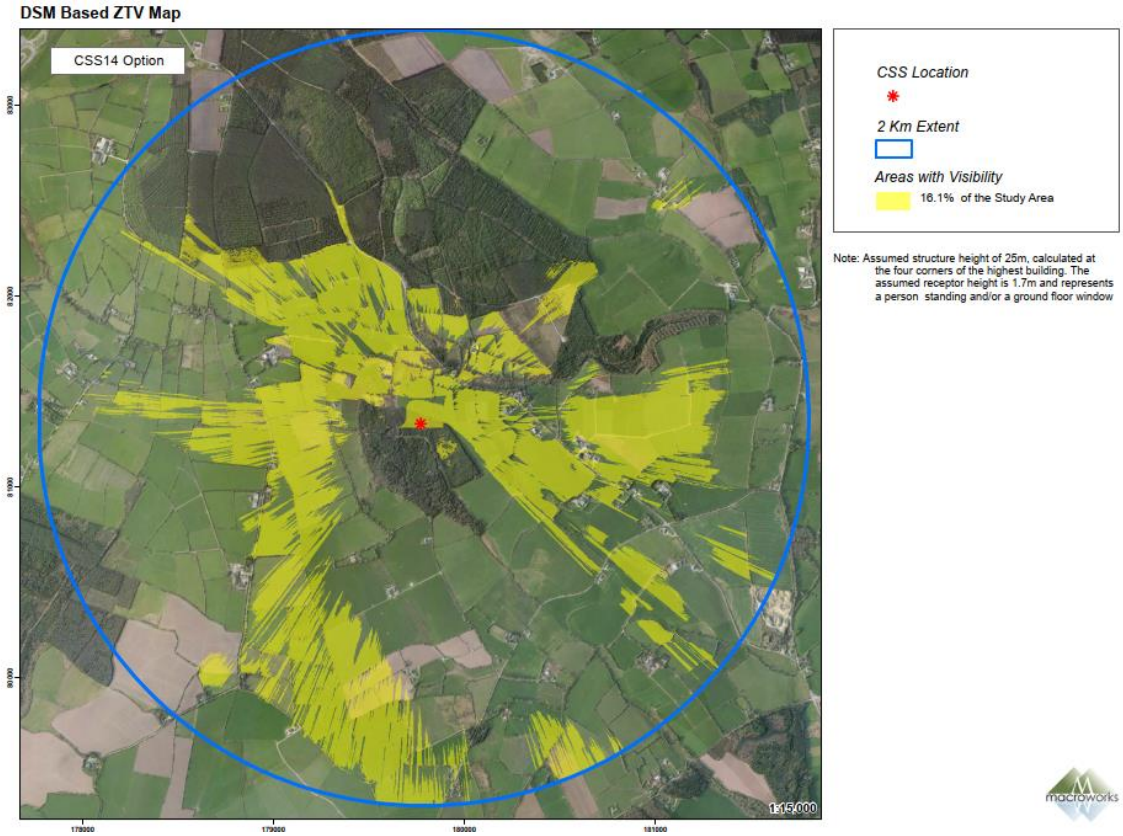
CSS 14 is remote from population centres (i.e. Knockraha and Leamlara) and major road traffic noise, in terms of noise sensitive receptors, however the HVDC route option assessed will be routed through Leamlara village. The potential for noise impacts were noted as a key concern raised by the Step 3 public consultation process by the residents of Leamlara. Leamlara also provides basic community services, i.e. education (Leamlara Montessori School and Bishop Aherne National School) and health services (Brookfield Care Centre). The proposed HVDC cable will require works along the existing road network in proximity to a number of noise sensitive receptors. These works will result in temporary noise nuisance for the duration of the installation works. However, these works are transient in nature. Given the nature of the settlement patterns in wider study area, there are scattered rural one-off housing, construction noise nuisance is likely to have an temporary adverse impact on noise sensitive receptors located along the existing road network. All construction related nuisances would be managed by a project-specific Construction Environmental Management Plan (CEMP). A construction Traffic Management Plan (TMP) will form part of this CEMP. An outline CEMP and TMP will be included with the planning applications for the proposed development. In terms of noise, a **Low-Moderate** ranking has been assigned.

10.5.3 Visual

The distinct ZTV visibility pattern is dictated by the forest plantations that occur immediately to the south and a short distance to the north of this site, which leaves a band of close visibility to the north and east. Due to the rising topography to the west, a strip of north-south running visibility emerges in this direction on slopes between 500m and 1km away, before the spur ridge

screens the landscape further west. Whilst the majority of ZTV pattern falls on uninhabited fields, there is a cluster of dwellings a modest distance to the southeast from which visibility will be afforded. A **Moderate** ranking has therefore been assigned.

Figure 53: CSS 14 ZTV



Source: MacroWorks

10.5.4 Combined Social Performance

CSS 14 has a combined social performance of **Moderate**. The key driver for this overall score is associated with the potential for impacts under the heading traffic and noise.

Option	Traffic	Noise	Visual	Combined Social Performance
CSS 14				

10.6 Technical Risks and Constraints

There has been no change from Step 3 regarding this criterion for CSS 14, and therefore remains as **Moderate.**

10.7 Deliverability Risks and Constraints

10.7.1 Design Complexity

HVDC Route

This route is generally narrow but constructible. There is a parallel water main along portions of the route that would need to be taken into account. Given the local residential nature of the supply, this is not expected to provide a challenging installation environment and space within the roadway for the narrow HVDC trench is expected to be available.

The route requires the crossing of nine water courses. No information has been received to date on bridges along these roads, but it can reasonably be expected that these crossings will be stone bridges or similar with insufficient deck space to install the cable ducts. As such, HDD would be required off-road for each of these crossings and in some cases a culvert could be installed. This route would also require the crossing of Gas Transmission pipelines twice along the route, which would require detailed interaction with Gas Networks Ireland as well as careful planning and installation. It is likely that HDD would be required for crossing the Owenacurra River.

A solar plant has received planning consent near Lysaghstown, the site boundary for which straddles the road. While the road will still remain open and owned by Cork County Council, it can reasonably be expected that 38 kV cables will cross the road at a number of locations across the solar site. These crossings will be done at right angles and are not expected to be difficult to achieve with the HVDC cable.

There are seven locations on this route which have corners with a bending radius tighter than the 20m minimum for duct installation. This will require cutting the corner, or alternatively, micro-routing cross-country.

Converter Station

CSS 14 is a mix of commercial forest and agricultural land in pasture. The area immediately east of the forest is relatively flat with well-drained soil. The area north of the forest is marshy and would require significant drainage works.

Tree clearing and a minimal amount of site levelling will be required but we do not foresee any significant design challenges with this location if the area to the north of the forest is avoided.

HVAC Route

The route is approximately 4.7km in length, of which approximately 2km are cross country. The remaining 2.5km traverses narrow country roads. The roads are wide enough to accommodate the 2m wide trench but may not be wide enough to accommodate joint bays within the road network.

Summary

The aspects raised above result in the Design Complexity risk of CSS 14 being assessed as **Low-Moderate**.

10.7.2 Traffic Disturbance Impact

HVDC Route

Each section under construction would require closure, while at all times maintaining access for local residents. Diversions are available for the sections along this route.

Converter Station

The site can be accessed from the L1540. This is the main route from Watergrasshill to Leamlara and provides relatively good access for construction traffic.

HVAC Route

Each section under construction would require closure, while at all times maintaining access for local residents. Diversions are available for the sections along this route. There would be minimal traffic disturbance impact for the cross-country portions of this route.

Summary

The aspects raised above result in the Traffic Disturbance Impact risk of CSS 14 being assessed as **Low-Moderate**.

10.7.3 Dependence on other infrastructure projects

Neither the routes nor the converter station have a dependence on other infrastructure projects, as such this is assessed to be **Low**.

10.7.4 Permits and Wayleaves

HVDC Route

Permits from and significant interaction with Gas Networks Ireland will be required for crossing the gas transmission networks. There are three gas transmission crossings as well as 10 other service crossings which will require permits to either cross or divert for this route.

Wayleaves and landowner consent will be required at the locations the route needs to cut the road corner (to meet the minimum duct bending radius) or traverse cross country.

Additionally, the final approach to the converter station location would require landowner engagement and consent.

Converter Station

Permits will be required for the delivery of abnormal loads however access routes are relatively good, thus reducing the risk of these being delayed / not granted.

HVAC Route

Permits and wayleaves as well as engagement with local landowners will be required for the approximately 2km of cross-country route.

Additional engagement would be required in places where the road cannot accommodate joint bays.

Summary

The aspects raised above result in the Permits and Wayleaves risk of CSS 14 being assessed as **Moderate**.

10.7.5 Implementation timelines

HVDC Route

At an installation rate of 50m per day, the approximately 20km route can be installed in approximately 80 crew-weeks which is within the critical path of this project.

Converter Station

It is estimated from start of construction to final energisation of the converter station will take approximately 2 years.

HVAC Route

At and installation rate of 25m per day, the 4.7km route can be installed in approximately 38 crew-weeks. This is not on the critical path of the project.

Summary

All aspects are not on the critical timeline for the project and is therefore considered a **Low** ranking.

10.7.6 Combined Deliverability Performance

The combined deliverability performance of CSS 14 is ranked as **Low-Moderate** with the dominating feature being the anticipated wayleaves required for off-road micro-routing.

Option	Design Complexity	Traffic Disturbance Impact	Dependence on other Infrastructure	Permits and Wayleaves	Implementation Timelines	**Combined Deliverability Performance**
CSS 14						

10.8 Economic Risks and Constraints

The estimated cost of the converter station, enabling works and associated HVDC and HVAC routes for **CSS 14** is approximately 17% higher than the lowest option, resulting in an assessment of **Moderate.** Higher costs of the cable route is expected due to the length of the AC route as compared to other CSS options.

10.9 Summary

The table below summarises the evaluation of CSS 14.

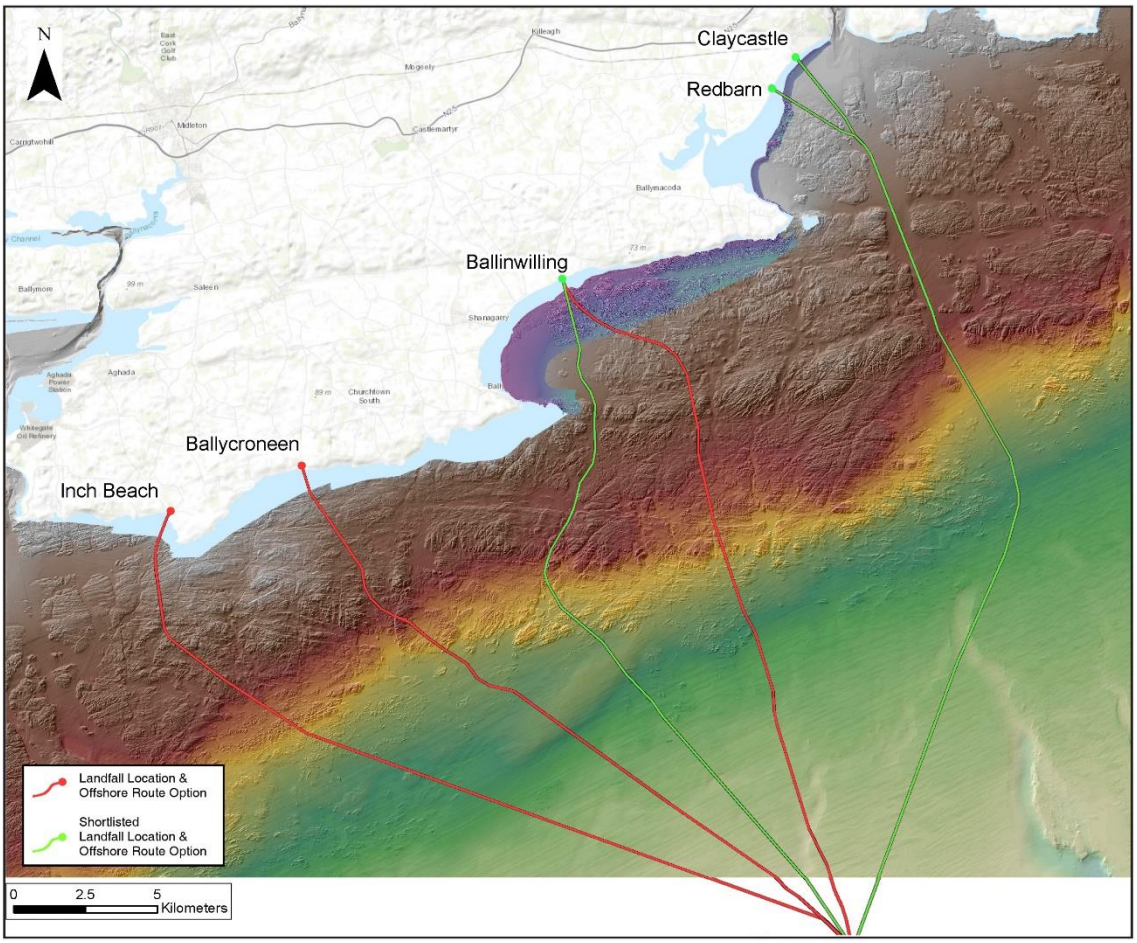
Option	Environmental	Social	Technical	Deliverability	Economic
CSS 14					

11 Landfall Locations

11.1 Introduction

The Step 3 Performance Matrix Assessments identified Ballinwilling Strand 2, Redbarn Beach and Claycastle Beach as the shortlisted landfall location options from five overall options, for further assessment. See **Figure 54** below.

Figure 54: Landfall Locations



Source: EirGrid

The majority of feedback from Step 3 consultations in relation to the three shortlisted landfall locations related to the potential for disturbance and disruption, albeit temporary, on local amenities and tourism and the local economy associated with the installation of the cable.

At this stage of the project it is anticipated that local access at the landfall locations will be restricted for a few weeks when the ducting to the transition pit is being installed. Further, local access along the beach will be restricted when the cables are being installed. More detailed studies and analysis will consider the potential for mitigation by avoidance (i.e. in terms of timing of works), where possible, such that works can be carried out outside the busy summer season.

Further mitigation that will be implemented will include a Traffic Management Plan (TMP) to ensure that construction activities, so far as is practical, do not adversely impact amenity, traffic or the environment in the surrounding area in terms of noise, access, disruption and / or nuisance. As this is common for all of the landfall options it has not been included as a differentiator in selecting the EBPO.

The following sections provide updates to the Step 3 assessments in terms of the offshore HVDC and onshore HVDC cable routing, and the findings of ornithological surveys of each of the three landfall options.

The offshore Step 3 assessment was as follows:

Option	Ballinwilling Strand 2	Redbarn Beach	Claycastle Beach
Offshore Environmental			
Offshore Social			
Offshore Deliverability			
Offshore Economic			
Offshore Technical			

The combined offshore and onshore Step 3 assessment was as follows:

Option	Ballinwilling Strand 2	Redbarn Beach	Claycastle Beach
Combined Environmental			
Combined Social			
Combined Technical			
Combined Deliverability			
Combined Economic			

11.2 Step 4 – Updated Offshore Assessment

Following assessment at Step 3, a number of further studies have been carried out related to the offshore elements of the project. The further studies carried out have not changed the overall assessment of offshore route options. The Celtic Interconnector Marine Consultant, Wood plc., has provided the following overview of the assessment of the offshore routes at this time.

11.2.1 Offshore Route – Ballinwilling Strand

The identified landfall location at Ballinwilling Strand is located 34km to the east of Cork City and 4.5km to the north-east of Ballycotton.

The route was developed in order to take advantage of what appears to be a sediment-infilled channel crossing the offshore area from the landfall vicinity. The bedrock remains close to the surface however, and the depth of sediment is less than that required to meet burial targets over a cumulative distance of approximately 6km and therefore rock-cutting is expected over this distance.

The length of rocky outcrops on the route proportionally affects the deliverability of the route. Implementation timelines will be dependent on the progress rate of installation through the rocky sections. There will be increased uncertainty with regard to trenching progress rates through rocky areas.

The primary fishing activity in the immediate area is static fishing for shrimp which normally occurs from 1st August to the 15th March when shrimp migrate from the rocky sections to the sandy sections. From a line 51º 47' North and 08º 06' West, North to the shoreline represents the westward line of the shrimp fishing. The eastward line is 51º 47' North and 07º 57' West, North to the shoreline. Local fishing and shipping is centred around Ballycotton harbour. The route traverses a known static fishing zone and therefore fishing activity could be directly affected during construction. Feedback from consultation with the local fishing association advised that moving fishing gear during the winter months can be challenging due to weather constraints and fishing being restricted to specific locations.

There is evidence of significant erosion occurring at the Ballinwilling Strand due to storm conditions. Numerous boulders of up to 1.0m diameter are present at the base of the cliff at the foreshore. Rock armour has been placed at the base of the cliff with the intention to limit coastal erosion. The hydrosedimentary study carried out on the project has indicated that this has a high level of seabed mobility with up to 2m of erosion during a 50 year storm event.

The Benthic surveys of both the Ballinwilling Strand approach routes indicate that no ecologically sensitive habitats or benthic communities were recorded that would prohibit operations over the proposed cable route. This included, notably, an absence of potential Annex I habitats (e.g. pockmark feature, biogenic or geological reefs).

11.2.2 Offshore Route – Redbarn Beach

The Redbarn Beach landfall is located approximately 3km south west of the town of Youghal. The landfall is formed by a gently sloping sandy beach. The offshore route differs from the Claycastle Beach route only for the 3.6km closest to landfall (see Section 11.2.3). This 3.6km section is characterised by 2km of rocky outcrops, boulder fields and high seabed gradients. By contrast the branch into the landfall at Claycastle Beach has none of the above within the final approach.

The Claycastle Beach and Redbarn Beach share an offshore route from the 12nm limit to approximately 4km from the beach. The routes are longer than that for Ballinwilling and follow a line near perpendicular to the coastline before turning south-southwest towards the point at which all of the nearshore routes meet. As with Ballinwilling Strand, the routes were identified to take advantage of apparently in-filled channels of sediment and thereby better cable burial conditions in the nearshore area.

The length of rocky outcrops on the route proportionally affects the deliverability of the route. Implementation timelines will be dependent on the progress rate of installation through the rocky sections. There would be increased uncertainty with regard to trenching progress rates through 2km of rock on approach to Redbarn Beach.

The Benthic surveys of the Redbarn Beach approach route indicate that no ecologically sensitive habitats or benthic communities were recorded that would prohibit operations over the identified cable route. This included, notably, an absence of potential Annex I habitats (e.g. pockmark feature, biogenic or geological reefs). The Redbarn Beach route recorded a marginally higher number of marine species and individuals compared to the Claycastle Beach route.

The Redbarn Beach route traverses a known static fishing zone and there is a presence of static gear (such as gill nets, pots and traps) all year round.

There is no evidence of erosion occurring on Redbarn Beach. The hydrosedimentary study carried out on the project shows that Redbarn Beach (along with Claycastle Beach) has the lowest erosion of any of the identified route landfalls.

Construction works at the landfall itself would require a local exclusion corridor on Redbarn Beach during construction thus dividing the beach in two for a number of weeks. This operation could be decoupled from the main cable installation such that it could occur off-peak by burying a conduit into which the cable would later be installed. However, the beach would be fully re-instated and there would be no post construction impacts or restrictions on beach usage following installation.

11.2.3 Offshore Route – Claycastle Beach

Claycastle Beach is approximately 2km south west of the town of Youghal. The landfall is formed by a gently sloping sandy beach which was extensively surveyed in 2017 and 2018. The marine route within Irish Territorial Waters is approximately 34km and it follows a large sediment channel identified within the band of bedrock present along the East Cork coast.

From a deliverability perspective, Claycastle Beach has the longest offshore cable route. However, it offers a more straightforward offshore installation and overall impacts during construction are less than those associated with the Redbarn Beach or Ballinwilling Strand routes. This is largely due to a wide sediment infilled channel, devoid of rock which enables the use of standard burial tools, negating the requirement for specialist rock cutting equipment or external protection.

Cable burial in sediment will result in temporary disruption of the seabed during trenching operations, however, it is envisaged that the trench would be back-filled with the sediment.

The key socio-economic impacts of the marine approaches are fisheries, recreation and tourism. Local fishing and shipping are primarily centred around two harbours, Ballycotton and Youghal. On the Youghal approach there appears to be sufficient open sea available and appropriate mitigation measures are available to minimise disruption to local fishing and shipping during construction.

Construction works at the landfall itself would require an exclusion corridor on Claycastle Beach during construction thus dividing the beach in two for a number of weeks. This operation could be decoupled from the main cable installation such that it could occur off-peak by burying a conduit into which the cable would later be installed. However, the beach would be fully re-instated and there would be no post construction restrictions on beach usage following installation.

Erosion and deposition occur on this beach. As noted above, the hydrosedimentary studies carried out to date show that Claycastle Beach (along with Redbarn Beach) has the lowest erosion of any of the landfalls identified for the project.

The Benthic surveys of the Claycastle Beach approach route indicate that no ecologically sensitive habitats or benthic communities were recorded that would prohibit operations over the proposed cable route. This notably included an absence of potential Annex I habitats (e.g. pockmark features, biogenic or geological reefs). The Claycastle Beach route recorded the lowest number of benthic species and individuals of all of the routes surveyed.

Peat deposits were identified within the intertidal zone at Claycastle Beach as part of the archaeological assessments carried out to date. The peat is overlain by a fine to coarse sand which becomes more coarse and gravelly with depth. The thickness of the overlying sand ranges from 0.05m to c. 2.70m with the depth of sand coverage increasing nearer the beach. The peat was recorded primarily in the area to the west of the proposed cable route but was not encountered in the north-east of the survey area.

While peat has archaeological potential, these deposits generally form part of an extensive landscape, so the potential impact of a relatively small linear cable trench is considered to be of low significance.

11.2.4 Offshore Assessment Summary

Wood plc, has confirmed that the further studies carried out since Step 3 have not changed their overall assessment. The offshore assessment remains unchanged from Step 3.

11.3 Onshore Assessment – Ballinwilling Strand

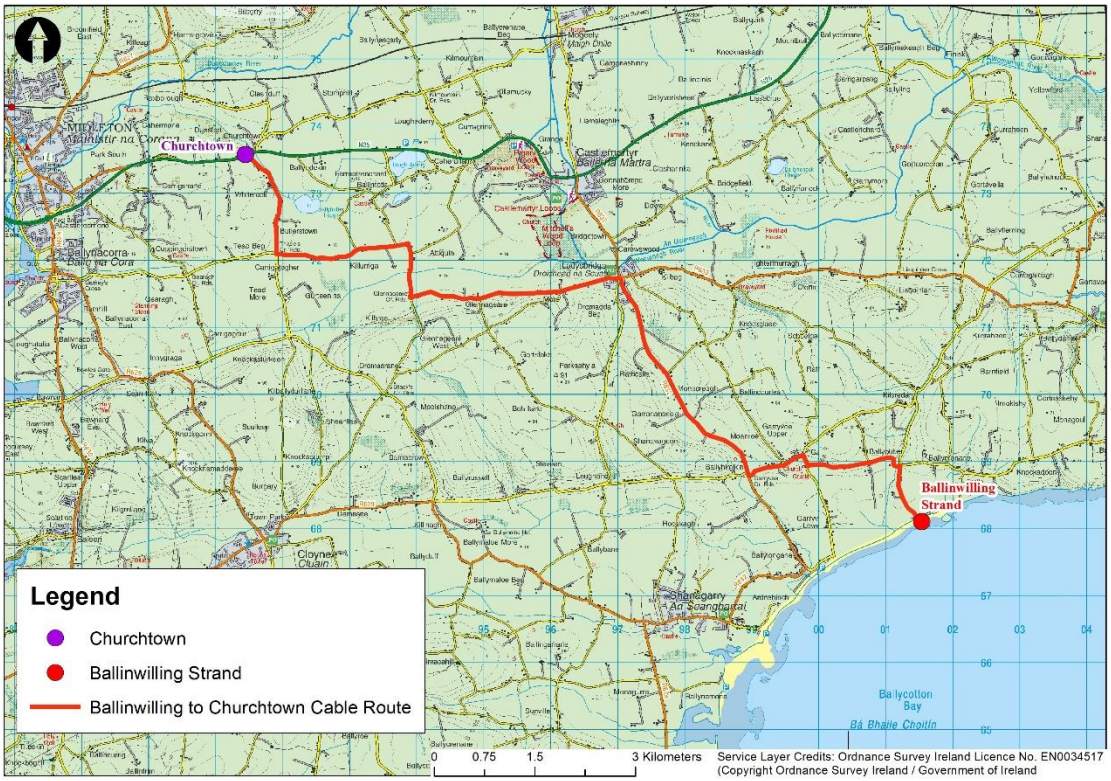
Ballinwilling Strand is a long sandy beach that stretches for over 2km linking Garryvoe Beach on the west side and bounded by a rocky shore at Knockadoon to the east.

Narrow stretches of dune separate the beach from an intensively farmed landscape (pasture and tillage). There are several small areas of cobble and shingle close to the car-park and two small areas of coastal marsh occur on either side of the car-park.

Ballycotton Bay SPA bounds the western end of the beach and Ballycotton, Ballynamona and Shanagarry pNHA stretches from Shanagarry in the southwest across a large part of the western half of the beach.

Ballinwilling Strand is popular with walkers, swimmers and runners etc. but most activities tend to be concentrated within approximately 500m of the car-park and there is considerably less human activity beyond the vicinity of the car-park on both the eastern and western sides of the beach.

Figure 55: Ballinwilling Strand



Source: Mott MacDonald

11.3.1 Route Options

The route follows the road from Ballinwilling to Ladysbridge via Garryvoe and then turning west towards Glengare continuing past Killorga and finally north past the Churchtown Industrial Estate to Churchtown.

11.3.2 Environmental Risks and Constraints

The proposed landfall at Ballinwilling is located adjacent to the Ballycotton Bay SPA (Site Code: 004022), and includes the Ballycotton Bay RAMSAR site and the Ballynamona & Shanagarry wildflower sanctuary. This area is therefore of particular importance to birds.

Of note also are the NPWS protected species records for common dolphin, leatherbacked turtle, otter, common frog and badger. There are historic records for protected flora in the wider environment including for protected mosses.

Given that the cable route will traverse the beach and from there will be on the road, the greatest environmental constraint will be in relation to birds. The following sections therefore present the findings of wintering and breeding bird surveys carried out at Ballinwilling Strand.

Wintering Bird Survey

Wintering waterbird counts were conducted at Ballinwilling Strand on 20th February and 6th March 2019 by Glas Ecology.

Levels of disturbance from beach users is much lower than at Redbarn/Claycastle and appears to be mostly at times other than high water as there is no walkway at high water.

The following table shows the highest numbers of each species (at either high or low water) and also gives the estimates of the all-Ireland wintering populations of each species, along with the figure where the numbers would qualify as being of national significance.

Table 15: Peak wintering waterbird numbers recorded (Ballinwilling Strand), compared relative to figures of national significance

Species	Peak number recorded	Figure of national significance[3]	Peak as % of Figure of national significance	All- Ireland population
Brent Goose	2	350	1	*35,150
Cormorant	1	110	1	*10,870
Oystercatcher	125	610	20	*60,540
Golden Plover	267	920	29	*92,060
Grey Plover	3	30	10	*2,940
Ringed Plover	38	120	32	*11,660
Curlew	88	350	25	*35,240
Turnstone	60	95	63	*9,480
Sanderling	140	85	165	*8,420
Dunlin	27	460	6	*45,760
Redshank	11	240	5	*23,800
Greenshank	1	20	5	*1,320
Black-headed Gull	180	1,000	N/A	50,162
Common Gull	17	500	N/A	18,050
Great Black-backed Gull	7	500	N/A	2,946
Herring Gull	30	500	N/A	13,953
Lesser Black-backed Gull	4	500	N/A	13,109

Source: Glas Ecology

Note: Red and Amber colours are used to highlight species of conservation concern

*Figures taken from Burke et al, 2019, all other figures taken from Crowe, 2005.

Sanderling numbers reached national significance at both Ballinwilling Strand and Redbarn / Claycastle Beaches, and there were robust numbers of other species e.g. Golden Plover and Turnstone. At Redbarn / Claycastle, the uniformity of the beach is likely to mean that no section in particular is likely to be favoured by birds. The area to the east, in the area of Knockadoon, was favoured by birds, with the presence of the seaweed covered rocks influencing this.

Additional wintering bird surveys would be required to provide a comprehensive picture of wintering bird usage, and would be carried out to inform the next stage of assessment should Ballinwilling Strand be assessed as the Best Performing Option (BPO).

[3] Figure of national significance is 1% of the All-Ireland population of a species

Breeding Bird Survey

Breeding bird surveys of Ballinwilling Strand were carried out on 10th May and 6th June 2019. A total of 34 bird species were recorded over the two visits. Eight waterbird species were recorded in small numbers at Ballinwilling. Six of these species are listed as birds of conservation concern in Ireland (Colhoun & Cummins 2013). Most of the small number of waterbirds recorded at this site were using the beach and bay area for foraging or resting purposes as opposed to breeding.

Table 16: All waterbirds recorded at Ballinwilling Strand in Spring/Summer 2019

Species	Special Conservation Interest of nearby Ballycotton Bay SPA	Ballinwilling 10th May 2019	Ballinwilling 6th June 2019	Breeding status at site
Shelduck	No	2	-	Non-breeding (in flight)
Mallard	No	1	-	Probably breeding
Great Northern Diver	No	1	-	Non-breeding (foraging)
Cormorant	No	1	1	Flying over bay
Ringed Plover	Yes (wintering populations)	2	4	Confirmed breeding
Common Sandpiper	No	-	1	Non-breeding (foraging/passage)
Herring Gull	No	-	12	Non-breeding (Resting/foraging)
Great Black-backed Gull	No	-	7	Non-breeding (Resting/foraging)

Note: Red and Amber colours are used to highlight species of high and medium conservation concern respectively

Table 17: Non-waterbird species of conservation concern recorded at Ballinwilling Strand in Spring/Summer 2019

Species	Special Conservation Interest of nearby Ballycotton Bay SPA	Ballinwilling 10th May 2019	Ballinwilling 6th June 2019	Breeding status at site
Meadow Pipit	No	6	5	Confirmed breeding
Stonechat	No	8	2	Confirmed breeding
Linnet	No	5	2	Confirmed breeding
Yellowhammer	No	4	-	Confirmed breeding

Note: Red and Amber colours are used to highlight species of conservation concern

Levels of bird usage at the site during the survey period were low generally and declined as the summer advanced. Only one species of waterbird, Ringed Plover, was found to be breeding at Ballinwilling. The reasons for such limited use of each of the beach relates to suitability of the habitat and human disturbance.

Most beach-nesting species require pebbles and small stones to conceal their eggs. Significant areas of the habitat is limited to two sites at Ballinwilling, approximately 175m east of the car-park and a second site located approximately 330m west of the car-park.

Evaluation

There is potential for disturbance to protected bird species. It is likely therefore that strict control surrounding the timing of the works and method of construction will be required in order to ensure no significant effects.

Similarly, while there are not qualifying features of any European site in the locality, marine mammals may be disturbed by the landfall works. A marine mammal observer would be a likely requirement and this matter can be addressed in the future planning application.

Given the challenges that will likely be associated with breaking out the sea bed for cable construction at this location, a prolonged presence on site is likely. Thus, there will be an associated risk that works might need to endure in to the wintering bird season, with associated risk of effects on birds through noise and visual disturbance. As such potential effects on wintering birds is a possible risk at this location. On this basis a **Moderate** risk is assigned.

Combined Environmental Performance

With regard to the offshore assessment discussed in Section 11.1, the combined environmental performance of Ballinwilling Strand is ranked as **Moderate**.

Option	Onshore Environmental Performance	Offshore Environmental Performance	**Combined Environmental Performance**
Ballinwilling Strand			

11.3.3 Social Risks and Constraints

There has been no change from Step 3 regarding this criterion for Ballinwilling Strand, and therefore remains as **Moderate.**

11.3.4 Technical Risks and Constraints

There has been no change from Step 3 regarding this criterion for Ballinwilling Strand, and therefore remains as **Low-Moderate.**

11.3.5 Deliverability Risks and Constraints

Design Complexity

The landfall at Ballinwilling Strand is more complex from a design perspective compared to the other locations. The car park area is elevated, and a large quantity of boulders have been placed between the car park and the beach to mitigate coastal erosion. These boulders present an obstacle for the cable works. They can be avoided by landing the cable approximately 100m west of the car park and installing the transition pit on private land or else a HDD will be required near the car park to retain the installation in public lands.

The onshore route is 14.8km in length. The approaches into Garryvoe and Ladysbridge have underground services that run under the road and would be parallel to the cable route. It is expected that, given the width of the road sections on these approaches, sufficient space is available under the road for the cable trench. The first kilometre from the landfall has some very tight turns which may present installation difficulties, and this portion of the route may benefit from running cross-country for a distance.

This route has one minor water course crossing and 14 underground service crossings of low complexity.

There are three locations on this route which have corners with a bending radius tighter than the 20m minimum for duct installation. This will require cutting the corner, or alternatively, micro-routing cross-country.

On the basis of the above, the design complexity is assessed to be **Low-Moderate**.

Traffic Disturbance Impact

The road between Ladysbridge and Garryvoe is two lanes wide, portions of which have a hard shoulder and other portions have a soft verge. It is anticipated that the cable ducting could be installed by closing only one lane and implementing traffic management on portions of the route where a hard shoulder is present. Suitable diversions are available for the entire length of road between Ladysbridge and Garryvoe, and it is recommended that each section being installed be closed completely with the exception of maintaining continuous access to local residents. This will allow for increased speed of construction.

The section between Garryvoe and the landfall location consists of narrow roads that would need to be closed during trench installation. With the exception of the final approach to the landfall, diversions for traffic are available for each section of the road. This will not be an issue if a cross-country route from the landfall is taken, as indicated in the Design Complexity sub-section above.

The route section between Ladysbridge and Churchtown is relatively wide, but individual portions are expected to be closed completely during trench installation at those portions. Diversions are available along all sections of the route, subject to access needing to be maintained for local residents on the portion under construction.

The traffic disturbance impact is assessed to be **Low-Moderate**.

Dependence on other infrastructure

This route has no dependence on other infrastructure and is therefore **Low** risk.

Permits and wayleaves

Wayleaves and landowner consent will be required at the locations the route needs to cut the road corner or micro-route cross country.

Permits and wayleaves risk is therefore assessed as **Low-Moderate**.

Implementation timelines

The route is 14.8km in length and at an installation rate of 50m per day, can be installed in approximately 60 crew-weeks which is not on the critical path of marine cable installation.

The implementation timeline risk is therefore assessed to be **Low**.

Combined Deliverability Performance

The combined onshore deliverability performance of the Ballinwilling Strand onshore route is ranked as **Low-Moderate**.

With regard to the offshore assessment discussed in Section 11.2, the combined deliverability performance of the Ballinwilling Strand option is ranked as **Moderate-High**.

Option	Design Complexity	Traffic Disturbance Impact	Dependence on other Infrastructure	Permits and Wayleaves	Implemen-tation Timelines	**Combined Onshore Deliverability Performance**	**Combined Offshore Deliverability Assessment**	**Combined Step 4 Deliverability Assessment**
Ballinwilling Strand								

11.3.6 Economic Risks and Constraints

The estimated cost of the Ballinwilling Strand landfall is the lowest option, resulting in an assessment of **Low-Moderate.**

11.3.7 Summary

The table below summarises the combined evaluation of Ballinwilling Strand.

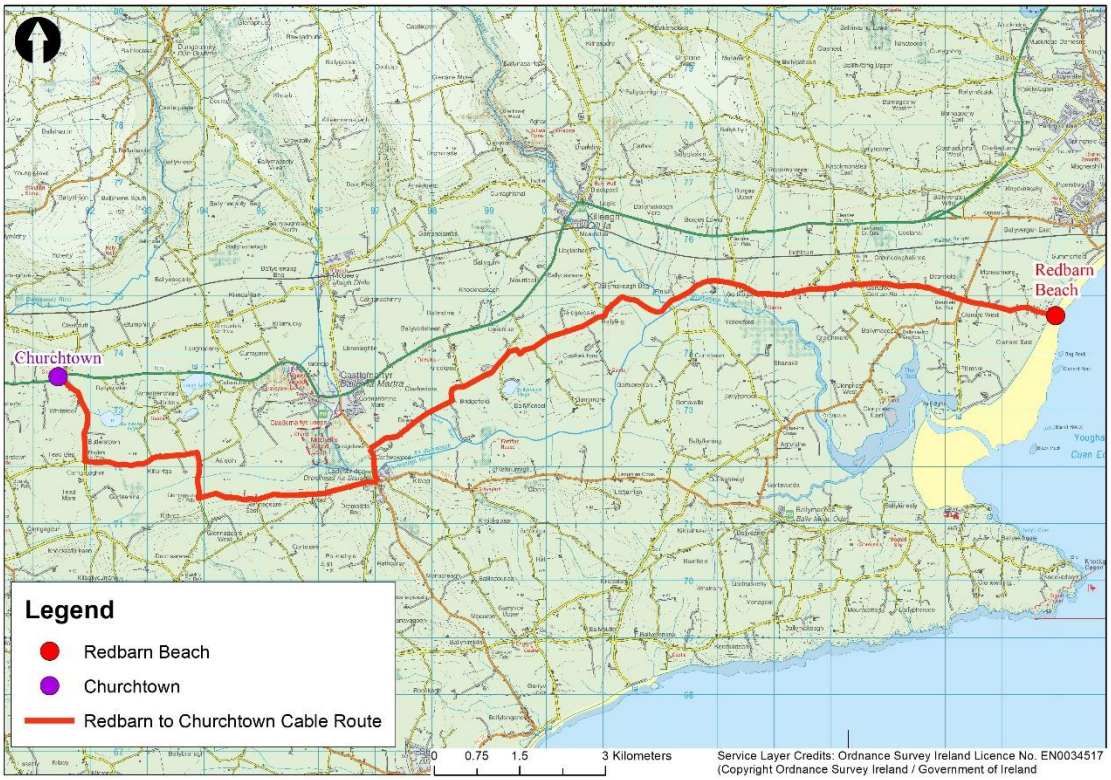
Option	Environmental	Social	Technical	Deliverability	Economic
Ballinwilling Strand 2					

11.4 Onshore Assessment – Redbarn Beach

Redbarn Beach forms part of an extensive length of sandy coastline that stretches from Claycastle in the north to Pilmore in the south. Narrow stretches of dune merge into a strip of coastal heath that adjoins intensively farmed land on the south side of a busy hotel complex.

Redbarn is a very popular venue for beach activities throughout the year. This is typified by the location of a large hotel and holiday dwellings in proximity to the access point to the beach.

Figure 56: Redbarn Beach



Source: Mott MacDonald

11.4.1 Route Options

The route follows the road from Redbarn to just north of Ladysbridge via Beanfield Cross, Fanisk and Carrigrostig and then south to Ladysbridge and then turning west towards Glengare continuing past Killorga and finally north past the Churchtown Industrial Estate to Churchtown.

11.4.2 Environmental Risks and Constraints

Redbarn Beach is bordered to the south by Ballymacoda Bay SPA (Site Code 004023). Ballymacoda (Clonpriest and Pilmore) SAC (Site Code 000077) and Ballymacoda Bay pNHA (Site Code 000077) are situated approximately 1.33km to the southwest.

Both Redbarn and Claycastle are adjacent to Ballyvergan Marsh pNHA (Site Code 000078). Redbarn Beach borders Ballymacoda Bay SPA on the southern side and Ballyvergan Marsh pNHA on the northern side. Redbarn Beach also adjoins a series of reclaimed fields that once

formed part of Ballyvergan Marsh. These fields contain an interesting mosaic of wet grassland in the wetter areas close to the drains.

Redbarn / Claycastle area is adjacent to the Ballyvergan Marsh proposed Natural Heritage Area (pNHA), this is the largest coastal freshwater marsh in County Cork, supporting a large area of reedbed. In turn, this reedbed provides habitat for a population of Reed Warblers which at the time of designation was a sizeable proportion of the Irish population. Ballyvergan Marsh is also a traditional roost site for wintering Hen Harriers, a species listed under Annex I of the EU Birds Directive.

The Flora Protection Order species Wild Clary (*Salvia verbenacea*) has been recorded on the dunes immediately to the west of Claycastle. Otter and common frog have been recorded in the locality.

Figure 57: Ballyvergan Marsh

Source: Mott MacDonald September 2019

The following sections present the findings of wintering and breeding bird surveys carried out at Redbarn / Claycastle Beaches.

Wintering Bird Survey

A wintering bird survey of Redbarn / Claycastle Beaches was carried out by Glas Ecology in February and March 2019.

Hen Harrier roost counts were conducted at Redbarn / Claycastle Beaches, overlooking Ballyvergan Marsh in the summer of 2019. Roost watches were conducted from a vantage point in the sand dunes, at the western end of the car park, with watches being carried out from

1.5 hours before sunset to half an hour after sunset or until it became too dark to see (*Gilbert et al*, 1998).

At high tide, it was noticeable that the high-water level reached to the foot of the sand dunes and the coastal walkway, meaning that there is very little habitat available for birds to roost at high water. This is coupled with the fact that the area is very popular with walkers and dog walkers. The main walkways are along the dunes and also along a boardwalk towards the eastern, Claycastle end. This leads to high levels of disturbance that would also deter birds from roosting along the edge of the shore line. At low water, Sanderling was the species recorded in the highest numbers. This small wading bird is a highly mobile species that is seen scurrying along the edge of the waterline picking at debris washed up the constantly moving drift line. Sanderling is likely to move constantly along the beach in search of food. The beach below the high-water level is relatively uniform for its length, with no conspicuous features (such as rock outcrops or areas of seaweed) obviously influencing bird distribution.

The following table shows the highest numbers of each species (at either high or low water) and also gives the estimates of the all-Ireland wintering populations of each species, along with the figure where the numbers would qualify as being of national significance.

Table 18: Peak wintering waterbird numbers recorded (Claycastle / Redbarn), compared with All-Ireland populations and figures of national significance

Species	Special Conservation Interest of nearby SPAs[4]	Peak number recorded	Figure of national significance[5]	Peak as % of Figure of national significance	All- Ireland population
Grey Heron	No	1	30	<1	2610
Cormorant	No	1	110	1	10,870*
Oystercatcher	No	43	610	7	60,540*
Curlew	Yes	57	350	16	35,240*
Bar-Tailed Godwit	Yes	6	170	4	16,530*
Sanderling	Yes	117	85	138	8,420*
Redshank	Yes	1	240	<<1	23,800*
Black-Headed Gull	Yes	22	1,000	2	50,162
Common Gull	Yes	19	500	4	18,050
Great Black-Backed Gull	No	8	500	2	2,946
Herring Gull	No	23	500	5	13,953
Lesser Black-Backed Gull	Yes	5	500	1	13,109

*Figures taken from Lewis et al, 2019, all other figures taken from Crowe, 2005.

[4] Blackwater Estuary SPA and/or Ballymacoda Bay SPA

[5] Figure of national significance is 1% of the All-Ireland population of a species

Source: Glas Ecology Note: Red and Amber colours are used to highlight species of conservation concern

Note: Red and Amber colours are used to highlight species of conservation concern

Four species that are red listed under Birds of Conservation Concern in Ireland (BoCCI) were recorded. However, all of these, with the exception of Curlew, are red listed as result of a decrease in their breeding populations. Curlew is red listed due to a decline in breeding and wintering populations. Sanderling are the only species whose numbers exceeded the figure for national significance. However, figures of national significance are calculated from the peak figures recorded over a five year period and the figures recorded at Claycastle / Redbarn are from two months' survey work only. Seven species that are species of conservation interest in the nearby SPAs were recorded during survey.

Additional wintering bird surveys would be required to provide a comprehensive picture of wintering bird usage, and would be carried out to inform the next stage of assessment should Redbarn Beach be assessed to comprise the Best Performing Option (BPO). Up to two roosting Hen Harriers were recorded using the Ballyvergan Marsh. This confirms that this site continues to be an important roost area for this species. Hen Harrier is amber listed under BoCCI but is also an Annex I species under the EU Birds Directive.

Additional wintering bird surveys would be required to provide a comprehensive picture of wintering bird usage, and would be carried to inform the next stage of assessment in Step 5.

Breeding Bird Survey

Redbarn Beach and the fields to the south of Ballyvergan Marsh were surveyed on 1st May and 10th June 2019. Small numbers of waterbirds were seen on the beach at Redbarn in May apart from a substantial flock of 44 Whimbrel seen on 1st May.

30 birds flew in from the Claycastle side and landed on the beach at Redbarn where they were joined by 14 birds that had been feeding in the fields to the south of Ballyvergan Marsh. No waterbirds were recorded on the beach or in the bay in June.

Table 19: Waterbirds recorded at Redbarn Beach in spring 2019

Species	Redbarn 1st May 2019	Redbarn 10th June 2019	Breeding status at the site
Mallard	1	-	Breeding
Whimbrel	44	-	Passage Migrant
Herring Gull	3	-	Resting/Foraging
Great Black-Backed Gull	2	-	Resting
Lesser Black-Backed Gull	1	-	Resting

Mallard are likely to be widespread breeding birds in Ballyvergan Marsh. The three species of gull recorded were resting or loosely foraging on the beach.

Table 20: Non-waterbird species of conservation concern recorded at Redbarn in Spring/Summer 2019

Species	Redbarn 1st May 2019	Redbarn 10th June 2019	Breeding status at the site
Meadow Pipit	5	5	Confirmed breeding
Stonechat		3	Confirmed breeding

Several bird species including Meadow Pipit, and Stonechat were recorded in the fixed dune system between Ballyvergan Marsh and the beach.

Levels of bird usage during the survey period (April 20th to June 10th) were low overall and declined as the summer advanced.

Evaluation

There is potential for disturbance to protected bird species during works at Redbarn. However, the works at this location are not likely to be as protracted as the works at Ballinwilling given that there may be a sedimentary route from the open sea to the shore, allowing easier and less intrusive (in relation to noise) construction. The potential for significant effects can be reduced / eliminated through strict control over the timing of construction.

While there are not qualifying features of any European site in the locality, marine mammals may be disturbed by the landfall works. A marine mammal observer would be a likely requirement and this matter can be addressed in the future planning application. The works are confined away from sites of recorded Flora Protection Order species. On the basis of the above a **Low-Moderate** ranking is assigned.

Combined Environmental Performance

With regard to the offshore assessment discussed in Section 11.1, the combined environmental performance of Redbarn Beach is ranked as **Low-Moderate**.

Option	Onshore Environmental Performance	Offshore Environmental Performance	**Combined Environmental Performance**
Redbarn Beach			

11.4.3 Social Risks and Constraints

There has been no change from Step 3 regarding this criterion for Redbarn Beach, and therefore remains as **Low-Moderate.**

11.4.4 Technical Risks and Constraints

There has been no change from Step 3 regarding this criterion for Redbarn Beach, and therefore remains as **Low-Moderate.**

11.4.5 Deliverability Risks and Constraints

Design Complexity

The landfall at Redbarn does not present any issues from a design complexity perspective. The approach from the public road to the shore has a relatively shallow gradient and there is space in the public road for the installation of a transition pit.

The approach to the landfall is narrow but constructible. The route requires the crossing of 6 water courses along the route. No information has been received to date on bridges along these roads, but it can reasonably be expected that these bridge crossings will be stone bridges or similar with insufficient deck space to install the cable ducts. As such, HDD would be required off-road for each of these crossings.

There are five locations on this route which have corners with a bending radius tighter than the 20m minimum for duct installation. This will require cutting the corner, or alternatively, micro-routing cross-country.

On the basis of the above, the design complexity is assessed to be **Low-Moderate**.

Traffic Disturbance Impact

The final approach to the Redbarn landfall does not have diversions available to it and will need to be closed subject always to maintaining access for local residents.

The route between Beanfield Cross and the intersection with the R632 is expected to require full closure for the sections under construction with the exception of maintaining continuous access for residents. There are a number of connections between these route sections and the N25, thus providing suitable diversions for non-resident traffic around the sections under construction. The R632 to Ladysbridge is expected to remain open by using the hard shoulder for traffic management.

The route from Ladysbridge to Churchtown via Killorga is fairly wide, but individual portions are expected to be closed completely during trench installation at those portions. Diversions are available along all sections of the route, subject to access needing to be maintained for local residents on the portion under construction.

The traffic disturbance impact is assessed to be **Low-Moderate**.

Dependence on other infrastructure projects

This route has no dependence on other infrastructure projects and is therefore assessed to be **Low**.

Permits and wayleaves

River crossings which come off the road network and into private lands would require additional wayleaves and consents for installation.

Wayleaves and landowner consent will be required at the locations the route needs to cut the road corner or micro-route cross country.

Permits and wayleaves risk is therefore assessed as **Moderate**.

Implementation timelines

At an installation rate of 50m per day, approximately 21.5km of this route can be installed in 86 crew-weeks which is not on the critical path for this project.

The implementation timeline risk is therefore assessed to be **Low**.

Combined Deliverability Performance

The combined onshore deliverability performance of the Redbarn onshore route is ranked as **Low- Moderate.**

With regard to the offshore assessment discussed in Section 11.2, the combined deliverability performance of the Redbarn option is ranked as **Low- Moderate.**

Option	Design Complexity	Traffic Disturbance Impact	Dependence on other Infrastructure	Permits and Wayleaves	Implemen-tation Timelines	**Combined Onshore Deliverability Performance**	**Off-shore Assessment**	**Combined Step 4 Offshore Assessment**
Redbarn Beach								

11.4.6 Economic Risks and Constraints

The estimated cost of the Redbarn Beach landfall is approximately 17% higher than the lowest option, resulting in an assessment of **Moderate.** The increased cost is attributable to the longer onshore HVDC route.

11.4.7 Summary

The table below summarises the evaluation of Redbarn Beach.

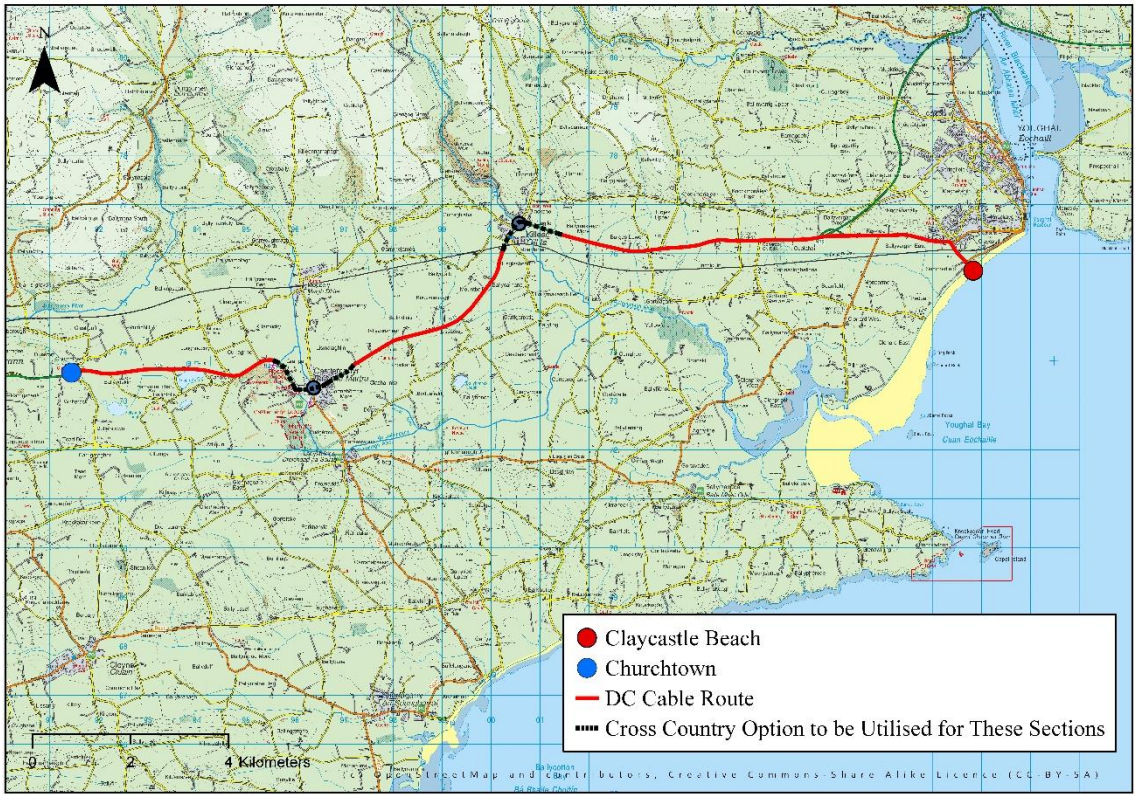
Option	Environmental	Social	Technical	Deliverability	Economic
Redbarn Beach					

11.5 Onshore Assessment – Claycastle Beach

Claycastle Beach is the northern extremity of a long sandy coastline that stretches south to Ballymacoda Bay.

The beach has a narrow strip of transitional dune that has been heavily modified in places to accommodate development such as caravan parks, car-parks and boardwalks. The transitional dune merges into fixed dune before adjoining the reed swamp of Ballyvergan Marsh.

Figure 58: Claycastle Beach



Source: Mott MacDonald

11.5.1 Route Options

Claycastle to Killeagh along the N25 and then the N25 through Castlemartyr and onwards to Churchtown with cross-country routing south of Killeagh, and north of Castlemartyr.

11.5.2 Environmental Risks and Constraints

Claycastle Beach is the northern extremity of a long sandy coastline that stretches south to Ballymacoda Bay, adjacent to Ballyvergan Marsh pNHA (Site Code 000078).

Ballyvergan Marsh is the largest area of coastal marsh in County Cork and it also contains one of the largest reedbeds in the country. Common Reed swamp is the predominant habitat within the marsh and this habitat supports a number of specialist bird species that are adapted to life among the reeds such as Water Rail, Sedge Warbler, Reed Warbler and Reed Bunting. Ballyvergan is of national importance for its population of the scarce but increasing Reed

Warbler, its roosting hen harrier population, and its pre-migratory roost of barn swallow *Hirundo rustica*. The flora protection order species Wild Clary has been recorded on the dunes immediately to the west of Claycastle. Details of protected species in the locality is presented in Section 11.4.2. The more substantial constraint pertains to birds, therefore winter and summer bird surveys were carried out.

Wintering Bird Survey

A wintering bird survey of Redbarn / Claycastle Beach was carried out by Glas Ecology, the findings of which are presented in Section 11.4 *Redbarn Beach*.

As discussed, Ballyvergan Marsh continues to be an important roost area for Hen Harrier, which is amber-listed under BoCCI and is an Annex I species under the EU Birds Directive. Additional wintering bird surveys would be required to provide a comprehensive picture of wintering bird usage, and would be carried out to inform the next stage of assessment should Claycastle Beach ultimately comprise the Best Performing Option (BPO).

Breeding Bird Survey

Claycastle Beach and the south-eastern section of Ballyvergan Marsh were surveyed on 1st May and 10th June 2019. A pair of Mallard was seen on 10th June and this species breeds in Ballyvergan Marsh. A single Grey Heron was seen foraging in the marsh on 10th June. Single Water Rails were heard calling in the reedbed on both dates and this species is known to breed in Ballyvergan. A foraging flock of 47 Sanderling were using the beach at Claycastle on May 1st. Two Snipe were noted near the stream that borders the marsh on May 1st and it is likely that these birds were breeding locally. Two Herring Gulls and three Great Black-backed Gulls were seen foraging/resting on the beach on June 10th.

The Ballyvergan Marsh pNHA is an important site for a number of reedbed specialist species as well as a variety of waterbirds and generalist species. A number of scarce or declining species were recorded on each visit. A single Cuckoo was seen on June 10th and Ballyvergan is one of the few remaining breeding sites for this species in East Cork. Swifts and Barn Swallows were recorded foraging over the reedbed, and the site is a significant pre-migration roost site for Barn Swallows. Meadow Pipits breed commonly in the grassland adjoining the marsh. Large numbers of Sedge Warbler breed in Ballyvergan Marsh and it is an important breeding site for the Reed Warbler in Ireland. Two Reed Warblers were heard on May 1st and one bird was heard in the same area in the south-eastern section of the marsh during a nocturnal survey on June 18th. On June 10th, two Reed Warblers were seen from the bird hide on the western side of the marsh. A single Grasshopper Warbler was heard on May 1st and three birds were heard during the nocturnal visit on June 18th. Reed Buntings are common in the marsh and were seen on both dates.

Table 21: Waterbirds recorded at Claycastle and Ballyvergan Marsh in Spring/Summer 2019

Species	Claycastle /Ballyvergan 1st May 2019	Claycastle /Ballyvergan 10th June 2019	Breeding status at the site
Mallard	-	2	Confirmed breeding
Grey Heron	-	1	Non-breeding (foraging)
Water Rail	1	1	Non-breeding (foraging)
Sanderling	47	-	Non-breeding (foraging)
Common Snipe	2	-	Confirmed breeding
Herring Gull	-	2	Non-breeding (foraging)
Great Black-backed Gull	-	3	Non-breeding (resting)

Note: Red and Amber colours are used to highlight species of conservation concern

Table 22: Non-waterbird species of conservation concern (recorded at Claycastle and Ballyvergan Marsh in Spring/Summer 2019

Species	Claycastle/ Ballyvergan 1st May 2019	Claycastle/ Ballyvergan 10th June 2019	Nocturnal Visit 18th June 2019	Breeding status at the site
Swift	-	4	-	Non-breeding (foraging)
Swallow	2	2	-	Non-breeding (foraging)
Meadow Pipit	8	3	-	Confirmed breeding
Stonechat	3	3	-	Confirmed breeding
Reed Warbler	2	-	1	Confirmed breeding

Note: Red and Amber colours are used to highlight species of conservation concern

Levels of bird usage during the survey period (April 20th to June 10th) were low generally and declined as the summer advanced.

The fields to the south of Ballyvergan Marsh are frequented by Meadow Pipit, Stonechat, Linnet and Reed Bunting and this area is also of botanical interest.

As previously noted, Ballyvergan Marsh adjacent to Claycastle Beach is an important habitat for a range of bird species including reedbed specialists such as Water Rail, Sedge Warbler, Reed Warbler and Reed Bunting as well as Grey Heron, Little Egret, Mallard Moorhen and Snipe. Ballyvergan is one of the most important locations in Ireland for the Reed warbler, a relatively recent colonist that was first recorded breeding in 1980 at nearby Ballycotton and 1983 at Ballyvergan. The population increased to between 25 and 50 pairs by 1995 (Smiddy & O'Mahony 1997) but the population appears to have declined in recent years (Bracken & Smiddy 2012). Ballyvergan Marsh is one of the last remaining sites for Cuckoo in East Cork. This site is used by several thousand Barn Swallows and Sand Martins in mid to late summer prior to migration (Smiddy *et al* 2007) and it is also used by Hen Harriers in the winter months.

Evaluation

There is potential for disturbance to protected bird species during works at Claycastle. However, the works at this location are not likely to be as protracted as the works at Ballinwilling given that there may be a sedimentary route from the open sea to the shore, allowing easier and less intrusive (in relation to noise) construction. As such potential for significant effects can be reduced / eliminated through strict control over the timing of construction.

The works may necessitate excavation of a section of the Ballyvergan Marsh pNHA. However HDD is more likely. Where an open cut method is employed this could result in localized hydrological changes with resulting alteration of habitat. Thus the potential for the habitat to support bird species could be altered. However, given the scale of the excavation works necessary relative to the size of the marsh habitat within the pNHA, a significant alteration of habitat would be unlikely. Potential for such effects will need to be further defined, and the need for HDD determined. Where HDD is used this would likely have a lesser effect on surface vegetation and hydrology.

While there are not qualifying features of any Natura 2000 site in the locality, marine mammals may be disturbed by the landfall works. A marine mammal observer would be a likely requirement and this matter can be addressed in the future planning application.

There are records for Wild Clary Sage, a Flora Protection Order species, in the dune habitat. The cable route alignment may be altered to protect this species.

On the basis of the above a ranking of **Low-Moderate** is assigned.

Combined Environmental Performance

With regard to the offshore assessment discussed in Section 11.1, the combined environmental performance of Claycastle beach is ranked as **Low-Moderate**.

Option	Onshore Environmental Performance	Offshore Environmental Performance	**Combined Environmental Performance**
Claycastle Beach			

11.5.3 Social Risks and Constraints

There has been no change from Step 3 regarding this criterion for Claycastle Beach, and therefore remains as **Low-Moderate.**

11.5.4 Technical Risks and Constraints

There has been no change from Step 3 regarding this criterion for Claycastle Beach, and therefore remains as **Low-Moderate.**

11.5.5 Deliverability Risks and Constraints

Design Complexity

The landfall at Claycastle does not present any issues from a design complexity perspective. The approach from the public road to the shore has a relatively shallow gradient and there is ample space in the car park for the installation of a transition pit.

On the approach to the landfall, HDD will likely be required at the bridge over the disused railway given the density of vegetation. The approach to the Claycastle landfall routes along underground services that run under the road and would be parallel to the cable route. It is expected that, given the width of the road sections on these approaches, sufficient space is available under the road for the cable trench.

The N25 between Claycastle and Killeagh is typically very wide and free from parallel underground services except for approximately 700m at Burgess and 350m on the approach to Killeagh.

Navigating through Killeagh presents significant difficulties for the following reasons:

- The route would need to cross the Dissour River at the Killeagh River Bridge in Killeagh. The road surface on the bridge is too shallow to install the cable route with sufficient cover over the bridge. Further, the height of the bridge and road surface above the river combined with the bend of the N25 at this point means that HDD at this point would be challenging;
- There are numerous parallel underground utilities at Killeagh as well as crossings of underground services;
- The road in Killeagh has recently been re-surfaced;
- The Killeagh Railway bridge would need to be crossed but is old and has insufficient cover to install the cable to the appropriate depth; and
- The Ballymakeagh More Bridge has insufficient cover to accommodate the trench, and as such, an offroad crossing of the water course would be required. The width of the water course may allow for a culvert, failing which, HDD would likely be required.

A cross-country diversion around the south of Killeagh, albeit through private lands avoids the difficulties of construction through Killleagh. In this case, a culvert or HDD would still be required to cross under the water course over which the Ballymakeigh More bridge crosses, but all three bridges would be avoided.

The N25 passes through Castlemartyr which presents substantial difficulties as follows:

- The route would need to cross the Kiltha River at the Kiltha River Bridge in Castlemartyr which is a stone bridge and a protected NIAH structure. The road surface on the bridge is too shallow to install the cable route with sufficient cover over the bridge. An in-road HDD would therefore be required;
- Navigating this constraint is more difficult given the parallel underground utilities at Castlemartyr as well as crossings of underground services; and
- The Castlemartyr Forest Bridge is also a stone bridge on the N25 with insufficient cover for installation of the trench. In this situation, crossing the river would require HDD which may be complex given the density of vegetation and apparent depth and width of the water crossing.

The above constraints at Castlemartyr are alleviated by either going cross-country to the north of Castlemartyr, or installing the ducts within the proposed Castlemartyr bypass, also to the north of Castlemartyr. HDD would still be required at the two river crossings, but in this diversion, the two bridges at Castlemartyr are avoided.

On the basis of the above, the design complexity is assessed to be **Low-Moderate**.

Traffic Disturbance Impact

The final approach to the Claycastle landfall can remain accessible through a diversion via Front Strand. The R634 from Youghal to the N25 is sufficiently wide for installation to take place by using the hard shoulders for traffic management and therefore will not require lane closure.

The same is true for the rest of the route sections which incorporate the N25 with the exception the portions passing through Killeagh and Castlemartyr, where due to the cross-country nature of the route around these two villages, disruption and traffic management is expected to be minimal.

The traffic disturbance impact is assessed to be **Low-Moderate**.

Dependence on other infrastructure projects

This route is dependent on the construction of the Castlemartyr bypass in that if the bypass goes ahead, the cable route past Castlemartyr would best be delivered through installation within the road bypass to be installed. If the bypass does not go-ahead, then the route could be delivered through a cross-country section along a substantially similar path.

On this basis, the dependence on other infrastructure is assessed to be **Low-Moderate**.

Permits and Wayleaves

Landowner engagement would be required for the approximately 3km of cross-country sections that would be required to deliver this project. This 3km would be less if the Castlemartyr bypass goes ahead.

The Permits and Wayleaves risk is therefore assessed to be **Moderate**.

Implementation Timelines

At an installation rate of 100m per day on the nearly 14km of the route on the N25 and 50m per day elsewhere, the approximately 21.5km route can be installed in approximately 58 crew-weeks. This is not on the critical path for this project and is therefore assessed to be **Low**.

Combined Onshore Deliverability Performance

The combined onshore deliverability performance of the Claycastle onshore route is ranked as **Low-Moderate.**

With regard to the offshore assessment discussed in Section 11.2, the combined deliverability performance of the Claycastle option is ranked as **Low**.

Option	Design Complexity	Traffic Disturbance Impact	Dependence on other Infrastructure	Permits and Way-leaves	Imple-mentation Timelines	**Combined Onshore Deliver-ability Perform-ance**	**Off-shore Assess-ment**	**Combined Step 4 Offshore Assess-ment**
Claycastle Beach								

11.5.6 Economic Risks and Constraints

The estimated cost of the Claycastle Beach landfall is 11% higher than the lowest option, resulting in an assessment of **Moderate**. The increase is attributable to the longer onshore HVDC route.

11.5.7 Summary

The table below summarises the evaluation of Claycastle Beach.

Option	Environmental	Social	Technical	Deliverability	Economic
Claycastle Beach					

12 Emerging Best Performing Option

12.1 Introduction

The following sections set out the considerations that have led to the identification of an Emerging Best Performing Option (EBPO). These considerations are based on the information included in the preceding sections, much of which in turn has been derived from previously published information, as well as from public and stakeholder feedback during public consultation.

12.2 Emerging Best Performing Converter Station Sites

An enhanced Performance Matrix of the various CSS options is provided below:

Criteria	Option	CSS 1	CSS 6	CSS 9A	CSS 9B	CSS 10	CCS12	CCS14
Environmental Performance	Land Use Planning							
	Soils and Geology							
	Landscape and Visual							
	Biodiversity							
	Waterbodies, Drainage and Flood Risk							
	Cultural Heritage							
	Combined Environmental Performance							
Social Performance	Traffic							
	Noise							
	Visual							
	Combined Social Performance							
Combined Technical Performance								

Criteria	Option	CSS 1	CSS 6	CSS 9A	CSS 9B	CSS 10	CCS12	CCS14
Deliverability Performance	Design Complexity							
	Traffic Disturbance Impact							
	Dependence on other Infrastructure projects							
	Permits and Wayleaves							
	Combined Deliverability Performance							
Economic								

A summary performance matrix of the various CSS options is provided below:

Criteria	CSS 1	CSS 6	CSS 9A	CSS 9B	CSS 10	CSS 12	CSS 14
Environmental Performance							
Social Performance							
Technical Performance							
Deliverability Performance							
Economic Performance							

Source: Mott MacDonald

12.2.1 Environmental Considerations

CSS 9B is considered to be the EBPO from an environmental perspective as the converter station would be constructed in close proximity to established and existing infrastructure and a number of potential environmental impacts would be mitigated by avoidance.

12.2.2 Social Considerations

From a social perspective, it is considered that CSS 12 is the EBPO due to its distance from sensitive receptors. It is noted however that traffic accessing the site from the roads to the east would likely result in considerable local traffic disruption / disturbance due to the anticipated road improvement works that may be required. While construction traffic impacts would be temporary in nature, the improved road will benefit local users. However, it may as a consequence result in a permanent increase in traffic along this route.

From a visual impact perspective CSS 12 is considered to be the EBPO, largely due to the substantial potential visual screening that the area of commercial forestry and surrounding topography offers from nearby roads and residences.

The ZTV for CSS 9B shows that much of the visibility to this site would occur from agricultural fields with a very high proportion of the dwellings benefiting from screening provided by intervening vegetation. Views would be seen in the context of an intensification of the existing infrastructure and long established electricity substation infrastructure.

In terms of noise, it should be noted that the design of the converter station will ensure opportunities for noise screening. Once the converter station is operational, the main sources of noise will relate to the cooling of the transformers and of the converter valves. The impact of this noise can be mitigated and minimised at the design phase of the project through a number of methods. Measures that could be taken may include:

- Optimising the layout of the converter station to provide noise screening, taking account of prevailing wind conditions and location of receptors within/close to the station;
- Placing all direct current (HVDC) equipment within buildings;
- Placing all transformer tanks within housings with noise damping ability;
- Acoustically optimising the air conditioning units to be used onsite;
- Designing all ventilation openings of the facades of the buildings to limit noise emissions;
- Installation of noise screening walls and acoustic barriers at the station perimeter; and
- Using very low noise fans for converter transformer cooling and the valve cooling system.

12.2.3 Deliverability

From a deliverability perspective, converter sites CSS 9A, CSS 9B, CSS 10 and CSS 12 are considered to be EBPOs, largely due to the reduced length of HVAC cable. There is substantial similarity between the options for HVDC routes in that they all pass CSS 10. Of these four sites, CSS 10 is the only site with an on-road section of the HVAC route, thereby slightly increasing its design complexity.

Access for construction traffic for CSS 9B and CSS 10 is substantially the same given that they neighbour similar types of roads, and construction traffic has operated on these roads previously. CSS 12 may have a more difficult construction access point through the Kilquane forest which would require the construction of a permanent bridge and potential road widening within the forest. Whether access to CSS 12 is through Kilquane forest to the west, or via local roads to the east, substantial road upgrades would be required.

Overall, from a deliverability perspective, CSS 9B is the EBPO due to the reduced HVAC cable route and ease of construction access.

12.2.4 Economic

From an economic perspective, converter sites CSS 9A and 9B are considered to be better performing options, largely due to the reduced length of total HVAC and HVDC cable. The next best performing options are CSS 10 and CSS 12 respectively. These sites are more expensive than CSS 9A and 9B largely due to their increased HVAC cable length. CSS 10 is less expensive than CSS 12 because of the shorter length of HVDC route.

12.2.5 Overall

With all of the above factors combined, CSS 12 is currently considered by EirGrid and its consultants to be the EBPO, primarily due to the substantial visual screening that the area of commercial forestry and surrounding topography offers from nearby roads and residences, and the relative accessibility of the site for both the HVDC and HVAC cable routes.

12.3 Emerging Best Performing Landfall Locations

A summary of the Step 4A evaluation of the landfall options is provided below.

Option	Ballinwilling Strand	Redbarn Beach	Claycastle Beach
Combined Environmental			
Combined Social			
Combined Deliverability			
Combined Technical			
Combined Economic			

It is considered that significant social impacts associated with the installation of the cable at any of the landfall location options – for example in respect of local amenity and tourism, and fishing, could largely be avoided with the implementation of standard construction phase mitigation such as timing of works and the implementation of an effective Construction Environmental Management Plan (CEMP) and Traffic Management Plan (TMP). These are generally prepared as outline documents to accompany the subsequent planning application, and will be prepared in detail post-consent and agreed with the Planning Authority prior to commencement of development. As such, there is no clear EBPO from a social perspective.

In terms of environmental considerations, Claycastle Beach is identified as the EBPO due to the least challenging conditions (sandy seabed) and associated mitigation of potential offshore environmental impacts by avoidance. It is noted that the information presented in this report has resulted in reduced onshore environmental rankings (Low-Moderate) for Redbarn Beach and Claycastle Beach when compared to the Step 3 onshore environmental rankings (Moderate and Moderate – High respectively).

In terms of deliverability considerations, Claycastle Beach is identified as the EBPO due to the less challenging environment on the final marine approach to the landfall. It is noted that the information presented in this report has resulted in a lower deliverability risk ranking for Redbarn Beach (Low-Moderate) as compared to Step 3 (Moderate). The ranking for Claycastle Beach has also changed to Low as compared to Step 3 (Low-Moderate).

From an economic perspective, the evaluation of each of the landfalls has remained the same as compared to Step 3, with Ballinwilling Strand the lowest cost, primarily because it has the shortest distance to any of the shortlisted CSSs.

With all of the above factors combined, it is currently considered by EirGrid and its consultants that Claycastle Beach is the EBPO landfall location, particularly as it offers the least constrained offshore approach, and a relatively good road network for the HVDC cable connection to the CSS.

12.4 Emerging Best Performing Option

Having due regard to the five criteria as set out in EirGrid's Framework for Grid Development, it is currently considered by EirGrid and its consultants that Claycastle Beach, the identified HVDC cable route, CSS 12, and the identified HVAC cable route to Knockraha 220 kV substation is the Emerging Best Performing Option (EBPO) for the Celtic Interconnector Project in Ireland.

12.5 Next Steps

CSS 12 has been identified as the EBPO for the converter station, however it is noted that CSS 9B performs best under both environmental end economic criteria. In addition, it is noted that notwithstanding its technical and deliverability challenges, CSS 1 continues to be advocated by stakeholders as a potentially appropriate site for the siting of the converter station given its urban setting, its industrial zoning, and its accessibility to the national road network.

CSS 12 will be brought forward as the EBPO to Step 4B, however further consideration will be given to both CSS 1 and CSS 9B at Step 4B prior to the announcement of the Best Performing Option (BPO) for the project.

Appendices

A. Glossary

AC - Alternating Current

ACA - Architectural Conservation Area

ALOs - Agricultural Liaison Officers

AOD - Above Ordnance Datum

BoCCI - Birds of Conservation Concern in Ireland

BPO - Best Performing Option

CCC - Cork County Council

CDP - County Development Plan

CEMP -Construction Environmental Management Plan

CFRAM - Catchment Flood Risk Assessment and Management

CLOs - Community Liaison Officers

CSLZ - Converter Station Location Zone

CSS - Converter Station Site

DSM - Digital Surface Model

DTM - Digital Terrain Mapping

EBPO - Emerging Best Performing Option

ED - Electoral Division

EPA - Environmental Protection Agency

ESBI - Electricity Supply Board International

FPO - Flora (Protection) Order

GIS - Geographic Information System

GSI - Geological Survey of Ireland

HDD - Horizontal Directional Drilling

HGV - Heavy Goods Vehicles

HV - High Voltage

HVAC - High Voltage Alternating Current

HVDC - High Voltage Direct Current

IDA - Industrial Development Authority

i-WeBS - Irish Wetland Bird Survey

kV - kilo Volt (1 kV = 1,000V)

L - Locally Important (Aquifer)

-

LAP Local Area Plan

MV - Medium Voltage

MW - Mega Watt (1MW = 1,000,000W)

NHA - Natural Heritage Area

NIAH - National Inventory of Architectural Heritage

NPWS - National Parks and Wildlife Service

OHL - Overhead Line

PRAI – Property Registration Authority of Ireland

pNHA - proposed Natural Heritage Area

RNLI - Royal National Lifeboat Institution

RMP - Records of Monuments and Places

RPS - Records of Protected Structures

RTÉ - Réseau de Transport d'Électricité

SAC - Special Areas of Conservation

SAOI - Social Area of Influence

SMR – Sites and Monuments Record

SPA - Special Protected Area

TII - Transport Infrastructure Ireland

TMP - Traffic Management Plan

WFD - Water Framework Directive

ZTV - Zone of Theoretical Visibility

B. Strategic SIA Scoping

B.1 Introduction

This section provides an update to the Step 3 Strategic Social Impact Assessment Scoping Report, to reflect the shortlist, the information gathered, feedback received during the Step 3 consultation process and the updated Step 4 Revised Social Area of Influence (SAOI).

B.2 Key Social Issues Identified

The majority of responses in relation to the Step 3 shortlist of Landfall Locations are related to socio-economic considerations, such as the potential for disturbance and disruption on local amenities and tourism and the local economy associated with the installation of the cable. Access to the beach and car park was also raised as a concern.

While a range of concerns were raised in relation to the Step 3 short-list of Converter Station Location Zones, written responses to the Step 3 public consultation and information events focused on issues relating to:

- Noise;
- Traffic disruption, restricted access and the local road network;
- Visual impact;
- Ecology;
- Health concerns;
- Cultural heritage,
- Water and water supply;
- Flood risk, water contamination and water supply; and
- Land use planning.

Details of the Step 3 consultations undertaken and the feedback received is presented in the Step 3 Consultation Report. Key social concerns and risks have been responded to in the Step 3 Consultation Response Document.

B.3 Stakeholder Review

In addition to the general public and landowners, a non-exhaustive list of key stakeholders identified to date, from a social impact perspective, within the SAOI are presented in **Table 23** below. The list includes organisations identified through the Step 3 consultation process as detailed above.

Table 23: Key Stakeholders within the SAOI

Community Organisations	Local Enterprise
Ballymacoda Ladysbridge Community Council	A1-K9 Dog Training Centre and Boarding Kennel
Cork Climate Action	Perks Entertainment Centre
Cork Environmental Forum	Ballinacurra Business Park
Cork Harbour Alliance for a Safe Environment	Ballincurrig Stud Farm
Cork Harbour Environmental Association	

Community Organisations	Local Enterprise
Cork Nature Network	Claycastle Pitch & Putt Club
Cork Renewable Energy Group	Summerfield Holiday Park
Cork Tourist Information Centre	Knockgriffin Industrial Park
County Nature Trust	National Space Centre - Elfordstown
Crafts on the Mall	Nellie Cashman Monument
Creative Housing Solutions Limited	Nordic Enterprise Park
Cul Ard Residents Association	Northern Point Business Park
Curragh Wood Walk	Owenacurra Business Park
Darling Buds pre-school Midleton	Perks Entertainment Centre
East Cork for a safe Environment	PSE Kinsale Energy
East Cork Harbour Environmental Association	Ramhill Industrial Estate
Energy Cork	The Holy Rosary Church
FEAST – The East Cork Food & Drink Festival	Seafield Caravan Park
Inch Hideaway Eco-Sustainable Camp	Youghal Dive Charters / Deep Sea Angling
An Taisce Green Coast	Quality Hotel and Leisure Centre Youghal
Irish Farmers' Association	Terra Solar
Clean Coasts Ballynamona	Aura Leisure Centre, Claycastle, Youghal
Youghal Residents Network, Cumann na Daoine	Ballymaloe House Restaurant
The Irish Environmental Network	Inn by the Harbour
Enterprise Youghal	Dairygold
South Coast Charter Angling	Garryvoe Hotel
Youghal Moby Dick Festival	Aura Leisure Centre, Claycastle, Youghal
Youghal Senior Citizens Co. Ltd	Ballycotton Development Company
Youghal For All	Ballycotton RNLI lifeboat Station
Youghal Queen of the Sea	Bayview Hotel (Ballycotton)
Ironman	Ballycotton Pitch and Putt Club
Ballycotton Development Company	Ballycotton Angling Centre
Cork Tourist Information Centre	Ballycotton Development Company
National Inshore Fisheries Forum	Ballycotton Fisherman's Association
Inch Hideaway Eco-Sustainable Camp	Ballycroneen National School
Carrigtohill Community Council	Ballyspillane West & Surrounding Area Action Group
Rocklands Residents Association	Barryscourt Medical Centre
Cul Ard Residents Association	Coastal Rowing Association
Carrigtohill United FC	Stephen Pearce Pottery
Lackenbehy Action Group	Christian Brothers Secondary School
Lisgoold Leamlara Alliance Against Converter Station (LLAACS)	Clonpreist National School
Midleton Arts Festival	Swell Surf School
Midleton MY PLACE Limited	
Midleton Dental Care	

Community Organisations	Local Enterprise
Midleton Educate Together National School	Southdoc Midleton
Midleton GAA Club	East Cork Tourism Ltd.
Midleton Golf Society	East Cork Business Alliance
Midleton Holistic Health Centre	East Cork Radio Group
Midleton Community Hospital	Enterprise Youghal
Midleton Garda Station	Fermoy Enterprise Board
Midleton Medical Centre	Ferrit & Lee
Midleton Veterinary Hospital	Glenview House
Midleton Football Club	Irish Coastal Rowing Fed
Midleton Rugby Club	Irish Whiskey Academy
Midleton Post Office	Irish Distillers
Midleton Pitch and Putt Club	Little Angels Creche
Midleton Farmers Market	Dairygold Co-Operative Society Ltd
Midleton Country Market	Jasmine Villa Caravan and Camping Park
Ballyspillane West & Surrounding Area Action Group	Barryscourt Castle
Ireland's Ancient East	Nordic Enterprise Park Management Company
Knockraha Area Community Association	Europa Enterprise Park Management Company
Lisgood GAA Club	Water Rock Golf Club
Lisgood Community Childcare Centre	East Cork Golf Club
Brookfield Care Centre	REID Associates
Lisgood/Leamlara Community Council	Ring of Cork
Lisgood/Leamlara Gun Club	St Colmcille's Church (Ballycotton)
Lisgood/Leamlara Seniors Club	St John the Baptist National School
Leamlara Montessori School	St. Colman's Cathedral (Cloyne)
Ballycroneen National School	St. Colmans Community College
Chase Cork Harbour	St. Cuain's Well, Holly Well
Church of Ireland Diocesan cathedral – the United Dioceses of Cork, Cloyne and Ross	St. Fergal's National School (Killeagh)
Church of the Immaculate Conception (Watergrasshill)	St. John the Baptist Catholic Church (Killeagh)
Cloyne Garda Station	St. Mary's Church (Ladysbridge)
Cloyne Post Office	St. Mary's Church
Dungourney Church	St. Mary's High School
Dungourney Church of Ireland	St. Peter's National School
Dungourney Clonmult Community Group	St. Peter's Roman Catholic Church
Dungourney post office	St. Raphael's Centre
Edgefield Property Investments Limited	The Old School House Childcare Facility
Fota Island Resort and Hotel Spa	The Paddocks Holiday Village
Fota Rock Residents Association	
Knockraha Football Club	

Community Organisations	Local Enterprise
Knockraha National School	The Thatched Inn
Leamlara Montessori School	Castlemartyr Resort and Castlemartyr Golf Resort
Our Lady of Lourdes Church	Trabolgan Holiday Village
Rocklands Residents Association	Amgen Technology (Ireland) Limited
Saint Colman's Church (Castlemartyr)	Angling Roxboro River
Scoil Naomh Eoin	Birdwatch Ireland: Cork Branch
Shanagarry Community Association	Bishop Ahern National School
Dungourney GAA Club	Brookfield Care Centre
Dungourney Camogie Club	Jameson Distillery Midleton
Midleton & Area Chamber of Commerce	Jasmine Villa Caravan and Camping Park
SECAD Partnership	Jungle World, Midleton
Youghal Community Health	Watergrasshill Industrial Park
Youghal Community Response Network	Watergrasshill National School
Youghal Environmental Safety (YES)	Willowbank Pre-School
Youghal & District Nursing Home	
Youghal Health Centre	
Youghal Garda Station	
Youghal RNLI lifeboat station	
Youghal post office	
Youghal Maritime Development Group	
Youghal Heritage Centre and Tourist Office	
Youghal Family Support Centre c/o Youghal Community Health Project	
Ballycotton Medical Centre	
Ballycotton RNLI lifeboat station	
Ballycotton Fisherman's Association	
Youghal Fisherman's Association	
The Youghal Socio-Economic Development Group	
Tidy Town Committees	

B.4 Step 3 SAOI

The Step 3 SAOI was revised to reflect the Step 3 shortlist, referred to in Section 1.2 *Purpose of this Report* and presented in **Figure 3** *Shortlist of Options*.

The spatial extent of the revised SAOI (Step 4Ai SAOI) considered at commencement of Step 4A extended to the eastern fringe of Cork City to the west, Youghal to the east, Watergrasshill to the north and the north of Great Island to the south. This area incorporated the Step 3 short-list of options, and associated Step 4 HVAC / HVDC route options, that were considered for further assessment in this Step 4A Report.

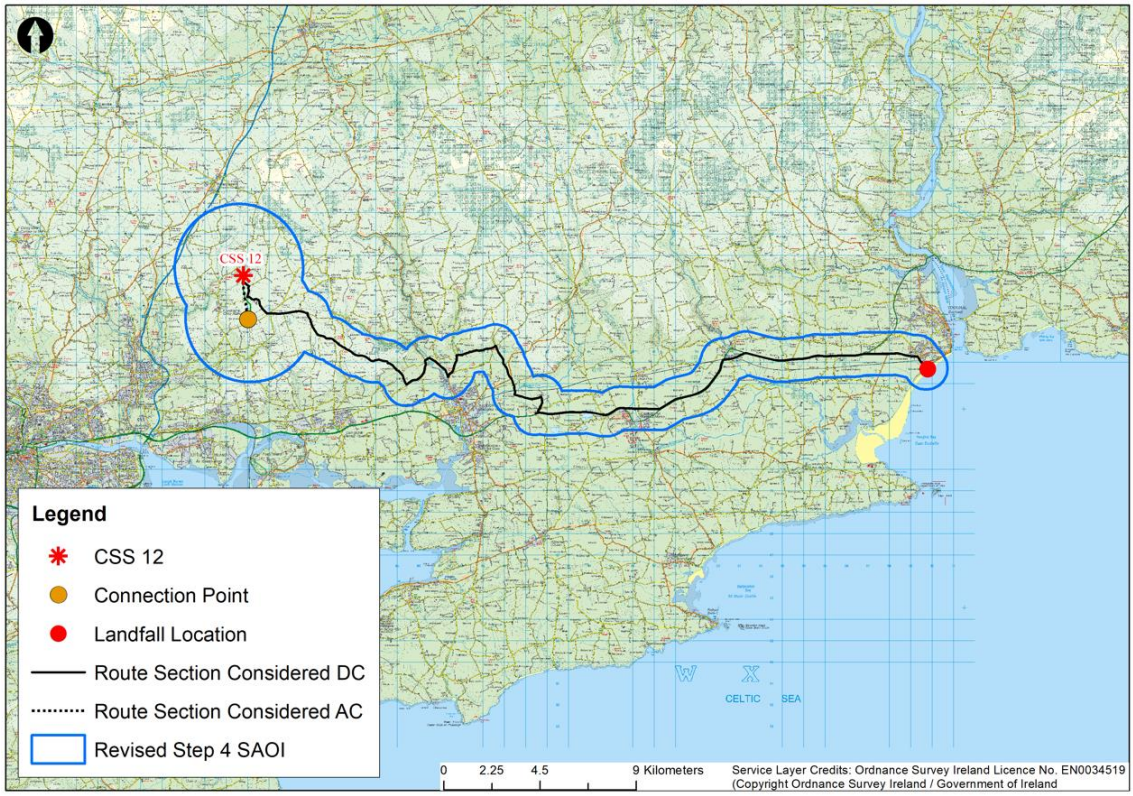
Figure 59: Step 4Ai SAOI

Source: Mott MacDonald

B.5 Step 4Aii Revised Social Area of Influence

The Step 4Aii Revised SAOI is presented in **Figure 60** below, having regard to the Emerging BPO for the location of the converter station, landfall and HVDC / HVAC cable routes, presented in Section 12.4 *Emerging Best Performing Option* of this report.

Figure 60: Step 4Aii Revised SAOI



Source: Mott MacDonald

In addition to the general public and landowners, a non-exhaustive list of key stakeholders identified to date, from a social impact perspective, within the area of the emerging BPO are presented in Table 37 below. It should be clearly noted though that stakeholders outside of the identified area may also be impacted socially, although arguably to a lesser extent as alternatives routes etc. are likely to be available.

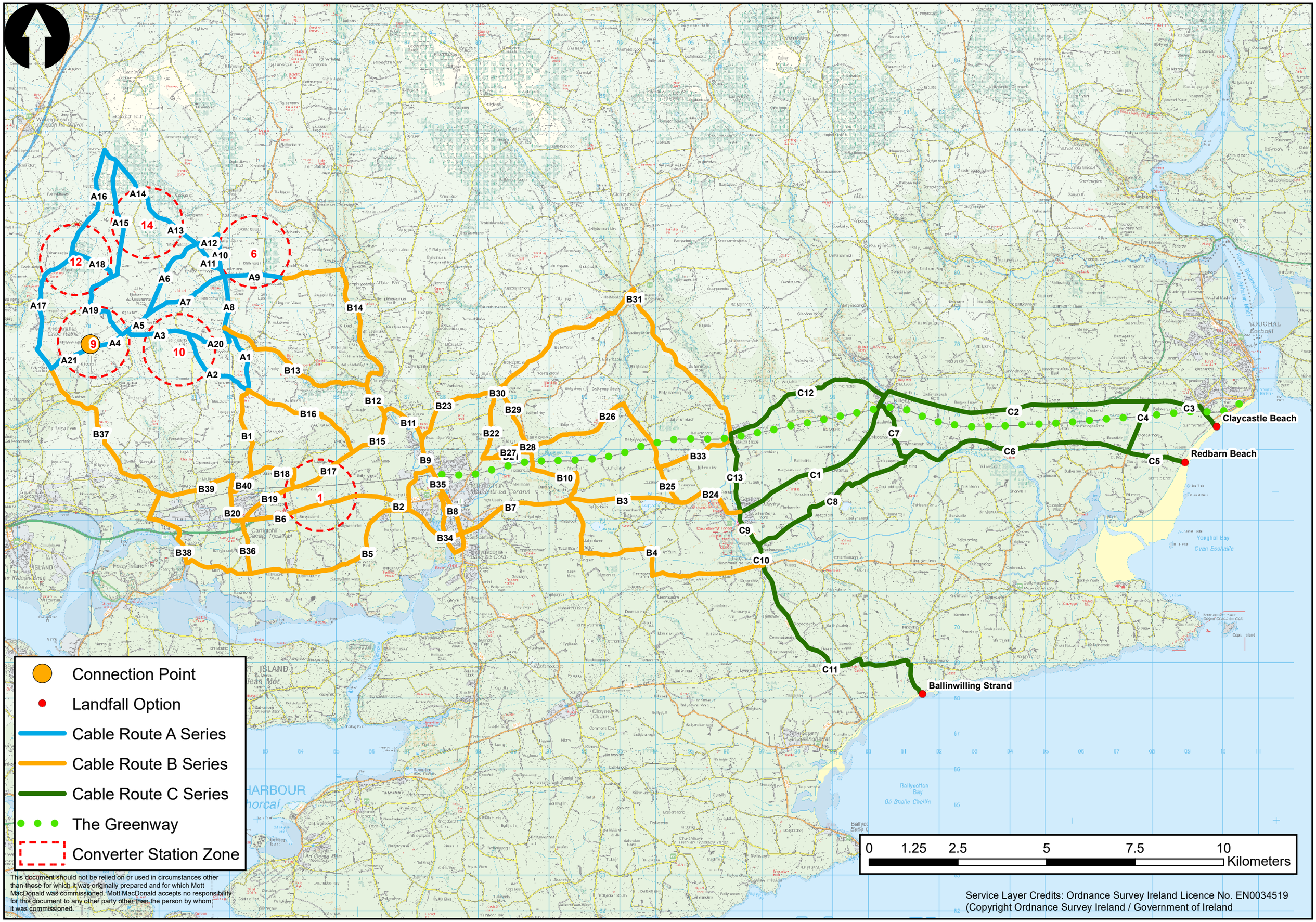
Table 37: Key Stakeholders in proximity to the emerging BPO

Community Organisations	Local Enterprise
• Cork Climate Action • Cork Environmental Forum • Cork Nature Network • Cork Renewable Energy Group • Cork Tourist Information Centre • County Nature Trust • Curragh Wood Walk • Darling Buds pre-school Midleton • East Cork for a safe Environment • East Cork Harbour Environmental Association • Energy Cork • FEAST – The East Cork Food & Drink Festival • An Taisce Green Coast • Irish Farmers' Association • Youghal Residents Network, Cumann na Daoine • The Irish Environmental Network	• A1-K9 Dog Training Centre & Boarding Kennel • Perks Entertainment Centre • Claycastle Pitch & Putt Club • Summerfield Holiday Park • Knockgriffin Industrial Park • Nordic Enterprise Park • Northern Point Business Park • Owenacurra Business Park • Perks Entertainment Centre • Seafield Caravan Park • Youghal Dive Charters / Deep Sea Angling • Quality Hotel and Leisure Centre Youghal • Terra Solar

Community Organisations	Local Enterprise
• Enterprise Youghal • South Coast Charter Angling • Youghal Moby Dick Festival • Youghal Senior Citizens Co. Ltd • Youghal For All • Youghal Queen of the Sea • Ironman • Cork Tourist Information Centre • National Inshore Fisheries Forum • Lisgoold GAA Club • Lisgoold Community Childcare Centre • Lisgoold/Leamlara Community Council • Lisgoold/Leamlara Gun Club • Lisgoold/Leamlara Seniors Club • Leamlara Montessori School • Leamlara Monterssori School • Lisgoold Leamlara Alliance Against Converter Station (LLAACS) • Midleton Arts Festival • Midleton MY PLACE Limited • Midleton Dental Care • Midleton Educate Together National School • Midleton GAA Club • Midleton Golf Society • Midleton Holistic Health Centre • Midleton Community Hospital • Midleton Garda Station • Midleton Medical Centre • Midleton Veterinary Hospital • Midleton Football Club • Midleton Rugby Club • Midleton Post Office • Midleton Pitch and Putt Club • Midleton Farmers Market • Midleton Country Market • Ballyspillane West & Surrounding Area Action Group • Ireland's Ancient East • Knockraha Area Community Association • Brookfield Care Centre • Edgefield Property Investments Limited • Knockraha Football Club • Knockraha National School • Saint Colman's Church (Castlemartyr) • Scoil Naomh Eoin • Midleton & Area Chamber of Commerce • SECAD Partnership • Youghal Community Health • Youghal Community Response Network • Youghal Environmental Safety (YES) • Youghal & District Nursing Home • Youghal Health Centre • Youghal Garda Station • Youghal RNLI lifeboat station • Youghal Post Office • Youghal Maritime Development Group • Youghal Heritage Centre and Tourist Office • Youghal Family Support Centre c/o Youghal Community Health Project • Youghal Fisherman's Association	• Aura Leisure Centre, • Coastal Rowing Association • Stephen Pearce Pottery • Clonpreist National School • Southdoc Midleton • East Cork Tourism Ltd. • East Cork Business Alliance • East Cork Radio Group • Enterprise Youghal • Ferrit & Lee • Glenview House • Irish Coastal Rowing Fed • Irish Whiskey Academy • Irish Distillers • Little Angels Creche • Dairygold Co-Operative Society Ltd • Water Rock Golf Club • East Cork Golf Club • REID Associates • Ring of Cork • St John the Baptist National School • St. Colmans Community College • St. Fergal's National School (Killeagh) • St. John the Baptist Catholic Church (Killeagh) • St. Mary's Church Knockraha • St. Mary's High School • St. Raphael's Centre • The Paddocks Holiday Village • Castlemartyr Resort • Castlemartyr Golf Resort • Birdwatch Ireland: Cork Branch • Jameson Distillery Midleton • Jungle World, Midleton • Willowbank Pre-School

Community Organisations	Local Enterprise
• Youghal Socio-Economic Development Group • Tidy Town Committees	

C. Route Option Identification



D. Cultural Heritage Report

Project code: CIMM19
Client: Mott MacDonald
Date: June 2019

EirGrid Celtic Interconnector

Archaeological, Architectural and Cultural Heritage Constraints Report for Converter Station Location Zones: Options 1, 6, 9, 10, 12 and 14.

Report Author: Teresa Bolger and Dawn Gooney
Report Status: FINAL
Report Reference: CIMM19-Rep-001

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RUBICON HERITAGE

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EXECUTIVE SUMMARY

Rubicon Heritage Services Ltd has been commissioned by Mott MacDonald to prepare an Archaeological, Architectural and Cultural Heritage Constraints Report for six options for the Converter Station Location Zones (CSLZs) for the proposed EirGrid Celtic Interconnector Project (Figure 1):

- Option 1: Ballymacadam, Co. Cork
- Option 6: Leamlara, Co. Cork
- Option 9: Knockraha, Co. Cork
- Option 10: Pigeon Hill, Co. Cork
- Option 12: Kilquane, Co Cork
- Option 14: Ballyvatta, Co. Cork

This study includes the identification of all recorded archaeological monuments and protected structures within the study area including the legal status, if any, of these features. The study also includes a review of recent archaeological excavations carried out in the study area.

This report is based on (a) detailed desk-based study of the archaeological, architectural and cultural heritage within each study area (published and unpublished datasets) (b) identification of all heritage constraints (c) identification of heritage sites vulnerable to impact in order to inform the Design Team at earliest stages.

This information has provided an insight into the development of each study area over time, an evaluation of archaeological and built heritage significance and identification of heritage sensitivities and constraints.

Constraint Types	Option 1 Ballyadam	Option 6 Leamlara	Option 9 Knockraha	Option 10 Pigeon Hill	Option 12 Kilquane	Option 14 Ballyvatta
Record of Monuments & Places (RMP)	4 Fulachta Fiadh 1 Excavation (site) 1 Tree Ring	7 Ringforts 1 Fulacht Fiadh	3 Ringforts 1 Enclosure	2 Fulachta Fiadh	1 Standing Stone	NONE
National Monument or Site with Preservation Order	NONE	NONE	NONE	NONE	NONE	NONE
Protected Structures (RPS)	NONE	1 Church	NONE	NONE	NONE	NONE
Architectural Conservation Area (ACA)	NONE	NONE	NONE	NONE	NONE	NONE
National Inventory of Architectural	NONE	1 Bridge	NONE	NONE	NONE	NONE

Constraint Types	Option 1 Ballyadam	Option 6 Leamlara	Option 9 Knockraha	Option 10 Pigeon Hill	Option 12 Kilquane	Option 14 Ballyvatta
Heritage (NIAH) Site						
Undesignated Cultural Heritage Site	NONE	NONE	1 bomb factory 1 arms dump 1 cast iron dump	NONE	1 Site of Executions/ Burials	NONE

As the proposed scheme has yet to be designed the recommendations outlined here are general in nature. It is recommended that, if possible, all impacts on identified cultural heritage sites, and their immediate vicinities, should be avoided in the selection of the preferred CSLZ and in the design and exact siting of the proposed Converter Station with the preferred Zone.

1 INTRODUCTION

This report by Rubicon Heritage Services Ltd details the archaeological, architectural and cultural heritage constraints for six options for the Converter Station Location Zones (CSLZs) for the proposed EirGrid Celtic Interconnector Project. The 2 km study area for each option was defined by the client (Figure 1). These works were undertaken on behalf of Mott MacDonald.

The objective for the Archaeological, Architectural and Cultural Heritage Constraints Report includes the identification of all recorded archaeological monuments within each study area including the legal status, if any, of these features. All protected structures are also identified as are other features of cultural heritage significance.

This report has been undertaken in accordance with the provisions of the following legislative procedures which are further detailed in Appendix 1:

- National Monuments Acts 1930-2004
- Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999
- Local Government (Planning and Development) Acts 2000-2001

It has also been undertaken in accordance with the policies set out in Chapter 12 of the Draft Cork County Development Plan 2015-2022.

1.1 Proposed development

The Celtic Interconnector is a proposed electrical link which will enable the movement of electricity between Ireland and France. The project is still at the design stage, but key elements of any proposed design include:

- Submarine cable route
- Landfall
- Terrestrial cable route(s)
- Terrestrial Converter Station

A number of zones in the Knockraha–Midleton area have been identified as potentially suitable for the location of a converter station. A converter station is an industrial type building with a height of up to 25 m and is accommodated within a larger outdoor compound with typical dimensions of 300 m x 150 m. Each CSLZ comprises a 2 km diameter area, which could feasibly accommodate a converter station for the project.

1.2 Converter Station Location Zones

Initially 14 CSLZs were identified, from which a shortlist of six zones has been identified. This report sets out the Cultural Heritage Constraints in relation to these options:

- Option 1: Ballyadam, Co. Cork
- Option 6: Leamlara, Co. Cork
- Option 9: Knockraha, Co. Cork
- Option 10: Pigeon Hill, Co. Cork
- Option 12: Kilquane, Co Cork
- Option 14: Ballyvatta, Co. Cork

2 OBJECTIVES AND METHODOLOGY

2.1 Objectives

This study aims to provide a high-level understanding of the key likely significant constraints within each study area. This information, when considered in parallel with all other environmental constraints, will assist in the decision-making process and inform the design and planning for the proposed scheme.

The scope and methodology for the study has been devised with reference to the following guidelines:

- EirGrid (2015) 'Cultural Heritage Guidelines for Electricity Transmission Projects. A stand approach to archaeological, architectural and cultural heritage impact assessment of high voltage transmission projects.'
- Environmental Protection Agency (2002) 'Guidelines on the information to be contained in Environmental Impact Statements'
- Environmental Protection Agency (2003) 'Advice notes on current practice (in the preparation of Environmental Impact Statements)'
- Environmental Protection Agency (2017) 'Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)'
- Department of Arts, Heritage, Gaeltacht and the Islands (DAHGI) (1999) 'Frameworks and Principles for the Protection of the Archaeological Heritage'
- Department of the Environment, Heritage and Local Government (2004) 'Architectural Heritage Guidelines'
- National Roads Authority (2005) 'Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes'
- National Roads Authority (2005) 'Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes'

2.2 Desktop Study Methodology

The present constraints report of the archaeological, architectural and cultural heritage of the study area is based on a desktop study of a number of documentary and cartographic sources. The desktop study was further augmented by an examination of aerial photography. The main sources consulted in completing the desktop study are listed here.

- Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) for County Cork
- Various editions of the Ordnance Survey of Ireland maps
- Archaeological Inventory for County Cork – Volume 1 (Power *et al*. 1992)
- National Inventory of Architectural Heritage
- Excavation Bulletins Database (www.excavations.ie)
- Cork County Development Plan (2015-2021)
- Various published sources for local history
- Ordnance Survey Namebooks and Letters
- Excavations Bulletin
- Aerial Photographs
- Cartographic Sources

2.3 Field Inspection Methodology

A windshield survey of each Convector Station Location Zone was undertaken by Rubicon Heritage Services Ltd on 29 and 30th May 2019 and 6 June 2019 (Plates 1–30).

3 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

3.1 Prehistoric Period

There is abundant evidence for prehistoric settlement in Co. Cork.

Fulachtaí fia survive as low mounds, usually horse-shoe shaped, of charcoal-enriched soil packed with fragments of heat-shattered stones (termed 'burnt mound'); when levelled, they are often noticeable as black spreads in ploughed fields. They were usually situated close to a water source, like a stream, or in wet marshy areas. It is generally accepted that they were probably used as cooking places (Ó Drisceóil 1988). Water was boiled in a regular pit (lined with wooden planks or stone slabs to form a trough) by the addition of hot stones from a fire close by. O'Kelly (1954, 105–55) showed by experiment that the large quantities of water can be boiled in this way in about twenty minutes. He also demonstrated that meat, wrapped in straw and immersed in the boiling water, cooked at a rate of twenty minutes per pound weight. When the cooking was over the remnants of heat-shattered stones in the trough were discarded to one side. Eventually, after many episodes of use, these would form a mound curving round three sides of the trough, hence the horse-shape mound (Power *et al*. 1997, 75). It is not certain whether *fulachtaí fia* were elements temporary hunting camps or of permanent settlements. The majority of radiocarbon dates place these monuments in the Bronze Age (Brindley and Lanting 1990, 55–6). They are the most numerous prehistoric sites in Ireland, with over 4,500 known examples, some 2,000 of these in Co. Cork (Power 1990, 13–17). Examples of this site type are present within the study areas for Option 1 (CO076-017, CO076-119, CO076-120, CO076-12, CO076-122 and CO076-123), Option 6 (CO065-002) and Option 10 (CO064-090 and CO064-091).

A review of the use of the term '*fulacht*' in early Irish literature and of references to 'activities that may have taken place at such sites', suggest associations with 'the cooking and eating of food, washing and bathing, music and sex' (Ó Drisceóil 1990, 157– 64). The word '*fulacht*' means a pit used for cooking. The second element can be interpreted as either '*fiadh*' meaning 'of the deer' or 'of the wild' or '*fian*' meaning 'of a roving band of hunters or warriors' or 'of Fianna or Fionn Mac Cumhail' (Ó Drisceóil 1988, 671–80).

Standing stones are large upright stones that may be found solely as a monolith, or as part of a group of similar stones. Their size can vary considerably, but their shape is generally uneven and squared, often tapering towards the top. They are widely distributed across Europe, Africa and Asia. However, they are most numerous in Western Europe; in particular herein Ireland, Great Britain and Brittany. Standing stones are usually difficult to date, but pottery, and/or pottery shards found at the site places them in the late Neolithic and early Bronze Age period. An example of this monument type is present within the study area for Option 12 (CO064-027).

3.2 Medieval period (AD 400–1540)

The early medieval documentary sources indicate a complex secular social system based on clientship during this period. Landowning commoners such as *ócaire* and *bóaire* were obligated to wealthy landowners (*mruigfer*), lords (*flaith*) and the king of a region with commoners (*betaghs*) bonded freemen (*fuidirs*) and slaves (*cumal*) lower down the scale but still required to pay tributes. The social system was dependant on clientelism with rents and what amounted to taxes being paid with labour, food and other commodities to the upper echelons and also to the church (Kelly 2000, 447). By the twelfth century the distinction between *ócaire* and *bóaire* diminished suggesting a change in the social order (Kelly 2000, 428). The *betagh* class came to refer to a servile tenant (Kelly 2000, 428). Many of these wealthy landowners and landowning commoners inhabited ringforts

Ringforts are undoubtedly the most widespread and characteristic archaeological field monument in the Irish countryside. Examples are present within the study areas for Option 6 (CO053-069, CO054-101, CO064-038, CO064-039, CO064-040, CO065-001) and Option 9 (CO064-028, CO064-074, CO064-075 and CO064-078). They are usually known by the names ráth or lios, forming some of the most common placename elements in the countryside. The ringfort is basically a circular or roughly circular area enclosed by an earthen bank formed of material thrown up from concentric fosse (ditch) on its outside. Generally, the diameter of the enclosure is between 25 m and 50 m. A single bank and fosse (univallate) is the most usual form; double rings (bivallate) or triple rings (trivallate) are rarer. The number of rings of defence are thought to reflect on the status of the site, rather than the strengthening of its defences. These sites have endured centuries of erosion, reuse and sometimes deliberate destruction and it is not always possible to distinguish original features; the overgrown nature of many sites compound the problem of field recording. However, entrances may be detected where a clear break in the bank is in line with an uncut causeway over the fosse (Power 1992, 131).

Archaeological excavation has shown that the majority of ringforts were enclosed farmsteads, built in the early medieval period. Though not forts in the military sense, the earthworks acted as a defence against natural predators like wolves, as well as human predators. Local warfare and cattle raiding were commonplace at this time. The construction of so many throughout the country, in a relatively short period (400–500 years), reflects on the stability and wealth of society at the time, and also its homogeneity. As well as farming-related activities like corn-grinding and animal husbandry, the ringfort was home to a wide variety of craft industries, including spinning, weaving, metal- and glass-working. Dwellings and outhouses were built on timber posts, with walls of wattle, mud or sods, which usually leave no trace above ground today. Excavation can trace the remains of these structures by revealing features like post-holes, stake-holes and sunken hearths (Power 1992, 131).

3.3 War of Independence (1919–1921) (after Shiels 2014)

The area around the village of Knockraha became deeply involved in supporting Irish forces during the War of Independence, a subject which has been the focus of local history groups and academics.

3.3.1 Knockraha's role in the War of Independence

Knockraha was never the scene of major engagements with Crown forces during the War of Independence. Its position as a 'quiet' area was far from accidental. Rather it was part of an intentional strategy by the I.R.A. of Cork No. 1 Brigade to avoid suspicion falling on the locality, allowing it to be utilised as a logistical base for the Brigade. That this was a strategic decision is borne out by the research of Dr. John Borgonovo, a historian based in U.C.C.:

> *'Cork Number One Brigade forbade attacks on the Crown Forces in the Knockraha area. From the perspective of Crown Forces reports, therefore, this parish was one of the most inactive in County Cork. Its importance as an I.R.A. base cannot be understood from statistical analysis of British material, reflecting the shortcomings of such methodology in a guerrilla conflict often composed of undocumented forces and actions' (Borgonovo 2010, 214).*

3.3.2 Bomb Factories

There is ample documentary evidence to suggest Knockraha's key importance for I.R.A. operations in Cork City and East Cork. As noted above, apart from the Ballynanelagh bomb factory it was also the location of a Brigade bomb factory. This was operated by Seamus Fitzgerald:

> *'In January [1921] I decided to go back to my 4th Battalion area and contacted David O'Brien who was on his safe keeping in E Company area at Knockraha, where we arranged, under instructions*

> *from the brigade, to set up and operate a brigade foundry unit for the manufacture of bomb cases. All this work took up full time duties to the end of March and the unit comprised David O'Brien, Charlie Reid (moulder) and myself. We were looked upon by the brigade as a special unit, engaged on full time work, and were paid 30/- a week for maintenance. The foundry building was built in a steep ravine to the west of Knockraha, with a small stream running under the floor, which latter had to be substantially made. The roof was camouflaged, as the area around was hunted at times by the Foxhounds of the United Hunt. The furnace was built with plates specially made for us at Rushbrooke Dockyard, and, after many failures, we eventually succeeded in making a large number of finished bomb cases in sand moulds and special chill moulds, delivered the bomb cases in sacks to special brigade couriers. We worked day and night, and slept in neighbouring barns and sometimes in dug-outs in the open. We were helped in this work by men from E Company, including Martin Corry, who was under strict orders to keep his company unit free from other active service and so avoid Crown Force activity in the area. Despite this, it was apparent that Capt. Geary, a British Intelligence Officer at Collins Barracks, had some knowledge of activity in the area, as we were raided by Crown Forces on many occasions and surrounded by lorries and armoured cars- 5 times during the fortnight preceding the Truce, when we were under fire on one occasion. Although we continued to carry rifles for protection all the time, we did not return fire, so that the foundry unit and ourselves successfully avoided capture up to the Truce' (WS 1737 of Seamus Fitzgerald).*

The establishment of this Brigade bomb factory in Knockraha had elicited significant effort on behalf of the 4th Battalion in order to get it up and running. Captain Michael J. Burke of 'A' (Cobh) Company, 4th Battalion, Cork No. 1 Brigade described a raid on Rushbrooke Docks in order to garner supplies for it:

> *'late in the year 1920 a party of twenty-five men from the Cobh Company seized Rushbrooke Docks and placed the watchmen and about ten officials under armed guard. Armed sentries were also placed at vantage points around the dockyard. Many of the men were competent tradesmen, i.e. shipwrights and fitters trained in Haulbowline and Rushbrooke. The machinery was got going and the men set to making a furnace for the manufacture of hand grenades. The men worked from 9 p.m. to 2 a.m, when the job was completed. The furnace was delivered to the brigade grenade dug-out at Knockraha, East Cork' (WS 1424 of Michael J. Burke).*

Similarly Edward Moloney, the 'Governor' of Sing Sing and member of the Knockraha Company recalled the efforts he made to support the Brigade bomb factory. A blacksmith with a forge in the village, his facilities were of use. He recalled how he '*worked with the Brigade below in the forge about half a mile, and I gave them the forge while they were making a chimney. And when they had it made they took it away to the fields.*' He also stated that the very first bomb was in fact made in his forge: '*I was there [at the forge] the first night a bomb was made, with Mick Leahy [Vice- Commandant of Cork No. 1 Brigade], and I got a piece of it and be got a piece of it*' (Edward Moloney Pension Application).

The importance the bomb factories held is evidenced in correspondence relating to the military pensions board in 1935. When a number of those who had served in the Ballynanelagh bomb factory and the Brigade bomb factory sought pensions (Denis Lynch, John Long, Patrick Fitzgerald, James Murphy, Martin Fitzgerald, William Sheehan and Michael Burke) a request was sent to Tom Crofts requesting that he 'submit a detailed statement regarding the Grenade Factories which are stated to have been established in the 4th Battn. Area, Cork I Brigade, during the Black and Tan period, indicating- (a) the names (and addresses if possible) of those who were engaged whole time therein; (b) the nature of the work on which each was engaged.' (MA/MSPC/RO/31)

3.3.3 Battalion Depot Area

Knockraha's importance to the I.R.A. effort extended well beyond its utilisation as a location for bomb production. It also seems to have performed functions as a Battalion depot area. Joseph Aherne, Captain of 'B' (Midleton) Company of the 4th Battalion, Cork No. 1 Brigade, recalled how after an ambush '*we handed over the captured arms to Lt. Fitzgerald, Ballinbrittas, Knockraha Company, and returned to Midleton…*' (WS 1367 of Joseph Aherne). The 4th Battalion Officer Commanding, Diarmuid Hurley, was also regularly to be found in Knockraha. Michael Burke recalled how he '*walked to Knockraha, eight miles to the east, where I contacted Diarmuid Hurley, O/C of the 4th Battalion, and told him of the success of my mission*' (WS 1424 of Michael J. Burke) while Joseph Aherne related receiving '*a message from Hurley [the O.C.] stating that he wanted to see me and that he was staying at Lt. Fitzgerald's house at Ballinbrittas near Knockraha*' (WS 1367 of Joseph Aherne).

3.3.4 Formation of Flying Column

When a decision was made to form a 4th Battalion Flying Column, Knockraha was once again the location selected. Patrick J. Whelan, Vice Commandant of the battalion relates:

> *'In the month of September 1920, the idea of forming flying columns was conceived in the Cork No. 1 brigade area. These columns were to be comprised of men already on the run, or who were considered to be in danger of arrest. Diarmuid Hurley, who had been on the run and who been out of the area for some time, returned to command the 4th battalion flying column. Mick Leahy, battalion O/C, conferred with Hurley as to the column's formation, and on 1st October, 1920, I was ordered by Mick to chuck my job with the Midleton Engineering Works, and report to Diarmuid Hurley at Knockraha for whole-time duty with the column' (WS 1449 of Patrick J. Whelan).*

Joseph Aherne, Captain of the Midleton Company confirmed that the Flying Column's '*first camp was situated in Knockraha in a disused farmhouse. We remained there for a few weeks and then moved on to Shanagarry*' (WS 1367 of Joseph Aherne). John Kelleher, Lieutenant of 'B' (Midleton) Company of 4th Battalion, Cork No. 1 Brigade, elaborated on Knockraha's role in the Column formation:

> *'…These men constituted the nucleus of the East Cork Flying Column which was formed about late September, 1920…The first headquarters of the Column was at Knockraha about four or five miles north of Carrigtwohill. Here, a few members of Midleton, Knockraha and other Companies went for training at week-ends. The training courses were conducted by Phil Hyde and Tom Buckley, both ex-British Army men. After six weeks or so, the Column moved to the Ladysbridge area…' (WS 1456 of John Kelleher).*

The decision to form the Column in Knockraha and to carry out its initial training there is of extreme significance, as it highlights just what a central role Knockraha played in the development of the guerrilla war in East Cork. It functioned not only as a supply and production centre, but also as a training location and perhaps most importantly a 'safe' area.

3.3.5 Safe Houses and point of Retreat

The fact that Knockraha was being kept intentionally quiet meant that it was ideal as a safe area and point of retreat. Patrick Whelan, 4th Battalion Vice-Commandant, particularly noted the value of the Fitzgerald farmhouse in Ballinbrittig and Canavan's pub in Knockraha village, noting that they were locals who provided food and board to the Flying Column (WS 1449 of Patrick J. Whelan). After one incident where it became necessary to abandon an ambush, Francis Healy of 'D' Company, 4th Battalion, Cork No. 1 Brigade, issued orders to '*abandon the place [the ambush site] immediately, dump all arms and equipment and retreat towards Knockraha*' (WS 1694 of Francis Healy).

Perhaps the most telling evidence of Knockraha's role in this regard were the actions of the Column in the immediate aftermath of the Clonmult Ambush, the disastrous reverse which left 12 volunteers dead in what was the worst loss of life sustained by the I.R.A. in a single event during the War of Independence. Only one man- Jack O'Connell- had escaped Clonmult. Patrick J. Whelan recalled the moment when he found about the disaster, and where everyone went in its aftermath:

> *'We were in the vicinity of Killacloyne, a few miles on the Cork side of Carrigtwohill, when we were stopped by Mick Burke, captain of the Cobh company, who told us that the column had been wiped out at Clonmult except for one man. He had no further details. We were staggered by this news, thought it impossible that he could be right, and hoped he was wrong. Poor Diarmuid was frantic on hearing the news, and askedme where I thought the one survivor would go. I gave, as a guess, Canavan's house at Knockraha in Martin Corry's territory- he was O/C, Knockraha company. We decided to go there, and sure enough, there was Jacko (Jack O'Connell), the one man who escaped Clonmult, the man whom I suggested should be in charge in our absence. He looked in a pitiable condition after his terrible ordeal- he had led a sortie from the house in Clonmult and was the sole survivor of the attempt- and told us all he knew. The four of us then set off by car for Clonmult' (WS 1449 of Patrick J. Whelan).*

It seems probable that there were standing orders to retreat to Knockraha, as men began making their way there as soon as they learned of what had occurred at Clonmult: Seamus Fitzgerald: '*…we drove in a trap to our base in Knockraha*' (WS 1737 of Seamus Fitzgerald); John P. O'Connell: '*Following the collapse of the blazing roof of the house in which the Column was trapped* [in Clonmult], *and as the messengers I had sent for help had not returned, I made my way to Knockraha, a few miles distance*' (WS 1444 of John P. O'Connell); Joseph Aherne: '*Getting into the car, which was closeby, we proceeded to Knockraha, arriving in the village we met some of the volunteers of the local company, including Martin Corry and Capt. Jack O'Connell*' (WS 1367 of Joseph Aherne).

3.3.6 Prison & Place of Execution

Perhaps Knockraha's most famous connection with the War of Independence was its use as the prison of Cork No. 1 Brigade and as a place where suspected spies, informers and British military were executed. Dr. John Borgonovo related how the prison, located within the cemetery, operated:

> *'Volunteers located an isolated, half-submerged crypt that was sound proof and could be locked from the outside, which they called Sing-Sing (after the famous American prison). The Brigade, rather than the local company, maintained Sing-Sing, which accommodated suspects, criminals, and condemned spies. The 'prison governor', a Brigade staff captain, fed the prisoners at night and left them alone during the daytime. Prisoners were brought into Sing-Sing blindfolded, to keep the location secret but also from a fear of their sanity, should they learn they were being left alone in a graveyard. Some prisoners were released, but many were removed and executed nearby' (Borgonovo 2010, 213).*

That the prison was run by the Brigade as opposed to Martin Corry and the local company is confirmed in the pension file of the Governor of Sing-Sing, Edward Moloney, who stated that he would not give the key to Corry even if he wanted it (Edward Moloney Pension Application). The fact that Knockraha was used as place of imprisonment and execution is apparent in a number of Witness Statements. Captain Sean Healy of 'A' Company, 1st Battalion, Cork No.1 Brigade told how one informer:

> *'was employed as a Post Office clerk where he was in a position to obtain valuable information for the enemy. Sean Culhane, J.J. O'Connell and I got instructions to put a stop to his activities. When he was picked up, walking along King St. one evening, we arrested him and conveyed him to 'an unknown destination' (in Knockraha) from which he never returned' (WS 1479 of Sean Healy).*

Captain Jos. O'Shea of 'E' Company, 1st Battalion, Cork No. 1 Brigade:

> *'On an evening in July [1920], following receipt of a report from our intelligence service, I went, with five others from E. Company, to Penrose Quay, Cork. We were armed with revolvers. In due course, O'Gorman came along, obviously going to the Cork Steampacket Company's boat which was sailing for England that same evening. I held him up and, with the others, put him into a motor car which we had ready nearby. He was brought to the Kilcully district, north of the city, where he was kept in a house, under armed guard, for a few days. He was then taken by car to Knockraha in East Cork where he was executed.' (WS 1675 of Jos. O'Shea).*

Captain Sean Healy of 'A' Company, 1st Battalion, Cork No. 1 Brigade:

> *'I have already referred to a traitorous Irishman who was executed at Knockraha. He died with "God save England" on his lips, may God forgive him' (WS 1643 of Sean Healy).*

The burial of these bodies has garnered much attention in recent years, particularly with the publication of the *The Year of Disappearances: Political Killings in Cork, 1920- 1921* by Gerard Murphy in 2010 and *The Graves of the Disappeared* television series broadcast by TV3 in 2012, both of which reference the burial of individuals in Knockraha. There is no doubt that such burials did occur, most notably in a boggy area of upland known locally as 'The Rea', which lies within the study area for Option 12.

The historical record clearly demonstrates the importance of Knockraha to the operations of Cork No. 1 Brigade during the War of Independence.

3.4 Knockraha War of Independence Heritage Sites

It is possible to locate a large number of War of Independence sites within Knockraha's landscape. These encompass the full range of I.R.A. activities during the War of Independence, from munitions production to training areas to safe houses. The majority of sites are identifiable due to the work undertaken by James Fitzgerald and others in interviewing surviving members of the company, including Martin Corry.

3.4.1 Knockraha Village

The main street of the village was where 'E' Company was assembled to drill each Sunday. The school (now a crèche) was the location where the Sinn Féin Courts were held. Canavan's pub, the Flying Column safe-house and building where volunteers assembled after Clonmult is today O' Donoghue's bar. It is notable that this is the building where the only survivor of Clonmult went, and where many would have heard what happened there for the first time. The house where Edward Moloney, Governor of Sing-Sing lived, also survives, as does the forge where he helped make material for the Brigade bomb factory. Knockraha Catholic Church also played a role in the War of Independence landscape, being used to store arms.

3.4.2 Dug-outs & Dumps

Dug-outs were recorded at a number of sites around Knockraha, some associated with pre-existing archaeological monuments. These include the dug-out in the ditch of the ringfort in Ballinbrittig townland (CO064-082). Martin Corry goes into some detail in the Corry Tapes about his extensive exploration with another volunteer of another ringfort and souterrain with a view to its use as an arms dump. During this investigation one of the men became trapped under a flag-stone and had to be extracted. Corry also expressed his shock when after the Truce it was discovered that the ringfort and

souterrain were both marked on the Ordnance Survey maps. This ringfort (CO064-021001) is in Rathfilode townland as is the accompanying souterrain (CO064-021002) which is marked as a 'cave' on the Ordnance Survey mapping. Another dug-out was located in Knockraha East townland where six men could sleep safely; although the site survives the dug-out itself has been filled in.

The Knockraha Company also created a number of 'dumps' of supplies around the landscape. Among these was a cast iron dump in Aghadull townland to provide raw material for the operation of Ballynanelagh Bomb Factory, with the same field also the site of an arms dump of weapons taken from H.M.S. Upnor. These lie within the study area for Option 9.

3.4.3 Buildings

Perhaps the most notable of the buildings is 'Liberty Hall' in the townland of Killacloyne near Ballinbrittig crossroads. A plaque was placed on this building by the local historical society in 2001. It was in this building that the Knockraha Company was formed, as was the Flying Column subsequently (The Story of Cork's Own Liberty Hall). The surrounding fields were also used for training. The Fitzgerald safehouse referred to in the historical records was situated across the road in Ballinbrittig (the Fitzgerald family also owned the land on which Liberty Hall was located. Another company camp was located at 'McGrath's House' in the townland of Kilrussane, a complex of buildings which still survives. Another safe house was 'Roche's', where Sean Hegarty, Officer Commanding Cork No. 1 Brigade is believed to have stayed for a time- located in Aghaduff townland, buildings still survive on the site. An abandoned farm cottage known as 'McGraths' in Blossomgrove townland is probably that used by the Flying Column soon after its formation, and was situated close to the Brigade bomb factory. As such the area around this building is particularly significant with regard to the early training of the East Cork Column. Although much of this site is now in use as a yard some older buildings survive as do the adjoining fields. Another important support building in the landscape is Longs Forge, which survives in Killeena townland. This forge supplied support to the Ballynanelagh Bomb Factory (in which the Longs also worked); some of the material utilised in the factory was made here.

3.4.4 Prisons & Executions

The most notable prison site in Knockraha is Sing-Sing, in Kilquane townland. The site is well-maintained and is another location where the local society has placed a commemorative plaque. It lies within the recorded graveyard (CO064- 026002) and is also within an early ecclesiastical enclosure (CO064-026001). The graveyard is also the location of a church (CO064-026003). Originally used to imprison thieves and lawbreakers, the site was taken over by Cork No. 1 Brigade as a centre to hold their most valuable prisoners. Another building where prisoners were believed to be held was Carrigeen in Knockraha townland to the south-west of the village, where some buildings still survive. A number of execution sites have been identified around Knockraha. These include the sand pit in Twomey's, now filled in but still under pasture, located in the townland of Ballinbrittig. Another is Ballingohig Bridge where a British army man was reportedly executed. The most significant is the boggy area in the north-east of Kilquane townland known as 'The Rea' where a number of executions were carried out. Today much of this area is under forestry. It lies within the study area for Option 12.

3.4.5 Bomb Factories

The bomb factory operated by the Knockraha Company was located in Ballynanelagh townland and lies within the study area for Option 9. The Brigade bomb factory was located in Blossomgrove townland close to the southern bank of the river, although its precise location has yet to be established. This area was also subjected to a raid as British forces unsuccessfully attempted to locate I.R.A. activity in the area.

4 OPTION 1—BALLYADAM

4.1 Site location

This Convector Station Location Zone focuses on an area of mainly agricultural lands with an undeveloped business/industrial park and a quarry/industrial site, c. 3.5 km west of Midleton. It includes eight townlands (Table 1) in the barony of Barrymore.

Analysis of aerial photography indicates that the area incorporated by Option 1 is crossed by the N25 road and the Midleton-Cork railway line. The northern section is mainly flat agricultural land, a large undeveloped business or industrial park occupies the area in the west between the trainline and the N25. To the south, a quarry/industrial site is surrounded by agricultural lands.

According to the Teagasc Soil Information System (http://gis.teagasc.ie/soils/index.php) the soil association in the area is a coarse loamy drift with siliceous stones. Overall this is the type of ground that has been well utilised in the past.

4.2 Toponomy

The Irish landscape is divided into approximately 60,000 townlands and the system of landholding is unique in Western Europe for its scale and antiquity. Many townlands predate the arrival of the Anglo Normans, and Irish historical documents consistently use townland names throughout the historic period to describe areas and locate events accurately in their geographical context. The townland names and boundaries were standardised in the nineteenth century when the Ordnance Survey began to produce large-scale maps of the country. The original Irish names were eventually anglicised to varying degrees, depending in part upon the linguistic skills of the surveyors and recorders. A study of the townland names can provide information on aspects of cultural heritage including descriptions of the use of the landscape by man and the potential presence of archaeological or cultural heritage sites or features.

The eight townlands within this Convector Station Location Zone are included in Table 1.

English Name	Irish Name	Glossary
Ballyadam	*Baile Adaim*	Baile - townland, town, homestead
Ballynabointra	*Baile na Baintrí*	Baile na Baintreabhaighe - "The Widow's Homestead"
Ballyrichard More	*Baile Risteaird Mór*	Baile - townland, town, homestead Mór - great, big
Burgesland	*An Bhuirgéis*	the borough-land
Carrigane	*An Carragán*	Carragán, 'means land with a rocky surface'
Carrigtohill	*Carraig Thuathail*	Carraig - rock
Clyduff	*An Claí Dubh*	Cladh dubh, 'i.e. black ditch'
Gortagousta	*Gort an Ghósta*	Gort -(also: gart) field

Table 1: Townlands within Option 1 (after Irish Placenames Committee, 2013)

4.3 Designated archaeological sites

4.3.1 Record of Monuments and Places (RMPs)

Section 12 (1) of the National Monuments Act 1994 made provision the establishment and maintenance of a Record of Monuments & Places (RMP). Under this Act, each site recorded in the Record of Monuments and Places is granted statutory protection. When the owner or occupier of a property, or any other person proposes to carry out, or to cause, or to permit the carrying out of any work at or in relation to a recorded archaeological monument they are required to give notice in writing to the Minister for Culture, Heritage and the Gaeltacht 2 months before commencing that work.

There are six recorded archaeological monuments incorporated by Option 1.

RMP No	Site Type	Description	Townland	ITM_E	ITM_N
CO076-017----	Designed landscape - tree-ring	The Archaeological Survey of Ireland (ASI) is in the process of providing information on all monuments on The Historic Environment Viewer (HEV). Currently the information for this record has not been uploaded.	BALLYRICHARD MORE	585506	573960
CO076-119----	Excavation - miscellaneous	In low-lying wet ground. Five pits and one post-hole were discovered in 2007 during archaeological monitoring in advance of the construction of an industrial development. The five pits were located in close proximity to each other and the post-hole was situated c. 0.15m to the E. Two of the pits had lenses of charcoal-enriched soil and oxidised clay in their fills and, according to Cleary (pers. comm.), it appeared that the material was dumped into the pits from activity elsewhere and did not represent in situ burning. The two pits were conjoined (overall L 1.6m N-S) and were probably dug at the same time. Burnt animal bone, a stone axehead fragment and a shaped stone were recovered from one of these pits. A thin layer of sandy clay extended across both pits and covered the charcoal-enriched lens and abutted the oxidised clay lens of one of the pits. Charcoal from the first pit yielded a C14 determination of AD 88-178 cal. Charcoal from the basal fill of the second pit returned a C14 determination of AD 94-231 cal. A layer (T 0.05-0.08m) of oxidised clay and charcoal occurred on the S lip of the latter pit and was interpreted as in situ burning. Of the other three pits, one (0.62m; max. D 0.20m) had a fill of charcoal-enriched soil with minute burnt bone fragments and two were of	BALLYADAM (Barrymore By.)	584667	573678

RMP No	Site Type	Description	Townland	ITM_E	ITM_N
		similar size (av. diam. 0.60m) and had a charcoal-enriched stony soil fill. The post-hole (diam. 0.12m; D 0.08m) was circular in plan. (pers. comm. Rose Cleary) The above description is derived from 'The Archaeological Inventory of County Cork. Volume 5' (Dublin: Stationery Office, 2009).			
CO076-120----	Fulacht fia	In low-lying wet ground. A low mound (20m E-W; 15m N-S; H 0.4m) of heat-shattered stones and charcoal-enriched soil was discovered in 2007 during archaeological monitoring in advance of the construction of an industrial development. The burnt stones were predominantly sandstone and were sourced at some distance from the monument. The S part of the mound overlay charcoal-rich peaty clay that extended into a pond (10m E-W; 8m N-S; D 0.9m) which was probably the water source for the fulacht fia. The pond was infilled with peat lenses and heat-shattered stone. Twelve pits were recorded, three of which were outside the limit of the stone spread. Two large pits were interpreted as troughs. The pits were in two main clusters to the N of the pond; two pits were to the E and single pit lay to the W. It is possible that each concentration of pit activity is related to discrete use of the troughs. This fulacht fia was radiocarbon dated to 2283-2146 cal. BC (3788±30BP) (UBA 8449). Another fulacht fia (CO076-121----) lies c. 220m to the SSE. (pers. comm. Rose M. Cleary) The above description is derived from 'The Archaeological Inventory of County Cork. Volume 5' (Dublin: Stationery Office, 2009).	BALLYADAM (Barrymore By.)	583814	573757
CO076-121----	Fulacht fia	In low-lying wet ground, to the S of an infilled pond. A spread of heat-shattered stones, under which was a series of pits including a trough, was discovered in 2007 during archaeological monitoring in advance of the construction of an industrial development. Three post-holes were recorded to the NW of the trough and ten stake-holes were to the S of a pit.	BALLYADAM (Barrymore By.)	583954	573562

RMP No	Site Type	Description	Townland	ITM_E	ITM_N
		The trough was c. 4m S of the pond. The pit was irregular in plan and the edges sloped into a second steep-sided pit that probably housed the trough lining. The fill comprised layers of heat-shattered stones and charcoal-rich silt and charcoal. This fulacht fia was radiocarbon dated to 996-920 cal. BC (2804±31) (UBA 8452). A second fulacht fia (CO076-120----) lies c. 220m to the NNW. (pers. comm. Rose M. Cleary) The above description is derived from 'The Archaeological Inventory of County Cork. Volume 5' (Dublin: Stationery Office, 2009).			
CO076-122----	Burnt mound	An irregular spread (6.8m E-W; 6.3m N-S; D 0.25m) of heat-shattered stones and three pits were discovered in 2007 during archaeological monitoring in advance of the construction of an industrial development. Two pits were recorded under the stone spread. One was oval in plan (1.1m E-W; 1.6m N-S; D 0.5m) and had a basal fill (T 0.1m) of charcoal-enriched silt with infrequent heat-shattered stones which may have accumulated naturally when the pit was open. The upper layers appeared to be deliberate infill of heat-shattered stones. The other pits were in a 'figure-of-8' plan (L 2m; Wth 1.1m; D 0.15m) with the N section being wider. There was a single fill of heat-shattered stones. This possible burnt mound was radiocarbon dated to 2197-2042 cal. BC (3726±33 BP) (UBA 8453). A fulacht fia (CO076-123----) lies c. 50m to the N. (pers. comm. Rose M. Cleary) The above description is derived from 'The Archaeological Inventory of County Cork. Volume 5' (Dublin: Stationery Office, 2009).	BALLYADAM (Barrymore By.)	584219	573737
CO076-123----	Fulacht fia	In low-lying ground. A spread of heat-shattered stones and charcoal-enriched soil over a trough and eight pits was discovered during archaeological monitoring in 2007 in advance of the construction of an industrial development. The pits were located to the north and south of the trough. The trough (2.65m E-W; 1.6-	BALLYADAM (Barrymore By.)	584224	573786

RMP No	Site Type	Description	Townland	ITM_E	ITM_N
		2.2m N-S; D 0.45m) was roughly oval in plan and the edges were irregular on the north side and the sides were vertical down to a flat base. Its fill comprised a layer of heat-shattered stones and charcoal that represented a single infill. This may be mound slippage rather than the final cooking activity at the site where it is unlikely that the amount of stones used filled the trough in entirety. Six stake-holes were recorded at the base of the trough. Three occurred on the N and S sides and one stake-hole was recorded adjacent to the southern trough pit edge. The stake-holes (diam. 0.08-0.11m; D 0.08-0.13m) were all 'V'-shaped in profile. The fills were stony charcoal-flecked silt. It is probable that the stake-holes within the trough pit functioned as pegs to secure the trough lining in place. A post-hole (0.3m N-S; 0.5m E-W; D 0.31m) was located 0.3m from the NW edge of the trough and may have held a post related to trough use. It contained a silt fill. Two large packing-stones remained in situ on the N side and a series of smaller stones along the remaining edges may also have held the post in place. A second post-hole (0.26m E-W; 0.31m N-S; D 0.21m) was located 0.45m from the trough edge. It contained charcoal-enriched clay fills. This fulacht fia was radiocarbon-dated to 2192-2938 cal. BC (3714±34 BP) (UBA 8454). A possible burnt mound (CO076-122----) lies c. 50m to the S. (pers. comm. Rose M. Cleary) The above description is derived from 'The Archaeological Inventory of County Cork. Volume 5' (Dublin: Stationery Office, 2009).			

Table 2: Archaeological monuments incorporated by Option 1.

4.3.2 National Monuments

National monuments are broken into two categories; National Monuments in the ownership or guardianship of the state and National Monuments in the ownership or guardianship of a local authority. Section 8 of the National Monuments (Amendment) Act 1954 provides for the publication of a list of monuments, the preservation, of which, are considered to be of national importance. Two months' notice must be given to the Minister for Arts, Heritage and the Gaeltacht where work is proposed to be carried out at or in relation to any National Monument.

There are no National Monuments incorporated by Option 1.

4.3.3 Sites with Preservation Orders

The National Monuments Act 1930-2004 provide for the making of Preservation Orders and Temporary Preservation Orders in respect of National Monuments. Under Section 8 of the National Monument Act 1930 (as amended) the Minister for Culture, Heritage and the Gaeltacht, can place a Preservation Order on a monument if, in the Ministers' opinion, it is a National Monument in danger of being or is actually being destroyed, injured or removed or is falling into decay through neglect. The Preservation Order ensures that the monument shall be safeguarded from destruction, alteration, injury, or removal, by any person or persons without the written consent of the Minister.

There are no sites with preservation orders incorporated by Option 1.

4.4 Designated architectural heritage sites

In 1997 Ireland ratified the Granada Convention on architectural heritage. This provided the basis for a national commitment to the protection of the architectural heritage throughout the country. The Local Government (Planning and Development) Act 2000, and the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999, made the legislative changes necessary to provide for a strengthening of the protection of architectural heritage.

4.4.1 Record of Protected Structures

The Cork County Development Plan (2015-2021) was consulted for schedules of Protected Structures. These are buildings that a planning authority considers to be of special interest from an architectural, historical, archaeological, artistic, cultural, scientific, social, and/or technical point of view. Protected Structures receive statutory protection from injury or demolition under Section 57 (1) of the Local Government (Planning and Development) Act 2000. Protected structure status does not exclude development or alteration but requires the developer to consult with the relevant planning authority to ensure that elements which make the structure significant are not lost during development.

There are no Protected Structures incorporated by Option 1.

4.4.2 Architectural Conservation Areas

The Cork County Development Plan (2015-2021) was consulted for records relating to Architectural Conservation Areas ((hereinafter 'ACAs'). The stated objective of ACAs is to conserve and enhance the special character of the area, including traditional building stock and material finishes, spaces, streetscapes, landscape and setting.

There are no areas listed as ACAs incorporated by Option 1.

4.4.3 National Inventory of Architectural Heritage (NIAH)

The National Inventory of Architectural Heritage (hereinafter the 'NIAH') is a state initiative under the administration of the Department of Culture, Heritage and the Gaeltacht and was established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. Its purpose is to identify, record and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently, as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for Arts, Heritage and the Gaeltacht to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS).

There are no structures listed in the NIAH incorporated by Option 1.

4.5 Recent excavations

The Excavations Bulletin is an annual account of all excavations carried out under license. The database is available online at www.excavations.ie and includes excavations from 1985 to 2017. This database was consulted as part of the desktop research for this report to establish if any archaeological investigations had been carried out within the townlands incorporated by Option 1. The database produced four results for archaeological excavations undertaken within the townlands incorporated by Option 1. The lands occupied by the partially developed industrial/ business estate were investigated and a number of sites excavated prior to the development.

County: Cork **Site name**: Ballyadam
Sites and Monuments Record No.: N/A **Licence number:** 06E0612
Author: Rose M. Cleary, Department of Archaeology, University College, Cork.
Site type: Fulachta fiadh and pits
ITM: E 584668m, N 573680m
Latitude, Longitude (decimal degrees): 51.915039, -8.222858
Ballyadam 1 – pits and post-hole
Five pits were recorded in close proximity to each other and a post-hole was recorded 0.15m to the east. Two pits (C3A and B) had lenses of charcoal-enriched soil and oxidised clay in the fills and the general impression was that the material was dumped into the pits from activity elsewhere rather than in situ burning. Burnt animal bone, a stone axehead fragment and a shaped stone were recovered from C3A. The overall length of C3A–B was 1.6m and the long axis was north–south. The pits were conjoined and probably dug at the same time. A thin layer of sandy clay extended across both pits and covered the charcoal-enriched clay in C3A and abutted the oxidised clay in C3B. Blackthorn/cherry (Prunus spp) charcoal from the basal fill of C3B returned a 14C determination of 94–231 cal ad; 1847645 (uba 8450). A 0.05–0.08m thick layer of oxidised clay and charcoal occurred on the southern lip of C3B and is interpreted as in situ burning. Hazel (corylus avellana) charcoal from C11 yielded a 14C determination of 88–178 cal ad; 1862629 bp (uba-8448).
Three other pits were excavated in close proximity. One pit measured 0.62m wide (maximum) by 0.2m deep and the fill was charcoal-enriched soil with minute burnt-bone fragments. Two other pits were of similar size (0.6m diameter) and had charcoal-enriched stony soil fill. The post-hole was circular in plan: diameter 0.12m, depth 0.08m.
Ballyadam 2 – fulacht fiadh
The shattered stone spread was dispersed over an area measuring 20m east–west by 15m. A mixture of alder (Alnus glutinosa), hazel and apple-type (Pomoideae) returned a 14C determination of 2283–2146 cal bc; 3788630 bp (uba 8449). The maximum extant height towards the north end was 0.4m and the stone tailed off towards the south. The stone was predominately sandstone that was sourced at some distance from the site. The southern area of the stone spread overlay charcoal-rich peaty clay that extended into a pond. This clay appeared natural in origin and may reflect localised wet ground conditions when the site was in use. This low-lying area is interpreted as a natural pond and this was probably the water source for the activity on site. The pond was 10m east–west by 8m and was infilled with peat lenses and heat-shattered stone. The maximum depth was 0.9m and this was due to the natural topography of the landscape rather than an artificially enhanced feature. The stone infilling may be a post-use phase when the mound material was dispersed.
Twelve pits were recorded on the site and three were outside the limit of the stone spread. Two large pits are interpreted as the locations of troughs. The pits were in two main clusters to the north of the

pond; two pits were to the east and a single pit lay to the west. It is possible that each concentration of pit activity is related to discrete use of the troughs.

Ballyadam 3 – fulacht fiadh

This site was 250m to the south-east of Ballyadam 2 (fulacht fiadh 1) and was similarly located in low-lying wet ground. Ballyadam 3 comprised a dispersed spread of heat-shattered stones over a series of pits, including a trough, to the south of a naturally occurring pond. The pond had been infilled in modern times with gravel. Three post-holes were recorded to the north-west of the trough and ten stake-holes were to the south of a pit. The trough was due south of the pond at a distance of c. 4m. The pit was the largest on site, irregular in plan, and the edges sloped into a second steep-sided pit that probably housed the trough lining. The fill comprised layers of heat-shattered stones and charcoal-rich silt and charcoal. Alder charcoal from the basal layer yielded a 14C determination of 996–920 cal bc; 2804631 (uba 8452).

Ballyadam 4 – burnt-stone spread

This site was located 50m to the south of a fulacht fiadh (Ballyadam 5) and comprised a spread of heat-shattered stone and three pits. The site was relatively small-scale in comparison to the fulachta fiadh at Ballyadam 2, 3 and 5 and, although heating of stones and other activity took place, the site did not have a feature that can be identified as a trough. The stone spread was irregular in plan and measured 6.8m east–west by 6.3m with a maximum central thickness of 0.25m. The spread tailed off around the edges. The basal layer comprised a charcoal-enriched soil with some heat-shattered stones; this was overlain by a thin (0.05m thick) layer of charcoal-enriched silt. Two pits were recorded under the stone spread. One was oval in plan, 1.1m east–west by 1.6m by 0.5m deep. The basal fill was a 0.1m-thick layer of charcoal-enriched silt with infrequent heat-shattered stones. This layer may have accumulated naturally when the pit was open. Hazel charcoal returned a 14C date of 2197–2042 cal bc; 3726633 bp (uba 8453). The upper layers appeared to be deliberate infill of heat-shattered stones with variations in the amount of charcoal and stones between the layers. The other pits were in a figure-of-eight plan with the northern section being wider. The overall length was 2m and the maximum width was 1.1m. The pit was 0.15m deep but was shallower in the central section. There was a single fill of heat-shattered stones.

Ballyadam 5 – fulacht fiadh 3

Similar to the other fulachta fiadh at Ballyadam, this was located in low-lying ground and comprised a spread of heat-shattered stones over a trough and eight pits. The pits were located to the north and south of the trough.

The trough was the largest on site, was roughly oval in plan and the edges were irregular on the north side. The overall length was 2.65m (east–west) and the width varied from 1.6m to 2.2m. The depth was at maximum 0.45m and the sides were vertical down to a flat base. The trough fill comprised a layer of heat-shattered stones and charcoal that represented a single infill. This may be mound slippage rather than the final cooking activity at the site, where it is unlikely that the amount of stones used filled the trough in entirety. Six stake-holes were recorded at the base of the trough. Three occurred on the north and south sides and one stake-hole was recorded adjacent to the southern trough pit edge. The stake-holes were all V-shaped in profile, with diameters of 0.08–0.11m and driven to depths of 0.08–0.13m. The stake-hole at the edge was 0.08m in diameter and 0.09m deep. The fills were stony charcoal-flecked silt. It is probable that the stake-holes within the trough pit functioned as pegs to secure the trough lining in place. A post-hole was located 0.3m from the north-western edge of the trough pit (C3) and may have held a post related to trough use. The post-hole was oval in plan, 0.3m north–south by 0.5m by 0.31m deep, U-shaped in profile with a silt fill. Two large packing stones remained in situ on the north side and a series of smaller stones along the remaining edges may also have held the post in place. A second post-hole was located 0.45m from the trough edge. This was oval in plan, 0.26m east–west by 0.31m by 0.21m deep, U-shaped in profile and had charcoal-enriched clay fills. A mixture of hazel, apple-type and birch (Betula spp) charcoal returned a 14C determination of 2192–2938 cal bc; 3714634 bp (uba 8454).

County: Cork **Site name**: Burgesland
Sites and Monuments Record No.: N/A **Licence number**: 07E0771
Author: Maurice F. Hurley, 6 Clarence Court, St Luke's Cork.
Site type: Fulacht fiadh
ITM: E 584643m, N 573402m
Latitude, Longitude (decimal degrees): 51.912540, -8.223209
In the course of monitoring of topsoil removal for a gas pipeline at Burgesland, Carrigtwohill, a spread of charcoal and heat-shattered stone, 5m by 3m, typical of material associated with a fulacht fiadh, was identified. The extent of the burnt material continued to the outside (south) of the pipeline corridor.
The site was situated in recently drained land. The fulacht fiadh was located c. 5m east of a stream, which runs north–south. The burnt material had been disturbed by a land drain cut to the north-east. A field fence partially covered the burnt material and part of a small pit. The position and dimensions of the land drain were recorded. The field fence was subsequently removed. The area of excavation was subrectangular and centred on the spread of burnt material.
The burnt spread was composed of six different deposits. Two pits were also excavated outside but were in close proximity to the burnt material. No trough was located. The overall measurement of the burnt spread was 11.3m east–west by 5.2m. Two slot-trenches were excavated to a maximum depth of 0.55m at right angles to each other.

County: Cork **Site name**: CARRIGTOHILL
Sites and Monuments Record No.: N/A **Licence number**: 11E0167
Author: Miriam Carroll
Site type: Linear features
I**TM**: E 582114m, N 573189m
Latitude, Longitude (decimal degrees): 51.910553, -8.259962
An assessment for a proposed two-classroom extension to St Mary's Boys National School, Carrigtohill, was undertaken at the request of the County Council. A subsequent condition of planning permission requested a test excavation of the development site. The extension is located near the site of a shell midden (CO075-068) excavated by Michael J. O'Kelly in the 1950s.

Three test trenches were opened on the site in the area of the proposed extension. The trenches were excavated using a 3-tonne mechanical excavator with a 1.5m-wide grading bucket. Testing in the area of the site was limited by the presence of services (water, sewerage etc.) and the depth at which the natural subsoil existed, (c. 1–1.3m below present ground level). The stratigraphy was similar throughout the site, the level of which appears to have been artificially built up. This was evident by the presence of modern fill and possible buried topsoil to a depth of 1.3m. The overburden contained plastic, red brick, crockery and glass. The natural subsoil appears to slope gently from north to south and consists of an orange/yellow silty sand material with few stones. Natural subsoil was exposed at the base of all the trenches. Three archaeological features were uncovered in Trenches 1 and 3.

A feature was uncovered in Trench 1 at a depth of 1.25m from present ground level at the eastern end of the trench. The linear feature extended under the northern and southern baulks. It measured 1.3m east–west and consisted of a mid-brown silty sand fill with charcoal flecks and few stones. A small section was manually excavated across the feature (1.2m east–west). The cut had a broad, V-shaped profile and measured 0.55m in maximum depth. A sherd of glazed medieval pottery, dating from the 13th–14th century, was recovered from the upper portion of the fill. A second cut feature was also uncovered at the western end of the trench and extended under the northern and western baulks. The fill appeared to be similar to that of the aforementioned linear feature. The exposed portion measured 0.7m north–south by 0.7m. This feature was not manually excavated. A feature was also uncovered at the western end of Trench 3 at a depth of 0.9m below present ground level. The fill was similar to that of the features exposed in Trench 1 and consisted of a mid-brown silty sand material. This linear feature

ran north–south and extended under the northern, southern and western baulks. The exposed section measured 0.5m in width (east–west).

The use of a raft foundation during the construction phase of the development meant that any further impacts on archaeology were avoided. The archaeological features occur at a depth of between 0.9m and 1.25m below present ground level. The use of a raft allowed a 0.5m horizontal buffer between the top of the archaeology and the base of the raft. Monitoring of services was also undertaken under the same licence in 2011, during which time no archaeological finds or features were uncovered.

County: Cork **Site name**: Station Road, Carrigtohill
Sites and Monuments Record No.: CO075-001-2 **Licence number**: 15E0233
Author: Donald Murphy
Site type: Multi-period
ITM: E 581994m, N 573497m
Latitude, Longitude (decimal degrees): 51.913320, -8.261715
An assessment (with test trenching) took place of the site of a proposed Post-Primary school and an amalgamated National school at Carrigtohill and Terrysland Townlands, Carrigtohill, Co. Cork behalf of the Department of Education and Skills, Portlaoise Road, Tullamore, Co. Offaly.
The testing is being carried out at a pre-planning stage as the site is located close to a medieval church and graveyard (CO075-001-2). A desktop survey highlighted the site as a suitable location for fulachtaí fia though none were specifically discovered. The site is flat and low-lying and would have been marshy and wet in the past though appears to have been reclaimed in modern times. The stream/river running north-south through the site forms the townland boundary between Terrysland and Carrigtohill and aids in the drainage of the site. A farmyard and some old farm buildings and a derelict house occupy the south-east corner of the site.
Between 27 and 29 May 2015 a total of forty-five test trenches with a combined total of 3,013 linear metres (6,026 sq. m) were excavated within the site. The trenches were excavated in all cases to natural deposits which varied across the site from grey to pale cream marl to a rusty orange/brown gravel boulder clay. The topsoil varied in depth from 0.2m to 0.5m but for the most part maintained an average 0.3m in thickness. A series of stone-filled drains were evident below the topsoil in all parts of the site indicating that significant drainage and land reclamation has taken place over the last two hundred years and is probably associated with the farm on the south-east corner of the site. Only two features of interest were exposed, two linear ditches measuring approximately 2m in width and aligned roughly east-west. Both ditches were filled with a brown clay containing post-medieval pottery and glass and are on the same alignment as two field boundaries marked on the 25 inch OS map and obviously formed part of the farm. Despite the potential for fulachtaí fia within the site, none were identified. No features of archaeological significance were exposed during the testing and the only finds recovered consisted of post-medieval pottery and glass from the topsoil.
A circular stone-lined well which has been partly covered by a concrete cap is evident towards the south end of the site and is marked on the 25 inch OS map (c. 1929). Though not marked specifically on the first edition OS map (c. 1841), the stream leading from the well towards the river is marked and the well could have been in existence from before this date.
In field 2, the gas pipeline had previously been stripped along the east and southern boundaries and prohibited testing in these areas. The topsoil stripping of the route for the pipeline was monitored at the time and no features were exposed in this field. During the present testing a gravel path was exposed below the topsoil in Trenches 18 and 29. The path was aligned roughly east-west, measured 1.5m in width and had multiple inclusions of glass and modern pottery. It obviously represents an old path leading to the well or pump which is indicated on the 25 inch OS map (c. 1920). The path itself is not marked on any of the OS editions. No other features of archaeological significance were exposed in Field 2 and no finds other than the glass and modern pottery were recovered.

The kiln and pit exposed in Field 1 are of archaeological significance and both will require full excavation prior to the construction phase. Despite stripping an area of topsoil around both the kiln and pit, no additional features were exposed.

5 OPTION 6—LEAMLARA

5.1 Site location

This Convector Station Location Zone focuses on an area of mainly agricultural land, c. 2.5 km west-northwest of the village of Lisgoold; 7.5 km north of the N25 and c. 8 km east of the M8 motorway. It includes 11 townlands (Table 3) in the barony of Barrymore.

Analysis of aerial photography indicates that the area incorporated by Option 6 is mainly agricultural lands with an expanse of forestry in the east within Lisgoold and Corballybane townlands. The windshield survey revealed that lands here become more elevated moving from west to east, from Ballynaskeha into Corballybane and Ballyleagh townlands.

According to the Teagasc Soil Information System (http://gis.teagasc.ie/soils/index.php) the soil association in the area is a fine loamy drift over sandstone bedrock. Overall this is the type of ground that has been well utilised in the past.

5.2 Toponomy

The Irish landscape is divided into approximately 60,000 townlands and the system of landholding is unique in Western Europe for its scale and antiquity. Many townlands predate the arrival of the Anglo Normans, and Irish historical documents consistently use townland names throughout the historic period to describe areas and locate events accurately in their geographical context. The townland names and boundaries were standardised in the nineteenth century when the Ordnance Survey began to produce large-scale maps of the country. The original Irish names were eventually anglicised to varying degrees, depending in part upon the linguistic skills of the surveyors and recorders. A study of the townland names can provide information on aspects of cultural heritage including descriptions of the use of the landscape by man and the potential presence of archaeological or cultural heritage sites or features.

The 11 townlands within this Convector Station Location Zone are included in Table 3.

English Name	Irish Name	Glossary
Ballyleagh	*An Baile Liath*	Baile - townland, town, homestead Liath - grey, grey place, grey horse
Ballynaskeha	*Baile na Sceiche*	Baile - townland, town, homestead Sceach -(also: sceich) hawthorn, thorn-bush
Ballysallagh	*An Baile Salach*	Baile salach, 'i.e. dirty or miry townland'
Clash East	*An Chlais Thoir*	Clais - trench, ravine
Clash West	*An Chlais Thiar*	Clais - trench, ravine
Corbally North	*An Corrbhaile Thuaidh*	Baile - townland, town, homestead
Corbally South	*An Corrbhaile Theas*	Baile - townland, town, homestead
Corballybane	*An Corrbhaile Bán*	Bán - white; lea-ground, grassy Baile - townland, town, homestead
Glengarriff More	*An Gleann Garbh Mór*	Mór - great, big Garbh - rough, rough one Glean - glen
Lisgoold North	*Lios Cúil Thuaidh*	Lios - ring-fort, enclosure Cúil - corner, nook

English Name	Irish Name	Glossary
Poundquarter	*Ceathrú an Phóna*	Ceathrú - quarterland An Púna - "The Pound"

Table 3: Townlands within Option 6 (after Irish Placenames Committee, 2013).

5.3 Designated archaeological sites

5.3.1 Record of Monuments and Places (RMPs)

Section 12 (1) of the National Monuments Act 1994 made provision the establishment and maintenance of a Record of Monuments & Places (RMP). Under this Act, each site recorded in the Record of Monuments and Places is granted statutory protection. When the owner or occupier of a property, or any other person proposes to carry out, or to cause, or to permit the carrying out of any work at or in relation to a recorded archaeological monument they are required to give notice in writing to the Minister for Culture, Heritage and the Gaeltacht 2 months before commencing that work.

There are eight recorded archaeological monuments incorporated by Option 6. An examination of aerial photography showed just one of these sites with any extant standing remains, CO0065-001 located in the east of Option 6; however, this site was not visible from the nearby public road.

RMP No	Site Type	Description	Townland	ITM_E	ITM_N
CO053-069----	Ringfort - rath	In pasture on N-facing slope. Depicted as circular enclosure on 1842 OS 6-inch map. Internal area (26m E-W) now truncated by drop into trackway to N; defined by earthen bank (H 1.85m) E->WSW; fosse (D 1.1m; Wth 4m) to S and W. Interior slopes to N. Overgrown with briars. The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994).	CORBALLYBANE	582249	581581
CO054-101----	Ringfort - rath	In pasture on steep NNE-facing slope, forming SE corner field; overlooks Owenacurra river to NE. Circular area (40m N-S; 41m E-W) enclosed by dumped stone bank (H 1m) WNW->SSE, incorporated into field fence E->SE; low rise SSE->WNW. Gap to NNE. Interior raised to NNE to compensate for slope (max. H 2m) but still slopes steeply. Slight traces raised area inside bank to N. The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994).	CORBALLY NORTH (Barrymore By., Lisgoold Par.)	583031	581607
CO064-038----	Ringfort - rath	In pasture, on NW-facing slope. Depicted on 1842 OS 6-inch map as broken line enclosing circular area (diam. c. 35m). No visible surface	BALLYNASKEHA	582057	581280

RMP No	Site Type	Description	Townland	ITM_E	ITM_N
		trace. According to Power (1923, 182), 'lios of circular plan and moderate size, but this has been levelled'. The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994).			
CO064-039----	Ringfort - rath	In rough grazing, on NE-facing slope. Shown on 1842 OS 6-inch map as circular enclosure (diam. c. 30m). Levelled; fragment of bank (int. H 0.8m; ext. H 0.4m) SSW->NNW, contained in field fence, with external fosse (max. D 0.2m). Low undulations in field indicate rest of site. The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994).	CORBALLYBANE	582476	581417
CO064-040----	Ringfort - rath	In tillage, on N-facing slope. Circular area (31.2m N-S; 32m E-W) enclosed by earthen bank (H 2.2m) and external fosse (D 0.8m); counterscarp bank (H 0.5m) W->N. Entrance to N with causeway. Interior slopes down to N. The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994).	CORBALLYBANE	582423	580978
CO065-001----	Ringfort - rath	In pasture, on NE-facing slope. Circular area (43m N-S; 42m E-W) enclosed by earth and stone bank (H 1.7m) E->NE; undulations elsewhere. Interior slopes down to ENE. The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994).	CORBALLY NORTH (Barrymore By., Lisgoold Par.)	583402	581150
CO065-002----	Fulacht fia	In tillage on E-facing slope. Irregular spread of burnt material. The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994).	CORBALLY NORTH (Barrymore By., Lisgoold Par.)	583504	581183
CO065-005----	Ringfort - rath	In tillage, on E-facing slope. Shown on 1842 OS 6-inch map as circular enclosure (diam. c. 30m). Levelled; no visible surface trace.	LISGOOLD NORTH	583618	580370

RMP No	Site Type	Description	Townland	ITM_E	ITM_N
		The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994).			

Table 4: Archaeological monuments incorporated by Option 6.

5.3.2 National Monuments

National monuments are broken into two categories; National Monuments in the ownership or guardianship of the state and National Monuments in the ownership or guardianship of a local authority. Section 8 of the National Monuments (Amendment) Act 1954 provides for the publication of a list of monuments, the preservation, of which, are considered to be of national importance. Two months' notice must be given to the Minister for Arts, Heritage and the Gaeltacht where work is proposed to be carried out at or in relation to any National Monument.

There are no National Monuments incorporated by Option 6.

5.3.3 Sites with Preservation Orders

The National Monuments Act 1930-2004 provide for the making of Preservation Orders and Temporary Preservation Orders in respect of National Monuments. Under Section 8 of the National Monument Act 1930 (as amended) the Minister for Culture, Heritage and the Gaeltacht, can place a Preservation Order on a monument if, in the Ministers' opinion, it is a National Monument in danger of being or is actually being destroyed, injured or removed or is falling into decay through neglect. The Preservation Order ensures that the monument shall be safeguarded from destruction, alteration, injury, or removal, by any person or persons without the written consent of the Minister.

There are no sites with preservation orders incorporated by Option 6.

5.4 Designated architectural heritage sites

In 1997 Ireland ratified the Granada Convention on architectural heritage. This provided the basis for a national commitment to the protection of the architectural heritage throughout the country. The Local Government (Planning and Development) Act 2000, and the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999, made the legislative changes necessary to provide for a strengthening of the protection of architectural heritage.

5.4.1 Record of Protected Structures

The Cork County Development Plan (2015-2021) was consulted for schedules of Protected Structures. These are buildings that a planning authority considers to be of special interest from an architectural, historical, archaeological, artistic, cultural, scientific, social, and/or technical point of view. Protected Structures receive statutory protection from injury or demolition under Section 57 (1) of the Local Government (Planning and Development) Act 2000. Protected structure status does not exclude development or alteration but requires the developer to consult with the relevant planning authority to ensure that elements which make the structure significant are not lost during development.

There is one Protected Structure in close proximity to Option 6, in Leamlara townland, the Church of the Sacred Heart (Plate 7).

RPS_ID	REG_NO	STRUCTURE	RMP_REF	ITM_E	ITM_N
393	0	Church of the Sacred Heart	-	581818	579922

Table 5: Protected structures in close proximity to Option 6

5.4.2 Architectural Conservation Areas

The Cork County Development Plan (2015-2021) was consulted for records relating to Architectural Conservation Areas ((hereinafter 'ACAs'). The stated objective of ACAs is to conserve and enhance the special character of the area, including traditional building stock and material finishes, spaces, streetscapes, landscape and setting.

There are no areas listed as ACAs incorporated by Option 6.

5.4.3 National Inventory of Architectural Heritage (NIAH)

The National Inventory of Architectural Heritage (hereinafter the 'NIAH') is a state initiative under the administration of the Department of Culture, Heritage and the Gaeltacht and was established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. Its purpose is to identify, record and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently, as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for Arts, Heritage and the Gaeltacht to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS).

There is one structure listed in the NIAH incorporated by Option 6.

REG_NO	DATE	NAME	TOWNLAND	ORIGINALTY	INUSETYPE	ITM_E	ITM_N
20906407	1800 - 1820	Aghnahan Bridge	Ballynabrannagh East, Leamlara	bridge	bridge	581737	579936

Table 6: Structure listed in NIAH incorporated by Option 6.

5.5 Recent excavations

The Excavations Bulletin is an annual account of all excavations carried out under license. The database is available online at www.excavations.ie and includes excavations from 1985 to 2017. This database was consulted as part of the desktop research for this report to establish if any archaeological investigations had been carried out within the townlands incorporated by Option 6. The database produced one result for archaeological excavations undertaken within the townlands incorporated by Option 6.

County: Cork **Site name**: Leamlara, Lisgoold North
Sites and Monuments Record No.: SMR 65:19 **Licence number**: 03E0364
Author: Sheila Lane, AE House, Monahan Road, Cork.
Site type: No archaeological significance
ITM: E 583442m, N 580208m
Latitude, Longitude (decimal degrees): 51.973689, -8.241004
Planning permission was granted for the development of a hurling/handball alley at the Lisgoold GAA grounds in County Cork, which fell within the zone of archaeological potential for a possible ringfort. A condition of planning required testing in advance of the development. Three test-trenches were

opened along the footprint of the proposed development to the immediate south of the possible ringfort. There were no archaeological finds or features noted in the test-trenches.

6 OPTION 9—KNOCKRAHA

6.1 Site location

This Convector Station Location Zone focuses on an area of mixed, open field, agricultural land c. 1.5 km east-southeast of the village of Knockraha. It includes eight townlands (Table 1) in the barony of Barrymore.

Analysis of aerial photography indicates extensive agricultural lands, mainly grazing fields centred on the large substation site in Ballynanelagh townland. A windshield survey revealed that the lands to the north are hilly and rise southwards to a level hilltop on which the existing substation is located. This hilltop is clearly visible from across the southwest and west.

According to the Teagasc Soil Information System (http://gis.teagasc.ie/soils/index.php) the soil association in the area is a fine loamy drift over sandstone bedrock. Overall this is the type of ground that has been well utilised in the past.

6.2 Toponomy

The Irish landscape is divided into approximately 60,000 townlands and the system of landholding is unique in Western Europe for its scale and antiquity. Many townlands predate the arrival of the Anglo Normans, and Irish historical documents consistently use townland names throughout the historic period to describe areas and locate events accurately in their geographical context. The townland names and boundaries were standardised in the nineteenth century when the Ordnance Survey began to produce large-scale maps of the country. The original Irish names were eventually anglicised to varying degrees, depending in part upon the linguistic skills of the surveyors and recorders. A study of the townland names can provide information on aspects of cultural heritage including descriptions of the use of the landscape by man and the potential presence of archaeological or cultural heritage sites or features.

The eight townlands within this Convector Station Location Zone are included in Table 1.

English Name	Irish Name	Glossary
Ballynagaul	*Baile na nGall*	"Baile - townland, town, homestead Gall - foreigner; standing stone"
Aghaduff	*Achadh Dubh*	"Achadh(also: -ach) – field Dubh(also: dú-, duí-) - black"
Ballyloohane	*Baile Lócháin*	Baile úi Locháin - "O'Loughane's Homestead"
Ballinbrittig	*Baile an Bhriotaigh*	Baile an Bhriotaig - "Britt's Homestead"
Knockraha East	*Cnoc Rátha Thoir*	"Cnoc - hill Ráth(also: ráith) - ring-fort"
Knockraha West	*Cnoc Rátha Thiar*	"Cnoc - hill Ráth(also: ráith) - ring-fort"
Killeena	*An Choillíneach*	Cillíneach - "early Church site"
Ballynanelagh	*Baile na nGeimhleach*	Baile na néilech, '(meaning not certain)'

Table 7: Towlands within Option 9 (after Iriah Placenames Committee, 2013)

6.3 Designated archaeological sites

6.3.1 Record of Monuments and Places (RMPs)

Section 12 (1) of the National Monuments Act 1994 made provision the establishment and maintenance of a Record of Monuments & Places (RMP). Under this Act, each site recorded in the Record of Monuments and Places is granted statutory protection. When the owner or occupier of a property, or any other person proposes to carry out, or to cause, or to permit the carrying out of any work at or in relation to a recorded archaeological monument they are required to give notice in writing to the Minister for Culture, Heritage and the Gaeltacht 2 months before commencing that work.

There are four recorded archaeological monuments incorporated by Option 9. The descriptions below are derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (1994).

RMP No	Site Type	Description	Townland	ITM_E	ITM_N
CO064-028----	Ringfort - rath	" In pasture, on SW-facing slope. Shown on 1842 OS 6-inch map as circular enclosure (diam. c. 35m). Levelled; no visible surface trace. Levelled enclosure (CO064-029---) c. 90m to N.	KNOCKRAHA EAST	577967	579017
CO064-074----	Ringfort - rath	"On SW-facing slope. Shown on 1842 OS 6-inch map as circular enclosure (diam. c. 20m). Levelled; no visible surface trace.	KILLEENA	577713	577761
CO064-075----	Enclosure	"In pasture on S-facing slope. Depicted as small hachured square enclosure (c. 20m x c. 20m) on 1842 OS 6-inch map. Levelled; no visible surface trace.	KILLEENA	578252	577553
CO064-078----	Ringfort - rath	" In pasture, on S-facing slope. Roughly circular area (36m N-S; 32m E-W) enclosed by two earthen banks with intervening fosse; entrance to E. Inner bank (H 0.7m) levelled SW->N; outer bank (H 1.6m) incorporated into field fence system W->NE. Interior slopes down gently to E.	BALLINBRITTIG	578598	577501

Table 8: RMP sites within Option 9

6.3.2 National Monuments

National monuments are broken into two categories; National Monuments in the ownership or guardianship of the state and National Monuments in the ownership or guardianship of a local authority. Section 8 of the National Monuments (Amendment) Act 1954 provides for the publication of a list of monuments, the preservation, of which, are considered to be of national importance. Two months' notice must be given to the Minister for Arts, Heritage and the Gaeltacht where work is proposed to be carried out at or in relation to any National Monument.

There are no National Monuments incorporated by Option 9.

6.3.3 Sites with Preservation Orders

The National Monuments Act 1930-2004 provide for the making of Preservation Orders and Temporary Preservation Orders in respect of National Monuments. Under Section 8 of the National Monument Act 1930 (as amended) the Minister for Culture, Heritage and the Gaeltacht, can place a Preservation Order on a monument if, in the Ministers' opinion, it is a National Monument in danger of being or is actually being destroyed, injured or removed or is falling into decay through neglect. The Preservation Order ensures that the monument shall be safeguarded from destruction, alteration, injury, or removal, by any person or persons without the written consent of the Minister.

There are no sites with preservation orders incorporated by Option 9.

6.4 Designated architectural heritage sites

In 1997 Ireland ratified the Granada Convention on architectural heritage. This provided the basis for a national commitment to the protection of the architectural heritage throughout the country. The Local Government (Planning and Development) Act 2000, and the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999, made the legislative changes necessary to provide for a strengthening of the protection of architectural heritage.

6.4.1 Record of Protected Structures

The Cork County Development Plan (2015-2021) was consulted for schedules of Protected Structures. These are buildings that a planning authority considers to be of special interest from an architectural, historical, archaeological, artistic, cultural, scientific, social, and/or technical point of view. Protected Structures receive statutory protection from injury or demolition under Section 57 (1) of the Local Government (Planning and Development) Act 2000. Protected structure status does not exclude development or alteration but requires the developer to consult with the relevant planning authority to ensure that elements which make the structure significant are not lost during development.

There are no Protected Structures incorporated by Option 9.

6.4.2 Architectural Conservation Areas

The Cork County Development Plan (2015-2021) was consulted for records relating to Architectural Conservation Areas ((hereinafter 'ACAs'). The stated objective of ACAs is to conserve and enhance the special character of the area, including traditional building stock and material finishes, spaces, streetscapes, landscape and setting.

There are no areas listed as ACAs incorporated by Option 9.

6.4.3 National Inventory of Architectural Heritage (NIAH)

The National Inventory of Architectural Heritage (hereinafter the 'NIAH') is a state initiative under the administration of the Department of Culture, Heritage and the Gaeltacht and was established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. Its purpose is to identify, record and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently, as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for Arts, Heritage and the Gaeltacht to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS).

There are no structures listed in the NIAH incorporated by Option 9.

6.5 Undesignated cultural heritage sites

This section deals with sites that are considered to be of cultural heritage value but which do not fall within the above categories as they are not registered.

Three sites are located within this study area which have been identified by local history groups and academic research through witness statements as some of those associated with Knockraha's involvement with Irish forces during the War of Independence (1919–1921) (Shiels 2014). These include the bomb making factory located on the Ballynanelagh/Knockraha East townland boundary, the cast iron dump and the Upnor arms dump.

6.6 Recent excavations

The Excavations Bulletin is an annual account of all excavations carried out under license. The database is available online at www.excavations.ie and includes excavations from 1985 to 2017. This database was consulted as part of the desktop research for this report to establish if any archaeological investigations had been carried out within the townlands incorporated by Option 9. The database produced no results for archaeological excavations undertaken within the townlands incorporated by Option 9.

7 OPTION 10—PIGEON HILL

7.1 Site location

This Convector Station Location Zone focuses on agricultural lands located c. 3.75 km northeast of the village of Knockraha, c. 7 km east of the M8 motorway and 5.4 km north of the N25. It includes 8 townlands (Table 7) in the barony of Barrymore.

Analysis of aerial photography indicates an area of open fields of agricultural land with a small area of rough scrubland towards the centre and a small forestry plantation in Cloneen townland to the west. This area is traversed by a number of unnamed roads. A windshield survey of this area showed that the lands towards the northwest and centre are elevated with views out over the valley to the southwest, while in the north there is a dip in the landscape between Ballynakilla townland and Leamlara demesne to the north.

According to the Teagasc Soil Information System (http://gis.teagasc.ie/soils/index.php) the soil association in the area is a fine loamy soils over sandstone bedrock. Overall this is the type of ground that has been well utilised in the past.

7.2 Toponomy

The Irish landscape is divided into approximately 60,000 townlands and the system of landholding is unique in Western Europe for its scale and antiquity. Many townlands predate the arrival of the Anglo Normans, and Irish historical documents consistently use townland names throughout the historic period to describe areas and locate events accurately in their geographical context. The townland names and boundaries were standardised in the nineteenth century when the Ordnance Survey began to produce large-scale maps of the country. The original Irish names were eventually anglicised to varying degrees, depending in part upon the linguistic skills of the surveyors and recorders. A study of the townland names can provide information on aspects of cultural heritage including descriptions of the use of the landscape by man and the potential presence of archaeological or cultural heritage sites or features.

The eight townlands within this Convector Station Location Zone are included in Table 7.

English Name	Irish Name	Glossary
Cloneen	*An Cluainín*	Cluainín - "Little Meadow"
Pigeonhill	*Cnocán an Cholúir*	Cnocán a'Cholúir - "The Pigeon's Little Hill"
Leamlara	*Léim Lára*	Léim Lárach - "The Mare's Leap"
Ballinbrittig	*Baile an Bhriotaigh*	Baile an Bhriotaig - "Britt's Homestead"
Ballynakilla	*Baile na Coille*	Baile - townland, town, homestead Coil -wood
Tibbotstown	*Baile Thiobóid*	Baile Thiobóid, 'Tibbot's or Theobald's town'
Condonstown	*Baile an Chondúnaigh*	Baile an Chúndúnaigh, 'Condon's town'
Killeena	*An Choillíneach*	Cillíneach - "early Church site"

Table 9: Townlands within Option 10 (after Irish Placename Committee, 2013).

7.3 Designated archaeological sites

7.3.1 Record of Monuments and Places (RMPs)

Section 12 (1) of the National Monuments Act 1994 made provision the establishment and maintenance of a Record of Monuments & Places (RMP). Under this Act, each site recorded in the Record of Monuments and Places is granted statutory protection. When the owner or occupier of a property, or any other person proposes to carry out, or to cause, or to permit the carrying out of any work at or in relation to a recorded archaeological monument they are required to give notice in writing to the Minister for Culture, Heritage and the Gaeltacht 2 months before commencing that work.

There are two recorded archaeological monuments incorporated by Option 10.

RMP No	Site Type	Description	Townland	ITM_E	ITM_N
CO064-090----	Fulacht fia	In pasture on E bank of stream. No visible surface trace. The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994).	TIBBOTSTOWN	581149	577076
CO064-091----	Fulacht fia	In pasture on W-facing slope. Spread of burnt material now grass-covered. The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994).	TIBBOTSTOWN	581274	577146

Table 10: Archaeological monuments incorporated by Option 10.

7.3.2 National Monuments

National monuments are broken into two categories; National Monuments in the ownership or guardianship of the state and National Monuments in the ownership or guardianship of a local authority. Section 8 of the National Monuments (Amendment) Act 1954 provides for the publication of a list of monuments, the preservation, of which, are considered to be of national importance. Two months' notice must be given to the Minister for Arts, Heritage and the Gaeltacht where work is proposed to be carried out at or in relation to any National Monument.

There are no National Monuments incorporated by Option 10.

7.3.3 Sites with Preservation Orders

The National Monuments Act 1930-2004 provide for the making of Preservation Orders and Temporary Preservation Orders in respect of National Monuments. Under Section 8 of the National Monument Act 1930 (as amended) the Minister for Culture, Heritage and the Gaeltacht, can place a Preservation Order on a monument if, in the Ministers' opinion, it is a National Monument in danger of being or is actually being destroyed, injured or removed or is falling into decay through neglect. The Preservation Order ensures that the monument shall be safeguarded from destruction, alteration, injury, or removal, by any person or persons without the written consent of the Minister.

There are no sites with preservation orders incorporated by Option 10.

7.4 Designated architectural heritage sites

In 1997 Ireland ratified the Granada Convention on architectural heritage. This provided the basis for a national commitment to the protection of the architectural heritage throughout the country. The Local Government (Planning and Development) Act 2000, and the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999, made the legislative changes necessary to provide for a strengthening of the protection of architectural heritage.

7.4.1 Record of Protected Structures

The Cork County Development Plan (2015-2021) was consulted for schedules of Protected Structures. These are buildings that a planning authority considers to be of special interest from an architectural, historical, archaeological, artistic, cultural, scientific, social, and/or technical point of view. Protected Structures receive statutory protection from injury or demolition under Section 57 (1) of the Local Government (Planning and Development) Act 2000. Protected structure status does not exclude development or alteration but requires the developer to consult with the relevant planning authority to ensure that elements which make the structure significant are not lost during development.

There are no Protected Structures incorporated by Option 10.

7.4.2 Architectural Conservation Areas

The Cork County Development Plan (2015-2021) was consulted for records relating to Architectural Conservation Areas ((hereinafter 'ACAs'). The stated objective of ACAs is to conserve and enhance the special character of the area, including traditional building stock and material finishes, spaces, streetscapes, landscape and setting.

There are no areas listed as ACAs incorporated by Option 10.

7.4.3 National Inventory of Architectural Heritage (NIAH)

The National Inventory of Architectural Heritage (hereinafter the 'NIAH') is a state initiative under the administration of the Department of Culture, Heritage and the Gaeltacht and was established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. Its purpose is to identify, record and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently, as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for Arts, Heritage and the Gaeltacht to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS).

There are no structures listed in the NIAH incorporated by Option 10.

7.5 Recent excavations

The Excavations Bulletin is an annual account of all excavations carried out under license. The database is available online at www.excavations.ie and includes excavations from 1985 to 2017. This database was consulted as part of the desktop research for this report to establish if any archaeological investigations had been carried out within the townlands incorporated by Option 10. The database produced one result for archaeological excavations undertaken within the townlands incorporated by Option 10.

County: Cork **Site name**: Leamlara, Lisgoold North
Sites and Monuments Record No.: SMR 65:19 **Licence number**: 03E0364

Author: Sheila Lane, AE House, Monahan Road, Cork.
Site type: No archaeological significance
ITM: E 583442m, N 580208m
Latitude, Longitude (decimal degrees): 51.973689, -8.241004
Planning permission was granted for the development of a hurling/handball alley at the Lisgoold GAA grounds in County Cork, which fell within the zone of archaeological potential for a possible ringfort. A condition of planning required testing in advance of the development. Three test-trenches were opened along the footprint of the proposed development to the immediate south of the possible ringfort. There were no archaeological finds or features noted in the test-trenches.

8 OPTION 12—KILQUANE

8.1 Site location

This Convector Station Location Zone focuses on an area of mixed forestry and agricultural land, c. 2 km northeast of the village of Knockraha and c. 3 km east of the M8 motorway. It includes 7 townlands (Table 9) in the barony of Barrymore.

Analysis of aerial photography indicates extensive forestry towards the central part of the zone in the townlands of Kilquane, Shanballyreagh and Meeleen, with mainly grazing land and some arable land towards the outer perimeter of the zone. The windshield survey revealed that the lands here are elevated in the centre with clear views over the countryside to the west from the edge of the forestry. Lands in the east are also elevated, with a dip in the landscape to the eastern edge of the forestry.

According to the Teagasc Soil Information System (http://gis.teagasc.ie/soils/index.php) the soil association in the area is in part a fine loamy drift over sandstone bedrock and fine loamy drift with sillceous stones. Overall this is the type of ground that has been well utilised in the past.

8.2 Toponomy

The Irish landscape is divided into approximately 60,000 townlands and the system of landholding is unique in Western Europe for its scale and antiquity. Many townlands predate the arrival of the Anglo Normans, and Irish historical documents consistently use townland names throughout the historic period to describe areas and locate events accurately in their geographical context. The townland names and boundaries were standardised in the nineteenth century when the Ordnance Survey began to produce large-scale maps of the country. The original Irish names were eventually anglicised to varying degrees, depending in part upon the linguistic skills of the surveyors and recorders. A study of the townland names can provide information on aspects of cultural heritage including descriptions of the use of the landscape by man and the potential presence of archaeological or cultural heritage sites or features.

The seven townlands within this Convector Station Location Zone are included in Table 9.

English Name	Irish Name	Glossary
Gogganstown	*Bhaile an Ghogánaigh*	Baile -townland, town, homestead
Kilquane	*Chill Chuáin*	the church of Cuán
Knockraha East	*Chnoc Rátha Thoir*	Hill, ringfort
Knockraha West	*Chnoc Rátha Thiar*	Hill, ringfort
Meeleen	*an Mhillín*	small knoll
Monaneague	*Mhóin an Fhiaigh*	Móin - bogland; an fhiaigh - hunting season
Shanballyreagh	*an tSeanbhaile Riabhaigh*	Riabhach - streaked, grey Baile -townland, town, homestead sean - old

Table 11: Townlands within Option 12 (after Irish Placename Committee, 2013)

8.3 Designated archaeological sites

8.3.1 Record of Monuments and Places (RMPs)

Section 12 (1) of the National Monuments Act 1994 made provision the establishment and maintenance of a Record of Monuments & Places (RMP). Under this Act, each site recorded in the Record of

Monuments and Places is granted statutory protection. When the owner or occupier of a property, or any other person proposes to carry out, or to cause, or to permit the carrying out of any work at or in relation to a recorded archaeological monument they are required to give notice in writing to the Minister for Culture, Heritage and the Gaeltacht 2 months before commencing that work.

There is one recorded archaeological monument incorporated by Option 12. This was not visible from public road on the day of the survey.

RMP No	Site Type	Description	Townland	ITM_E	ITM_N
CO064-027----	Standing stone	In tillage on SW-facing slope. Irregular stone (H 1.5m; 1m x 0.28m), long axis NW-SE, narrowing towards top. The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994).	KILQUANE (Barrymore By.)	576834	579862

Table 12: Archaeological monuments incorporated by Option 12.

8.3.2 National Monuments

National monuments are broken into two categories; National Monuments in the ownership or guardianship of the state and National Monuments in the ownership or guardianship of a local authority. Section 8 of the National Monuments (Amendment) Act 1954 provides for the publication of a list of monuments, the preservation, of which, are considered to be of national importance. Two months' notice must be given to the Minister for Arts, Heritage and the Gaeltacht where work is proposed to be carried out at or in relation to any National Monument.

There are no National Monuments incorporated by Option 12.

8.3.3 Sites with Preservation Orders

The National Monuments Act 1930-2004 provide for the making of Preservation Orders and Temporary Preservation Orders in respect of National Monuments. Under Section 8 of the National Monument Act 1930 (as amended) the Minister for Culture, Heritage and the Gaeltacht, can place a Preservation Order on a monument if, in the Ministers' opinion, it is a National Monument in danger of being or is actually being destroyed, injured or removed or is falling into decay through neglect. The Preservation Order ensures that the monument shall be safeguarded from destruction, alteration, injury, or removal, by any person or persons without the written consent of the Minister.

There are no sites with preservation orders incorporated by Option 12.

8.4 Designated architectural heritage sites

In 1997 Ireland ratified the Granada Convention on architectural heritage. This provided the basis for a national commitment to the protection of the architectural heritage throughout the country. The Local Government (Planning and Development) Act 2000, and the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999, made the legislative changes necessary to provide for a strengthening of the protection of architectural heritage.

8.4.1 Record of Protected Structures

The Cork County Development Plan (2015-2021) was consulted for schedules of Protected Structures. These are buildings that a planning authority considers to be of special interest from an architectural, historical, archaeological, artistic, cultural, scientific, social, and/or technical point of view. Protected Structures receive statutory protection from injury or demolition under Section 57 (1) of the Local Government (Planning and Development) Act 2000. Protected structure status does not exclude development or alteration but requires the developer to consult with the relevant planning authority to ensure that elements which make the structure significant are not lost during development.

There are no Protected Structures incorporated by Option 12.

8.4.2 Architectural Conservation Areas

The Cork County Development Plan (2015-2021) was consulted for records relating to Architectural Conservation Areas ((hereinafter 'ACAs'). The stated objective of ACAs is to conserve and enhance the special character of the area, including traditional building stock and material finishes, spaces, streetscapes, landscape and setting.

There are no areas listed as ACAs incorporated by Option 12.

8.4.3 National Inventory of Architectural Heritage (NIAH)

The National Inventory of Architectural Heritage (hereinafter the 'NIAH') is a state initiative under the administration of the Department of Culture, Heritage and the Gaeltacht and was established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. Its purpose is to identify, record and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently, as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for Arts, Heritage and the Gaeltacht to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS).

There are no structures listed in the NIAH incorporated by Option 12.

8.5 Undesignated cultural heritage sites

This section deals with sites that are considered to be of cultural heritage value but which do not fall within the above categories as they are not registered.

The area around the village of Knockraha became deeply involved in supporting Irish forces during the War of Independence (1919–1921), a subject which has been the focus of local history groups and academics (Shiels 2014). One of these sites, known locally as 'The Rea', is situated in the area of forestry plantation which occupies the centre of the study area for Option 12. During this period, suspected spies, informers and British military were imprisoned and also executed at Knockraha. The prison was located in the cemetery at Knockraha and those executed were buried locally. 'The Rea' is understood to be one of the areas where such prisoners were taken for execution and burial (Shiels 2014).

8.6 Recent excavations

The Excavations Bulletin is an annual account of all excavations carried out under license. The database is available online at www.excavations.ie and includes excavations from 1985 to 2017. This database was consulted as part of the desktop research for this report to establish if any archaeological

investigations had been carried out within the townlands incorporated by Option 12. The database produced two results for archaeological excavations undertaken within the townlands incorporated by Option 12.

Site name: 'Kilquane Church', Kilquane
Sites and Monuments Record No.: SMR 42:68 **Licence number**: 94E0055
Author: Eamonn Cotter, Ballynanelagh, Rathcormac, Co. Cork.
Site type: Medieval church
ITM: E 554660m, N 588559m
Latitude, Longitude (decimal degrees): 52.047143, -8.661001
The licence was granted for the purpose of supervising the restoration and clearing work being carried out in and around Kilquane church by members of the local community, and the re-erection of a holed stone. Kilquane lies in a narrow valley on the banks of the Clyda river. The main site is the medieval church, now badly ruined, with a graveyard immediately to the south, both enclosed by a relatively modern boundary fence and bounded on the north by a public road. Some 30m to the north-west on the far side of the road is a holed stone lying on the ground. Approximately 45m to the south-west of the church, close to the river bank, is a circular mound, c.1.5m high and 5m in diameter. This mound is constructed of stones set on edge and packed with earth, in the manner common in field fences in the area. Its function is uncertain.
The church is aligned approximately east-west and consists of a nave with a doorway in the west wall and an added chancel at its east end. The original structure, now the nave, measures 11.33m east-west x 6.7m north-south internally. Its walls are c.1m thick and stand to a maximum height of 3.24m. They are constructed of large blocks of masonry, roughly coursed, interspersed with courses of flat slabs and set in a strong mortar of river gravel with a high lime content. The walls were laid on a foundation of flat slabs forming a plinth which projects c. 0.1m from the wall on all sides. Only the footings of the east wall of the nave survive, including the south jamb of a doorway, indicating that this wall remained standing after the chancel was added, with a doorway mined out to connect the two.
The west doorway of the original structure measured c.1m wide with a slight internal splay. Traces of a drawbar socket survive. The surviving traces of the jambs are of yellow sandstone blocks displaying diagonal tooling marks.
The chancel measures 8.14m east-west x 6.45m north-south internally and its walls stand to a maximum height of 3.2m, with a pronounced base batter. In the construction of these walls less use was made of large blocks of masonry than in the walls of the nave, and these walls do not have a foundation course as do the latter.
Closer inspection of the walls of the chancel shows that on the north and east sides the unmortared base batter was added to an existing mortared wall, while on the south side the base batter is an integral part of the wall, with no mortar. The likelihood is that at some point this south wall collapsed and was rebuilt with a base batter, while at the same time a base batter was added to east and north walls.
Within the chancel a section of window jamb was uncovered which suggests a 15th-century date for this section of the structure. This was a splayed, chamfered jamb with a rectangular groove to hold glass.
Three phases are suggested for the site : 1) the original construction, now the nave, in the 13th century;2) the construction of the chancel and the mining out of a connecting doorway between the two in the 15th century; 3) the rebuilding of the south wall of the chancel and the addition of the base batter to the north and east walls, again probably in the 15th century.
The holed stone, known locally as the Sinner`s Stone, measures 1.96m long x 0.7m wide and c. 0.3m thick. It is roughly triangular in section with the hole near the thin side, 1m from the base. The hole itself measures 0.11m in diameter. A small-scale excavation was carried out in the vicinity of the stone. No archaeological features were uncovered and the stone was subsequently re-erected in this area.

Site name: Kilquane

Sites and Monuments Record No.: CO064-026001- **Licence number**: C000639
Author: Eamonn Cotter
Site type: Ecclesiastical enclosure
ITM: E 576470m, N 579583m
Latitude, Longitude (decimal degrees): 51.967927, -8.342539
Test trenching was carried out on 12 June 2014 in the area of a proposed graveyard extension. The existing graveyard is located within an Ecclesiastical Enclosure and the proposed extension will be in the field outside the extant bank of the enclosure. Two test trenches were excavated, radiating out from the enclosure. The test trenches showed the existence of two ditches outside the ecclesiastical enclosure appearing to run concentric with the enclosure itself. While no section of either ditch was fully excavated, a section of one was partially excavated. Its width and steep sides suggested it was a substantial ditch. Both ditches are presumed to be part of the ecclesiastical enclosure complex, and a slight rise in ground level between them is likely to be the remnant of a former earthen bank.

9 OPTION 14—BALLYVATTA

9.1 Site location

This Convector Station Location Zone focuses on an area of mixed forestry and agricultural land, c. 3.5 km northeast of the village of Knockraha and c. 4 km east of the M8 motorway. It includes 8 townlands (Table 11) in the barony of Barrymore.

Analysis of aerial photography indicates extensive forestry towards the northern part of the zone in the townlands of Moanbaun and Carrigane and towards the south in the townland of Ballynaglogh with mainly grazing land, and some arable, in the remaining areas. A number of unnamed roads traverse this area. The windshield survey showed open agricultural lands in the northern half of the area with a ravine running along the north side and parallel to the northwest-southeast orientated road within Moanbaun townland. A plateau of open fields lies to the west of the central forestry within Ballyvatta townland, some of which are included in planning permission applications. The edge of the plateau lies west of the road in Monatooreen townland with views across to Watergrasshill in the northwest.

According to the Teagasc Soil Information System (http://gis.teagasc.ie/soils/index.php) the soil association in the area is a fine loamy over sandstone bedrock. Overall this is the type of ground that has been well utilised in the past.

9.2 Toponomy

The Irish landscape is divided into approximately 60,000 townlands and the system of landholding is unique in Western Europe for its scale and antiquity. Many townlands predate the arrival of the Anglo Normans, and Irish historical documents consistently use townland names throughout the historic period to describe areas and locate events accurately in their geographical context. The townland names and boundaries were standardised in the nineteenth century when the Ordnance Survey began to produce large-scale maps of the country. The original Irish names were eventually anglicised to varying degrees, depending in part upon the linguistic skills of the surveyors and recorders. A study of the townland names can provide information on aspects of cultural heritage including descriptions of the use of the landscape by man and the potential presence of archaeological or cultural heritage sites or features.

The 8 townlands within this Convector Station Location Zone are included in Table 11.

English Name	Irish Name	Glossary
Ballynaglogh	*Bhaile na gCloch*	Baile - townland, town, homestead Cloch - (also: cloich) stone, stone building
Clash	*An Chlais*	Clais - trench, ravine
Ballyvatta	*Baile Mhata*	Baile an bhata, 'town of the stick' Baile Mhata - "Matthew's Homestead"
Monatooreen	*Móin an Tuairín*	Tuairín - little paddock, little (cultivated) field, little pasture Móin (also: mónaidh) - bogland
Moanbaun	*An Mhóin Bhán*	Bán - white; lea-ground, grassy Móin(also: mónaidh) - bogland
Meeleen	an Mhillín	small knoll
Carrigane	*An Carragán*	Carragán - land with a rocky surface

English Name	Irish Name	Glossary
Glengarriff Beg	*An Gleann Garbh Beag*	Beag- small Garbh - rough, rough one Glean - glen

Table 13: Townlands within Option 14 (after Irish Placename Committee, 2013).

9.3 Designated archaeological sites

9.3.1 Record of Monuments and Places (RMPs)

Section 12 (1) of the National Monuments Act 1994 made provision the establishment and maintenance of a Record of Monuments & Places (RMP). Under this Act, each site recorded in the Record of Monuments and Places is granted statutory protection. When the owner or occupier of a property, or any other person proposes to carry out, or to cause, or to permit the carrying out of any work at or in relation to a recorded archaeological monument they are required to give notice in writing to the Minister for Culture, Heritage and the Gaeltacht 2 months before commencing that work.

There is one recorded archaeological monument incorporated by Option 14.

9.3.2 National Monuments

National monuments are broken into two categories; National Monuments in the ownership or guardianship of the state and National Monuments in the ownership or guardianship of a local authority. Section 8 of the National Monuments (Amendment) Act 1954 provides for the publication of a list of monuments, the preservation, of which, are considered to be of national importance. Two months' notice must be given to the Minister for Arts, Heritage and the Gaeltacht where work is proposed to be carried out at or in relation to any National Monument.

There are no National Monuments incorporated by Option 14.

9.3.3 Sites with Preservation Orders

The National Monuments Act 1930-2004 provide for the making of Preservation Orders and Temporary Preservation Orders in respect of National Monuments. Under Section 8 of the National Monument Act 1930 (as amended) the Minister for Culture, Heritage and the Gaeltacht, can place a Preservation Order on a monument if, in the Ministers' opinion, it is a National Monument in danger of being or is actually being destroyed, injured or removed or is falling into decay through neglect. The Preservation Order ensures that the monument shall be safeguarded from destruction, alteration, injury, or removal, by any person or persons without the written consent of the Minister.

There are no sites with preservation orders incorporated by Option 14.

9.4 Designated architectural heritage sites

In 1997 Ireland ratified the Granada Convention on architectural heritage. This provided the basis for a national commitment to the protection of the architectural heritage throughout the country. The Local Government (Planning and Development) Act 2000, and the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999, made the legislative changes necessary to provide for a strengthening of the protection of architectural heritage.

9.4.1 Record of Protected Structures

The Cork County Development Plan (2015-2021) was consulted for schedules of Protected Structures. These are buildings that a planning authority considers to be of special interest from an architectural, historical, archaeological, artistic, cultural, scientific, social, and/or technical point of view. Protected Structures receive statutory protection from injury or demolition under Section 57 (1) of the Local Government (Planning and Development) Act 2000. Protected structure status does not exclude development or alteration but requires the developer to consult with the relevant planning authority to ensure that elements which make the structure significant are not lost during development.

There are no Protected Structures incorporated by Option 14.

9.4.2 Architectural Conservation Areas

The Cork County Development Plan (2015-2021) was consulted for records relating to Architectural Conservation Areas ((hereinafter 'ACAs'). The stated objective of ACAs is to conserve and enhance the special character of the area, including traditional building stock and material finishes, spaces, streetscapes, landscape and setting.

There are no areas listed as ACAs incorporated by Option 14.

9.4.3 National Inventory of Architectural Heritage (NIAH)

The National Inventory of Architectural Heritage (hereinafter the 'NIAH') is a state initiative under the administration of the Department of Culture, Heritage and the Gaeltacht and was established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. Its purpose is to identify, record and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently, as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for Arts, Heritage and the Gaeltacht to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS).

There are no structures listed in the NIAH incorporated by Option 14.

9.5 Recent excavations

The Excavations Bulletin is an annual account of all excavations carried out under license. The database is available online at www.excavations.ie and includes excavations from 1985 to 2017. This database was consulted as part of the desktop research for this report to establish if any archaeological investigations had been carried out within the townlands incorporated by Option 14. The database produced no results for archaeological excavations undertaken within the townlands incorporated by Option 14.

10 CONCLUSIONS

10.1 Summary of Constraints

Constraint Types	Option 1 Ballyadam	Option 6 Leamlara	Option 9 Knockraha	Option 10 Pigeon Hill	Option 12 Kilquane	Option 14 Ballyvatta
Record of Monuments & Places (RMP)	4 Fulachta Fiadh 1 Excavation (site) 1 Tree Ring	7 Ringforts 1 Fulacht Fiadh	3 Ringforts 1 Enclosure	2 Fulachta Fiadh	1 Standing Stone	NONE
National Monument or Site with Preservation Order	NONE	NONE	NONE	NONE	NONE	NONE
Protected Structures (RPS)	NONE	1 Church	NONE	NONE	NONE	NONE
Architectural Conservation Area (ACA)	NONE	NONE	NONE	NONE	NONE	NONE
National Inventory of Architectural Heritage (NIAH) Site	NONE	1 Bridge	NONE	NONE	NONE	NONE
Undesignated Cultural Heritage Site	NONE	NONE	1 bomb factory 1 arms dump 1 cast iron dump	NONE	1 Site of Executions/ Burials	NONE

10.2 Recommendations

It is recommended that, if possible, all impacts on identified cultural heritage sites, and their immediate vicinities, should be avoided in the selection of the preferred CSLZ and in the design and exact siting of the proposed Converter Station with the preferred CSLZ.

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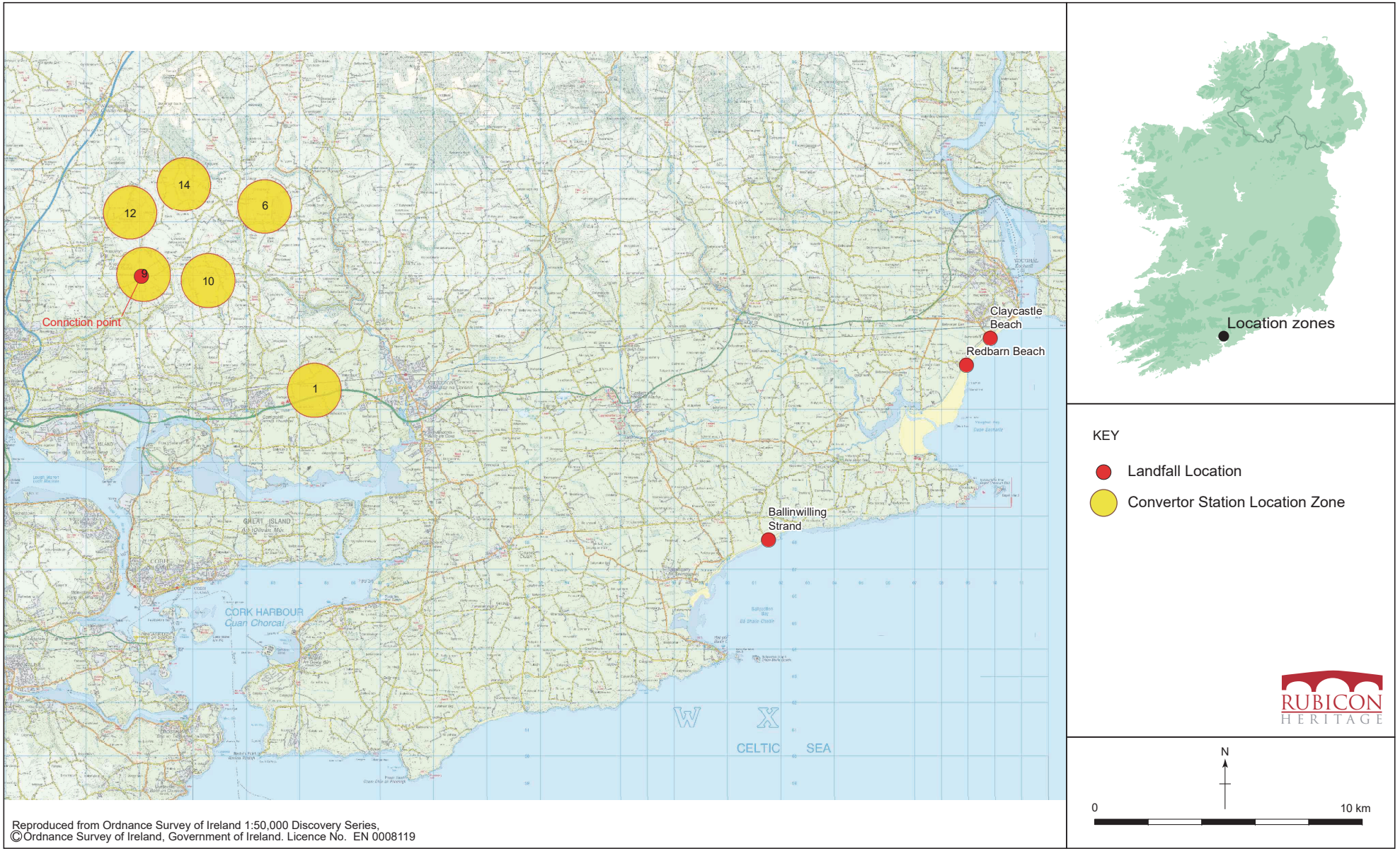

Figure 1 - Location of Convertor Station Location Zones.

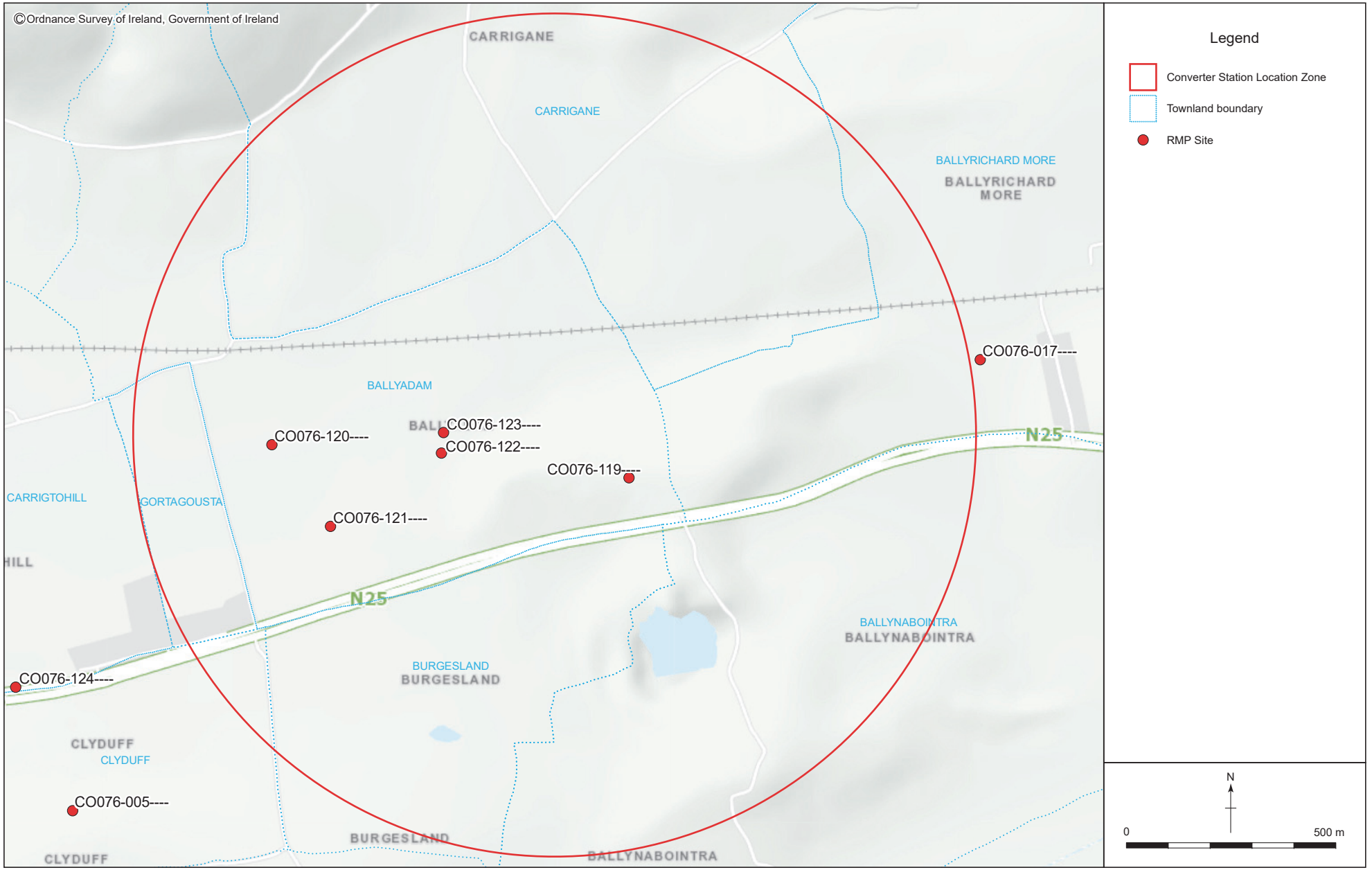

Figure 2 - Option 1: Archaeological Constraints.

Figure 3 - Option 1: Architectural Constraints.

Figure 4 - Option 1: First Edition 6-inch Ordnance Survey map.

Figure 5 - Option 1: Second Edition 25-inch Ordnance Survey map.

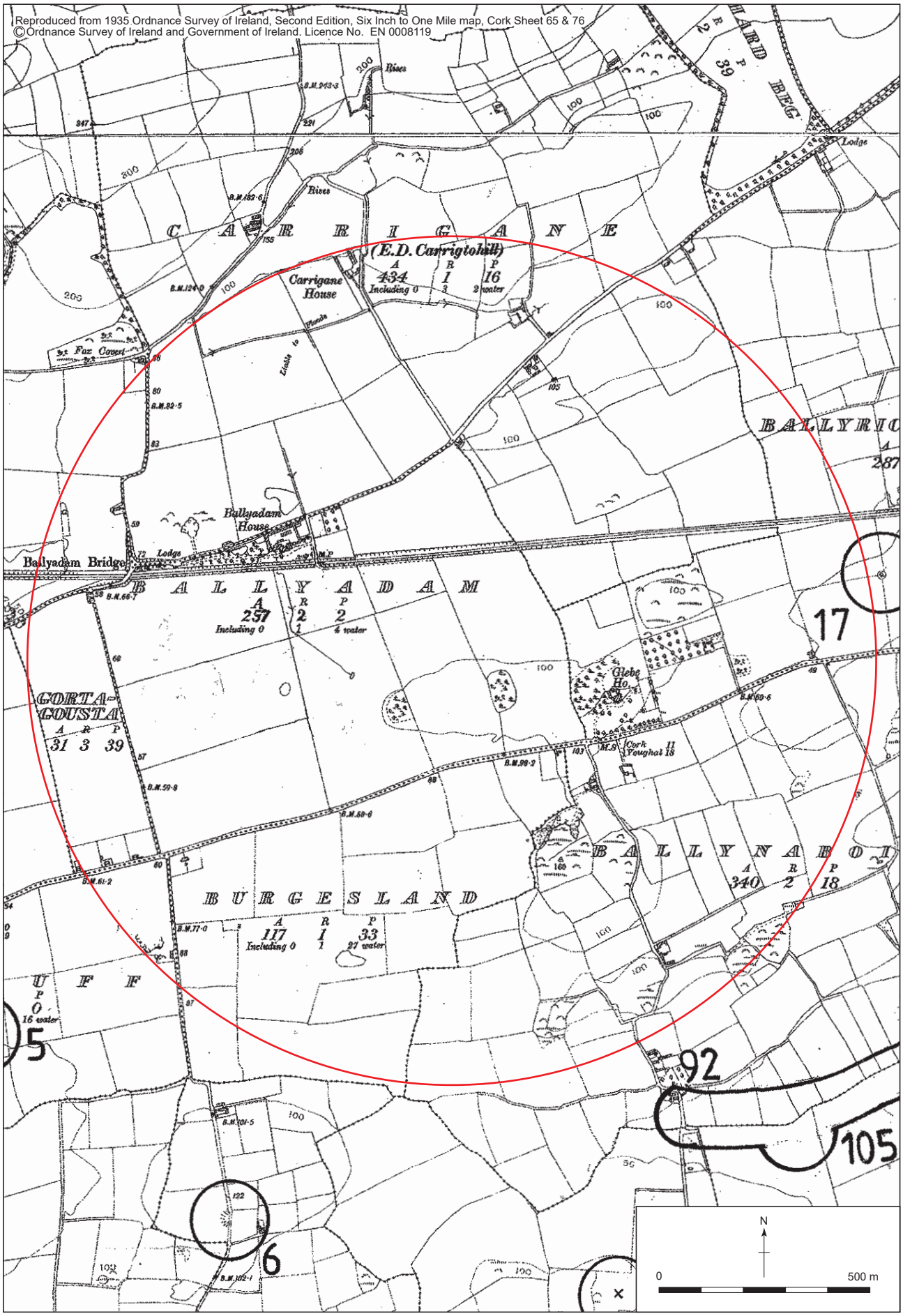

Figure 6 - Option 1: RMP map.

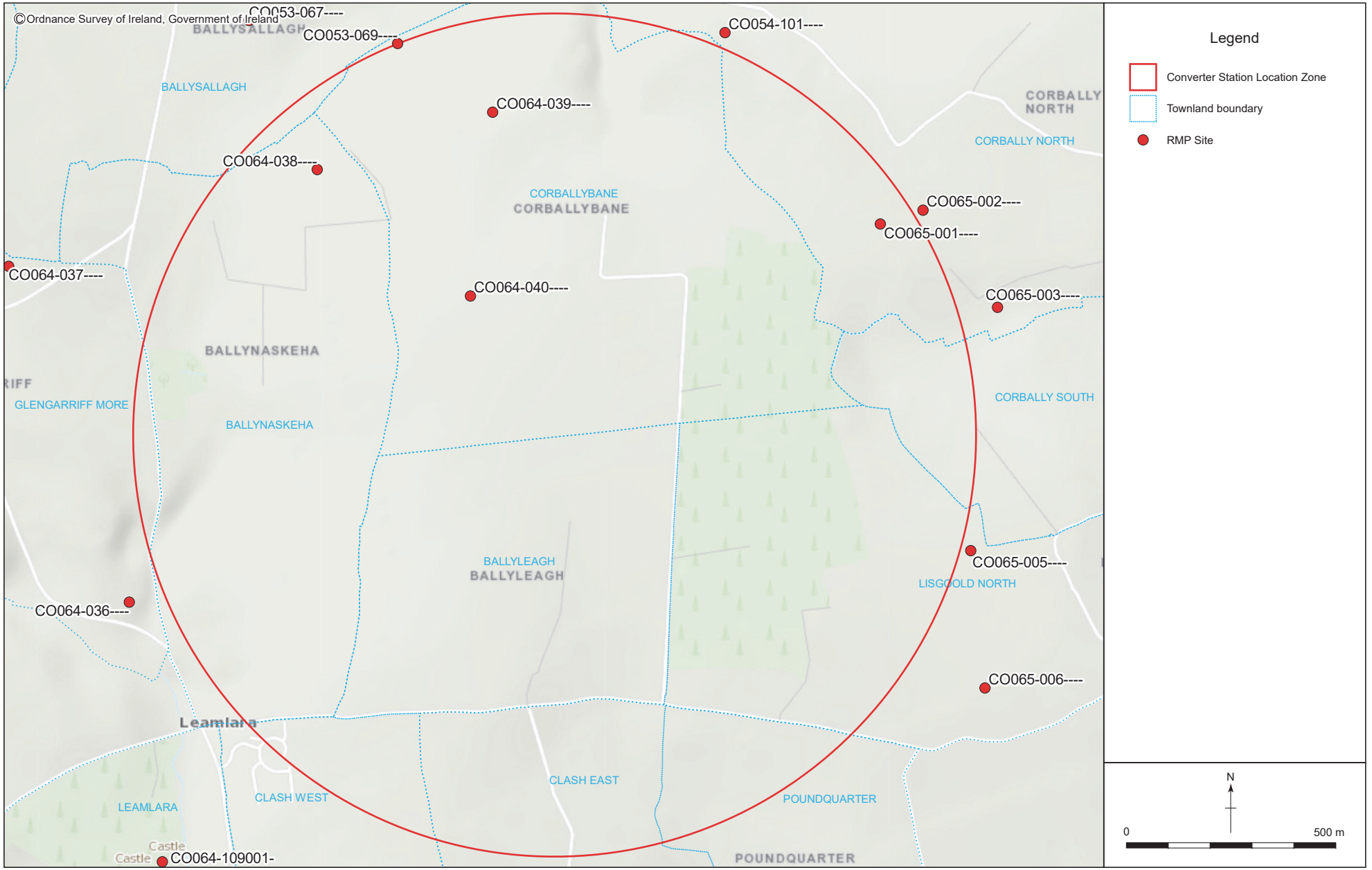

Figure 7 - Option 6: Archaeological Constraints.

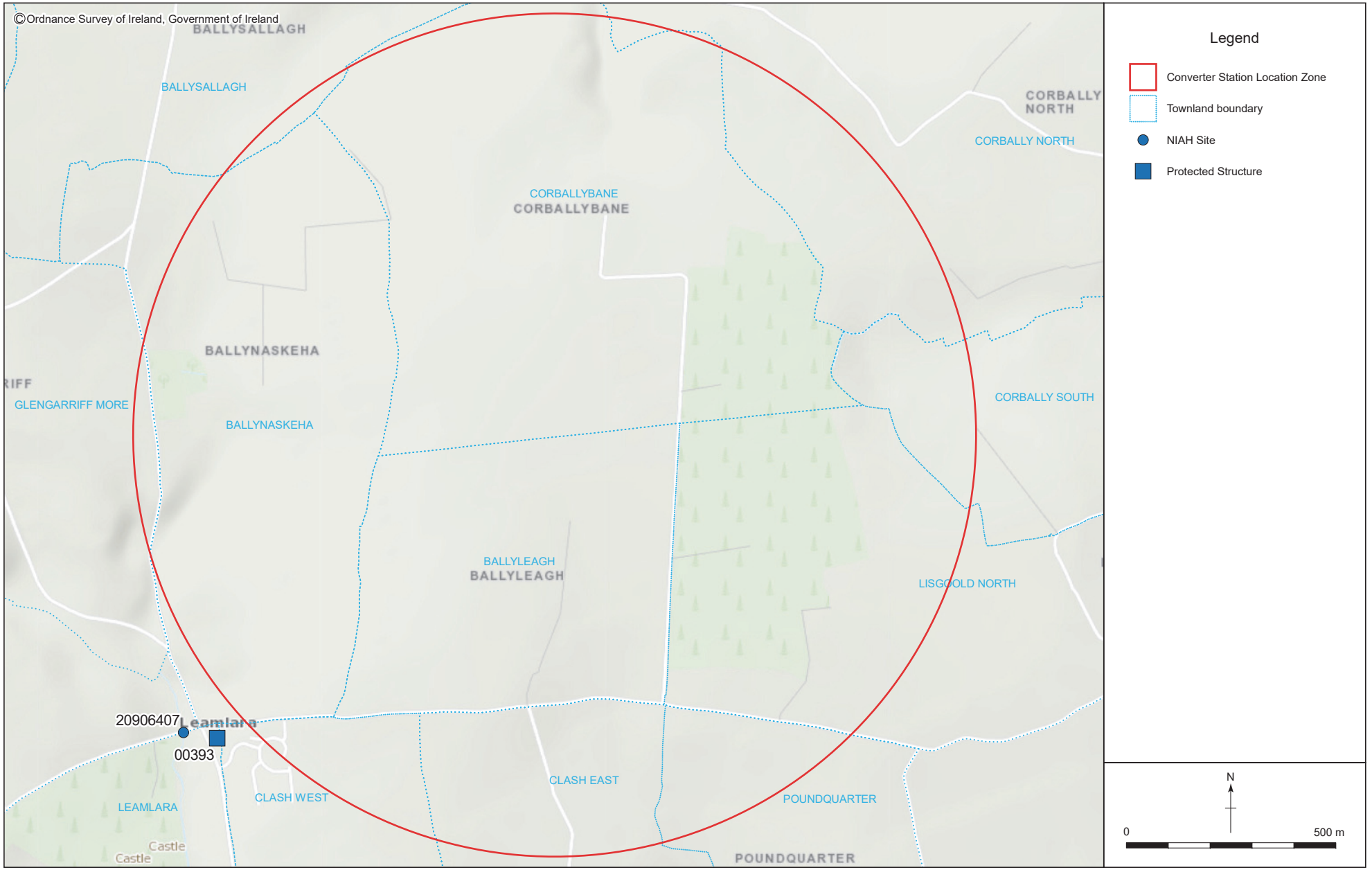

Figure 8 - Option 6: Architectural Constraints.

Figure 9 - Option 6: First Edition 6-inch Ordnance Survey map.

Figure 10 - Option 6: Second Edition 25-inch Ordnance Survey map.

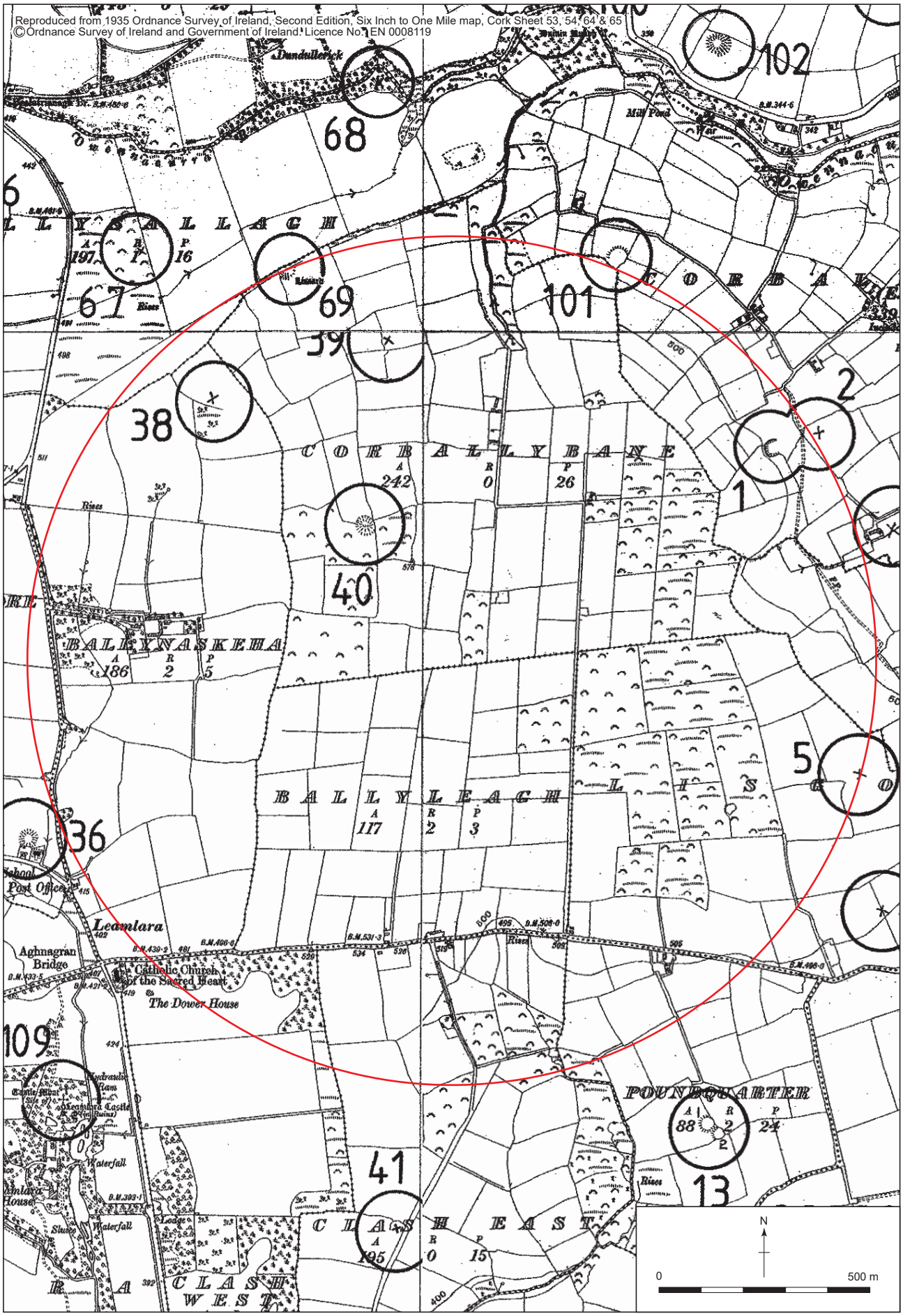

Figure 11 - Option 6: RMP map.

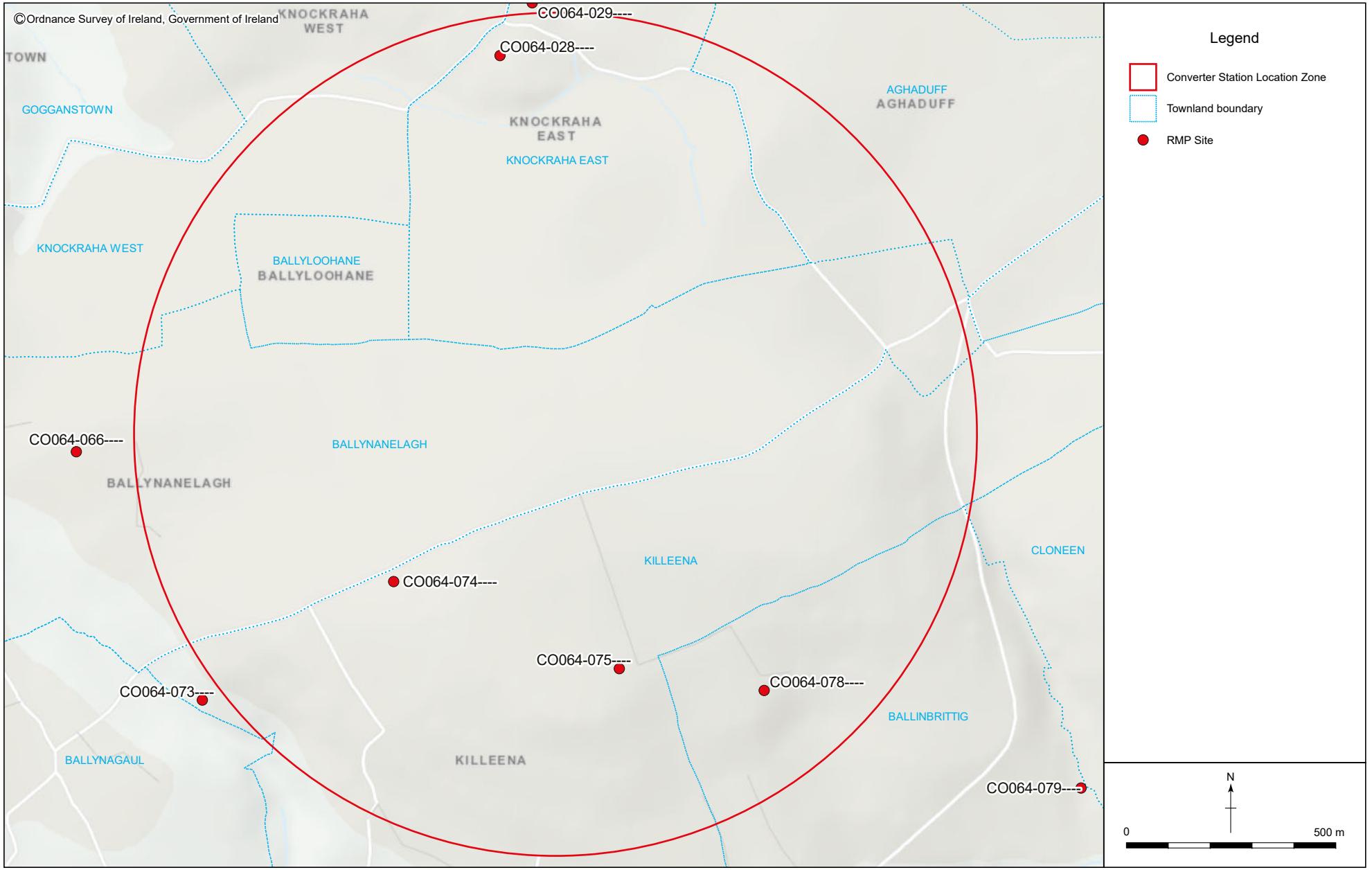

Figure 12 - Option 9: Archaeological Constraints.

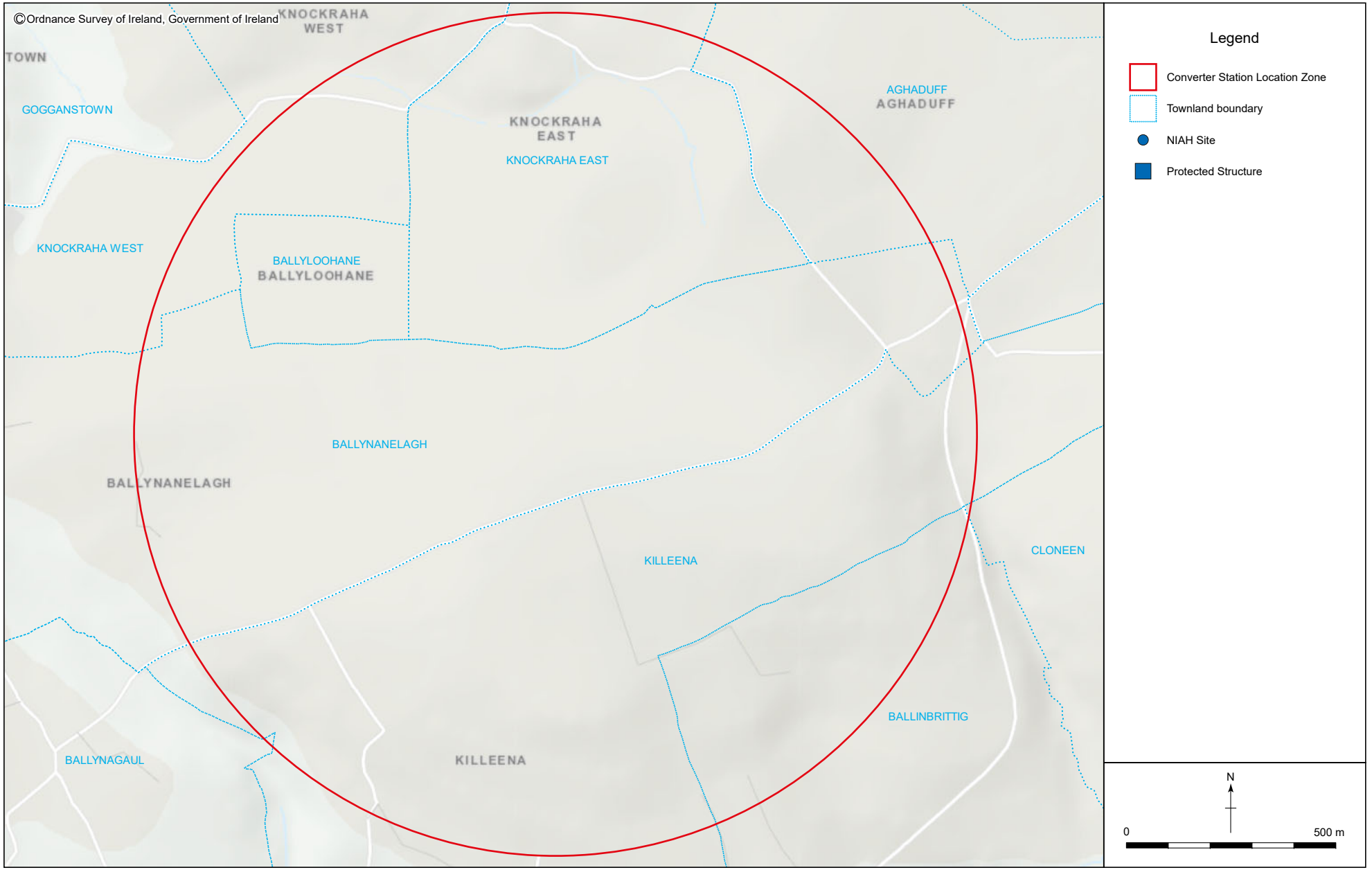

Figure 13 - Option 9: Architectural Constraints.

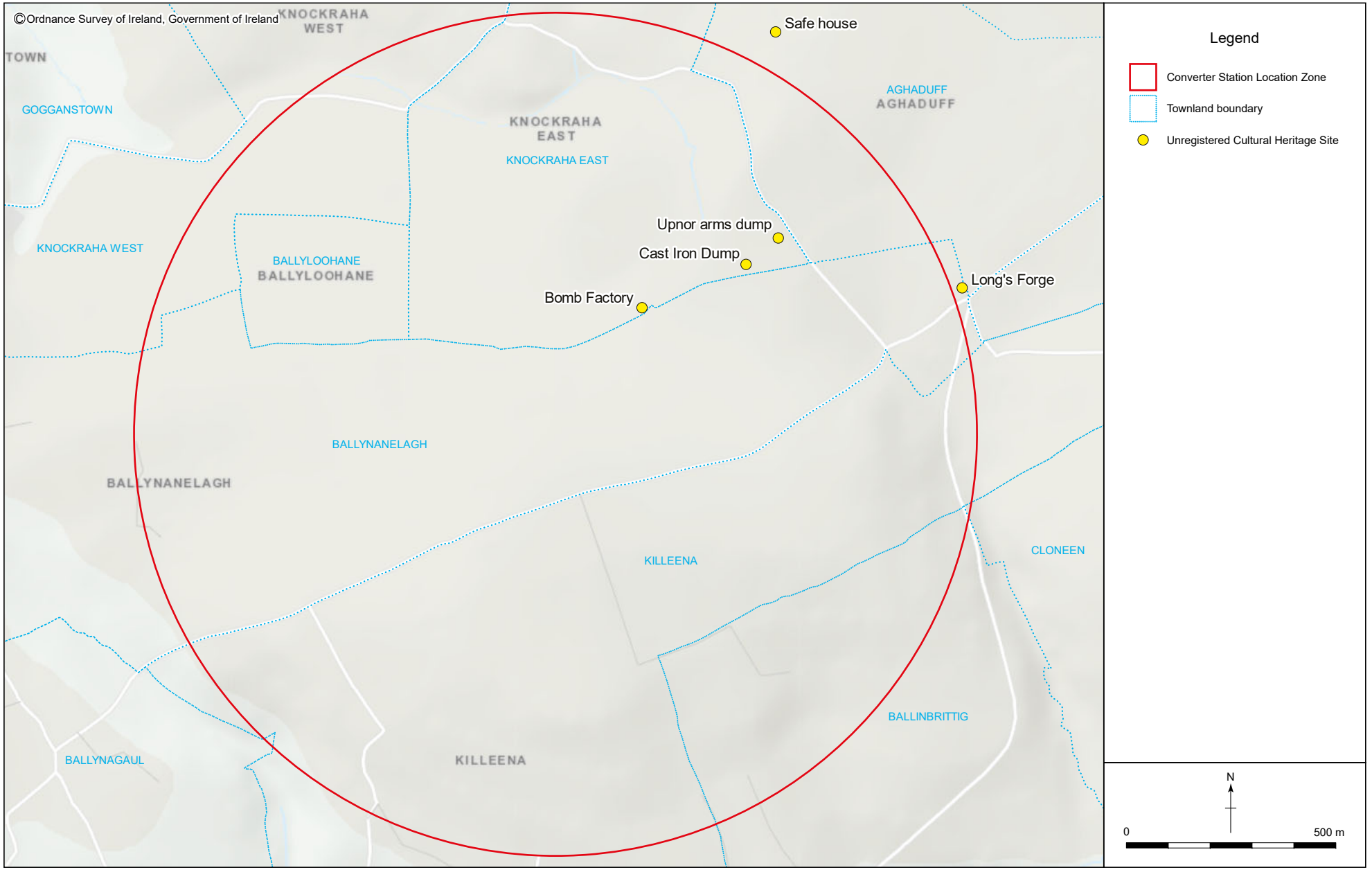

Figure 14 - Option 9: Unregistered Cultural Heritage Sites.

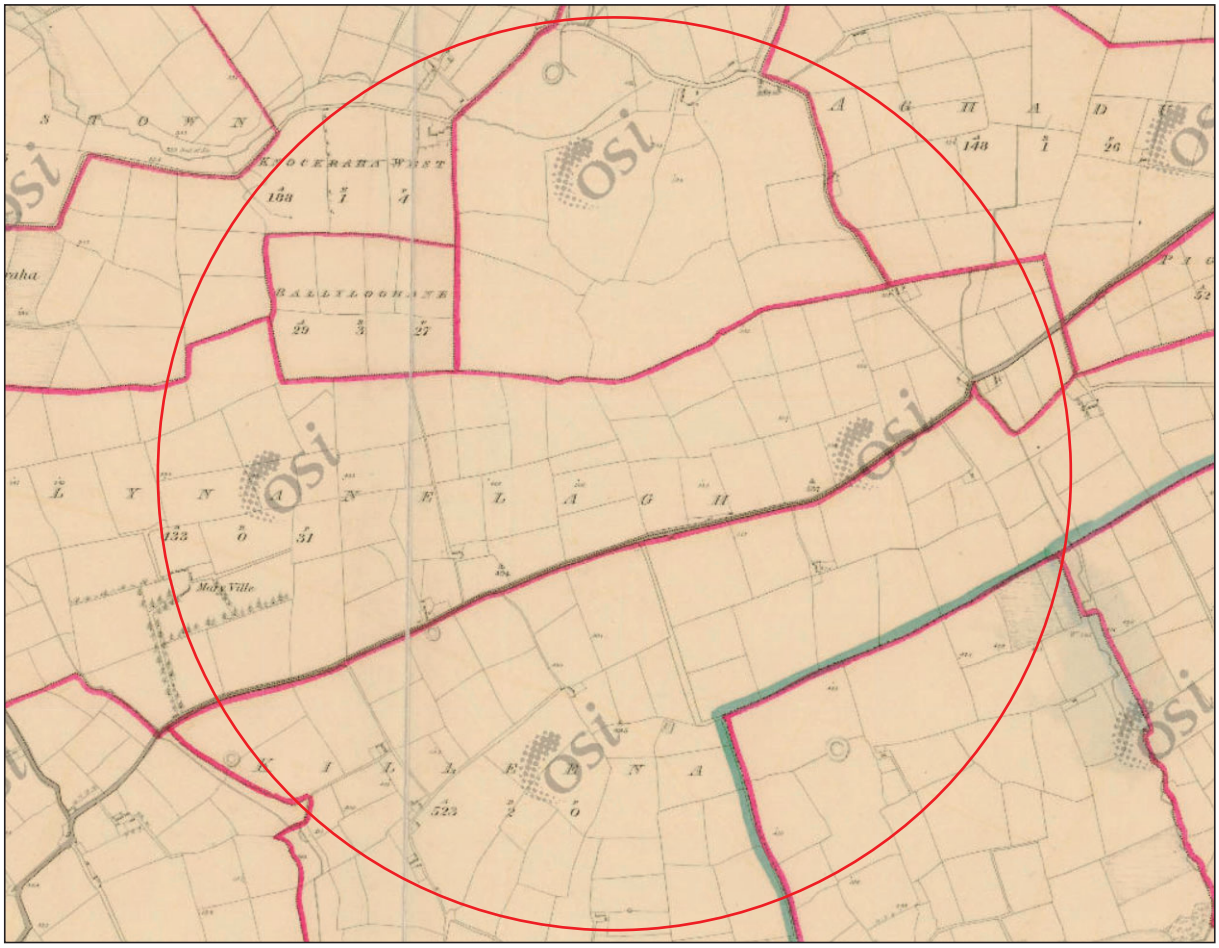

Figure 15 - Option 9: First Edition 6-inch Ordnance Survey map.

Figure 16 - Option 9: Second Edition 25-inch Ordnance Survey map.

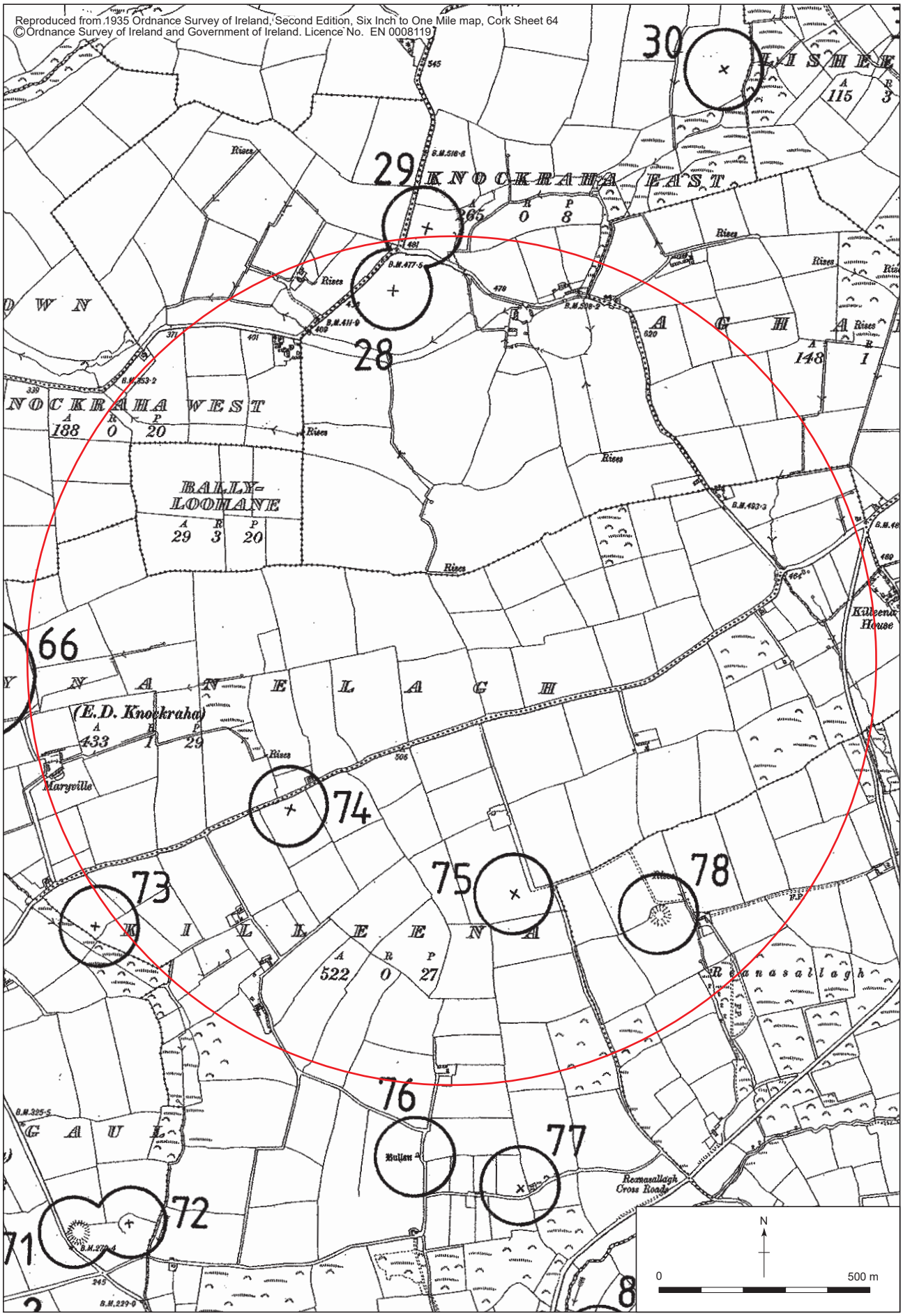

Figure 17 - Option 9: RMP map.

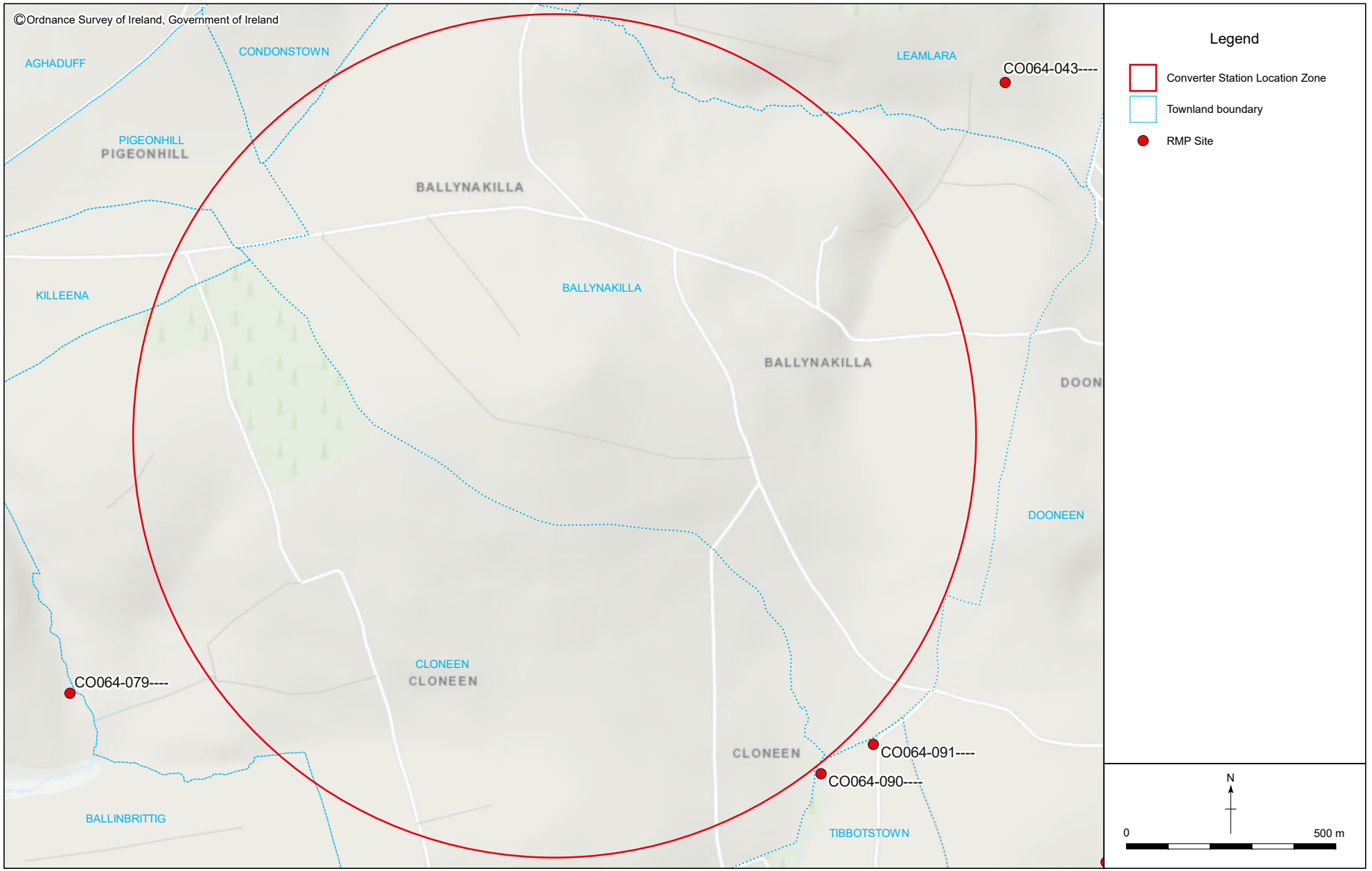

Figure 18 - Option 10: Archaeological Constraints.

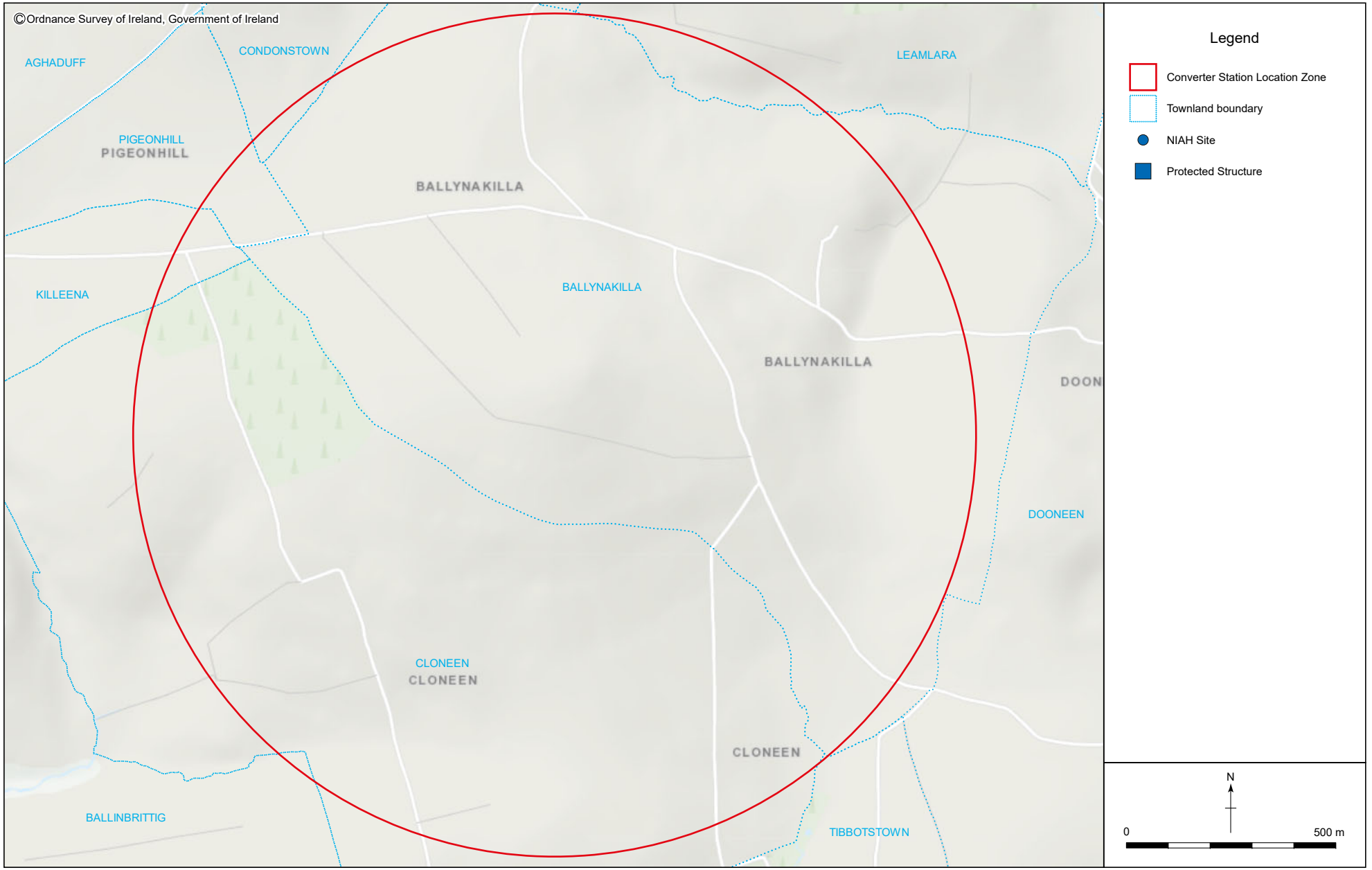

Figure 19 - Option 10: Architectural Constraints.

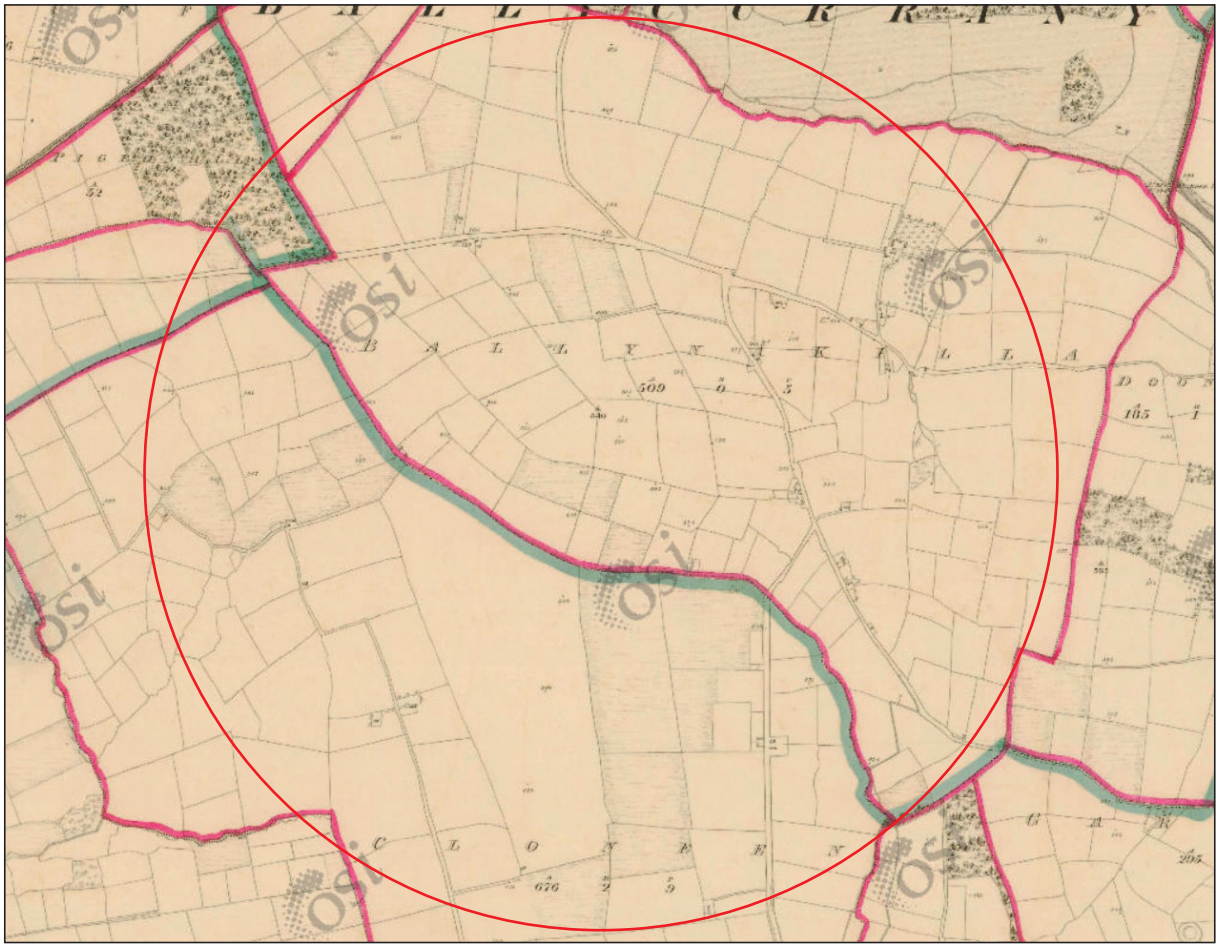

Figure 20 - Option 10: First Edition 6-inch Ordnance Survey map.

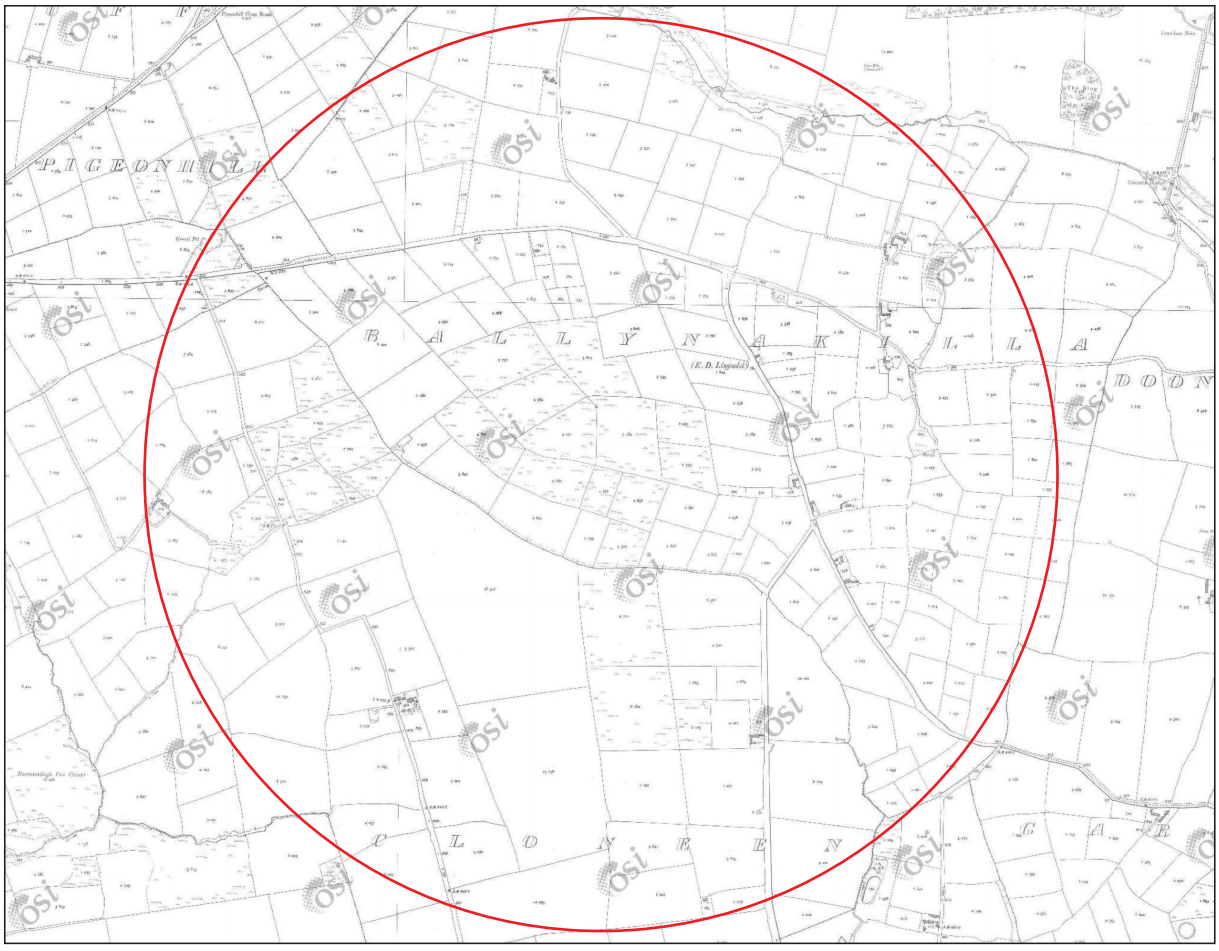

Figure 21 - Option 10: Second Edition 25-inch Ordnance Survey map.

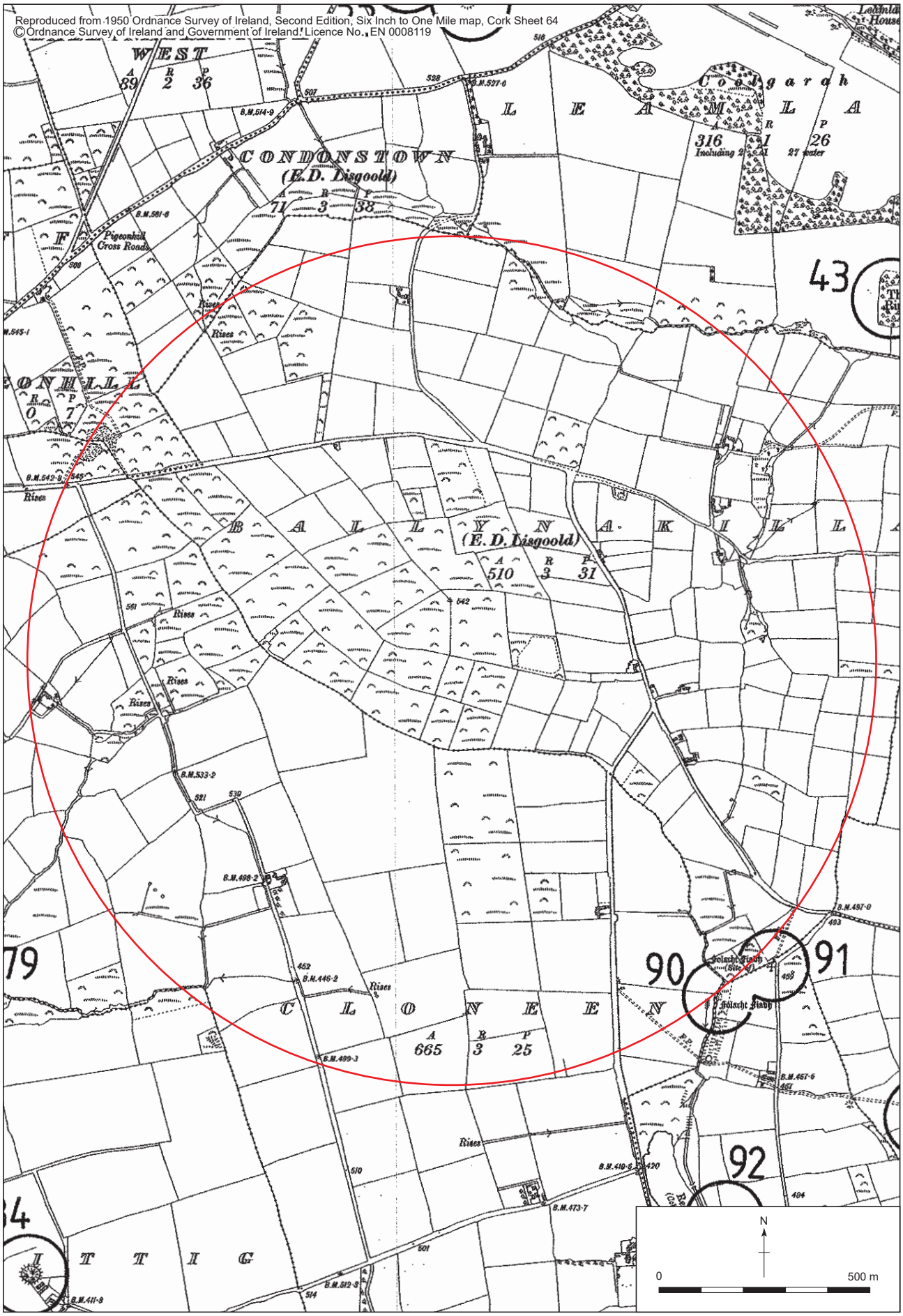

Figure 22 - Option 10: RMP map.

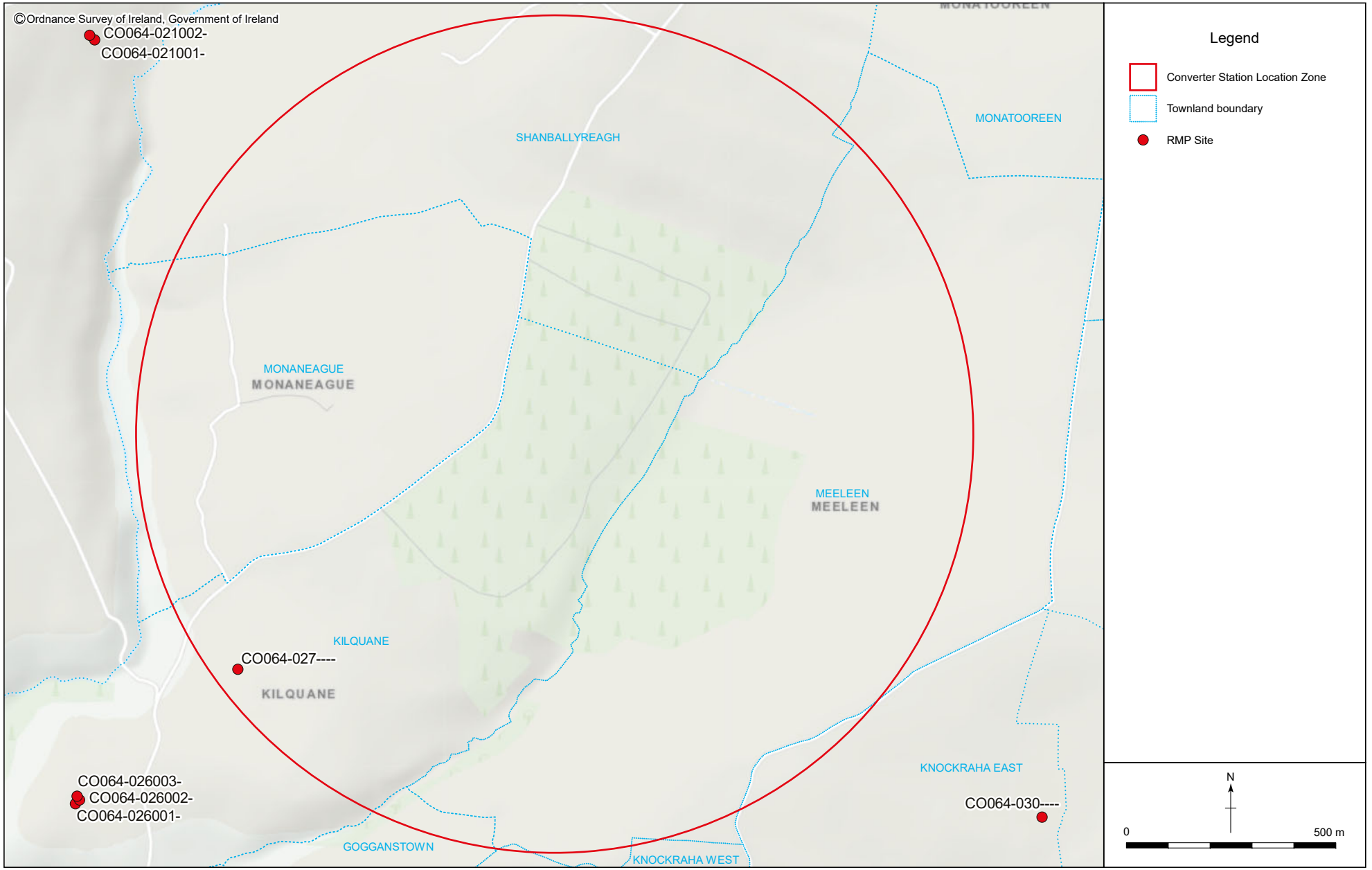

Figure 23 - Option 12: Archaeological Constraints.

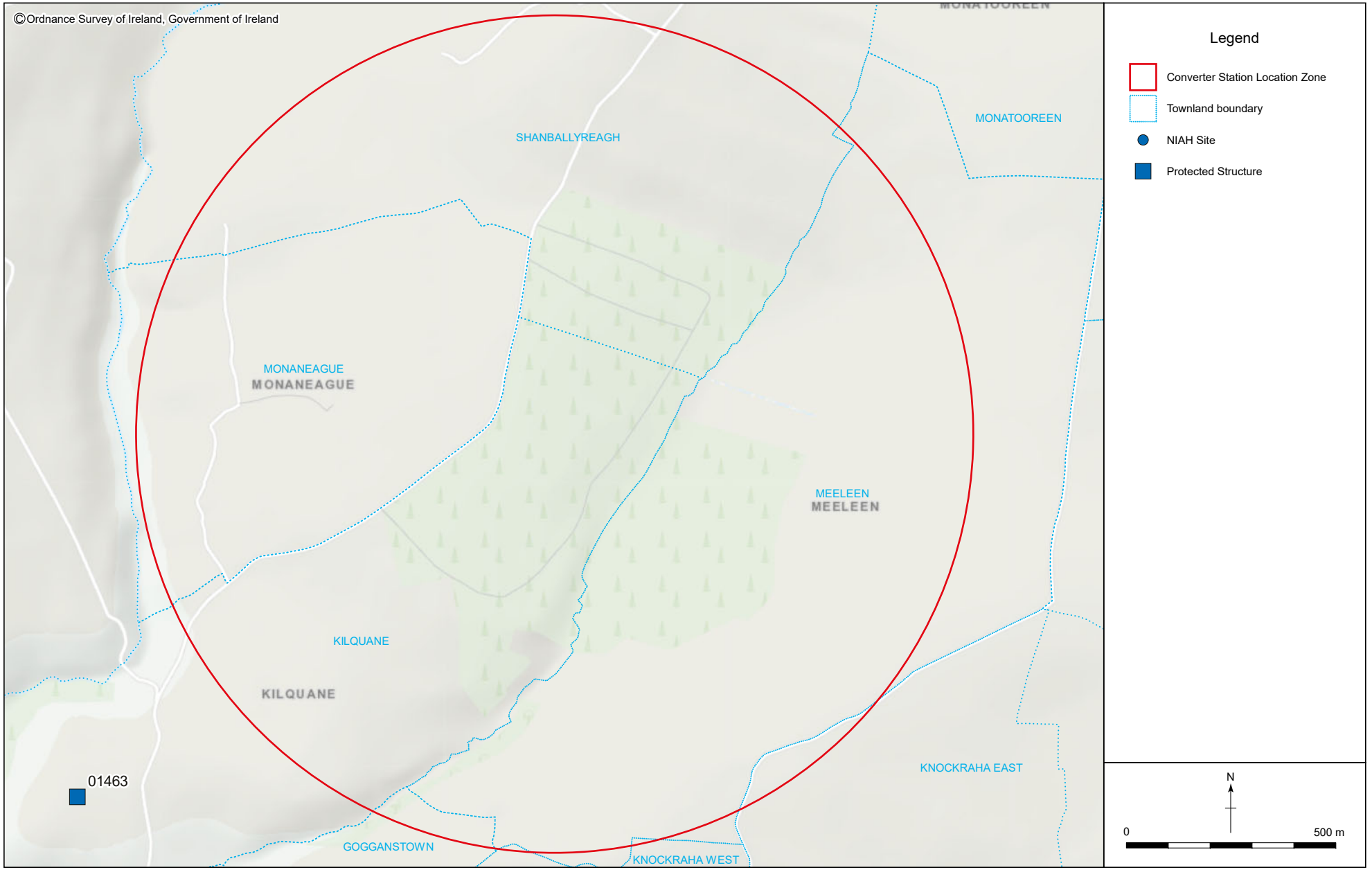

Figure 24 - Option 12: Architectural Constraints.

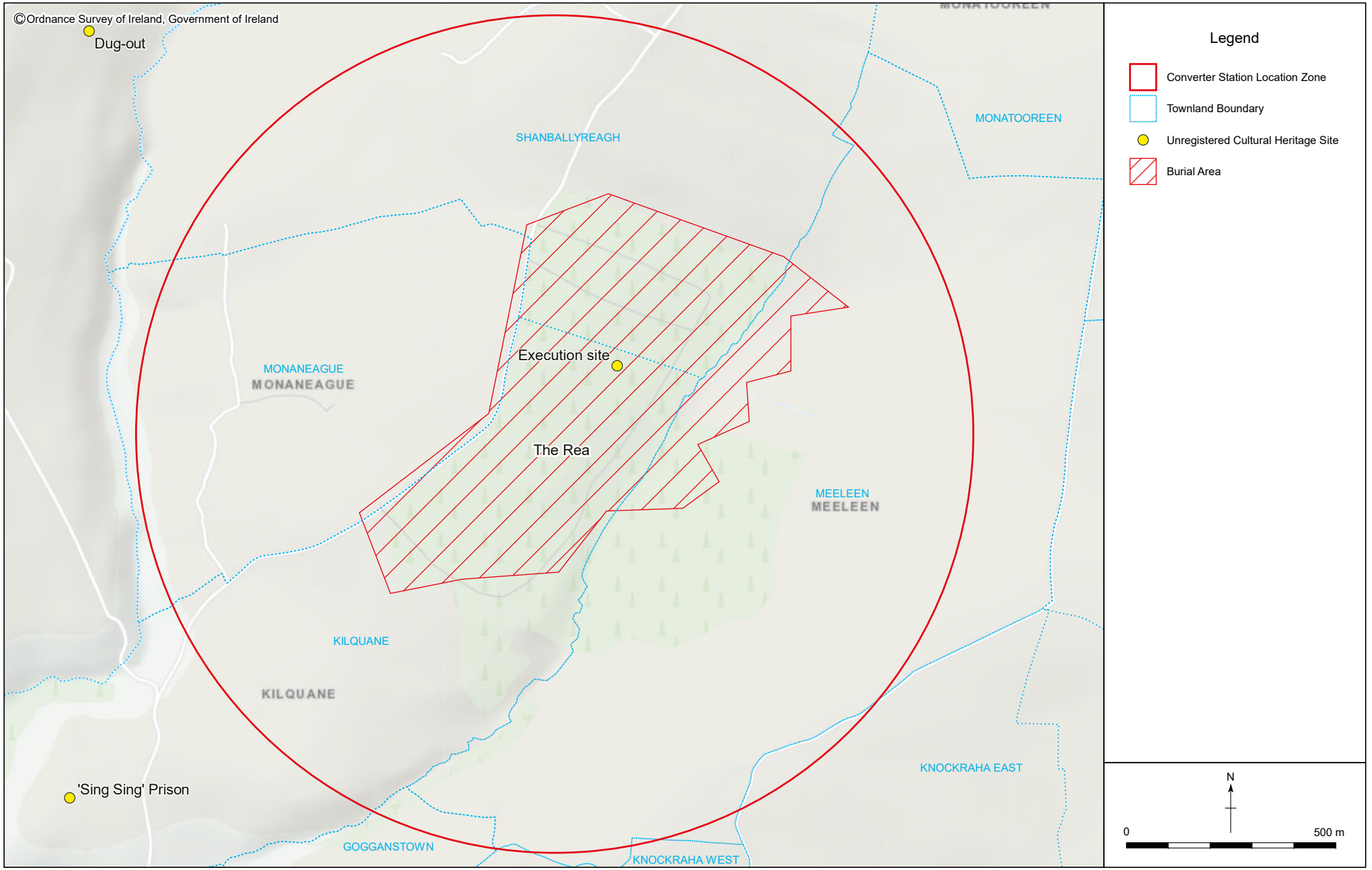

Figure 25 - Option 12: Undesignated Cultural Heritage Sites.

Figure 26 - Option 12: First Edition 6-inch Ordnance Survey map.

Figure 27 - Option 12: Second Edition 25-inch Ordnance Survey map.

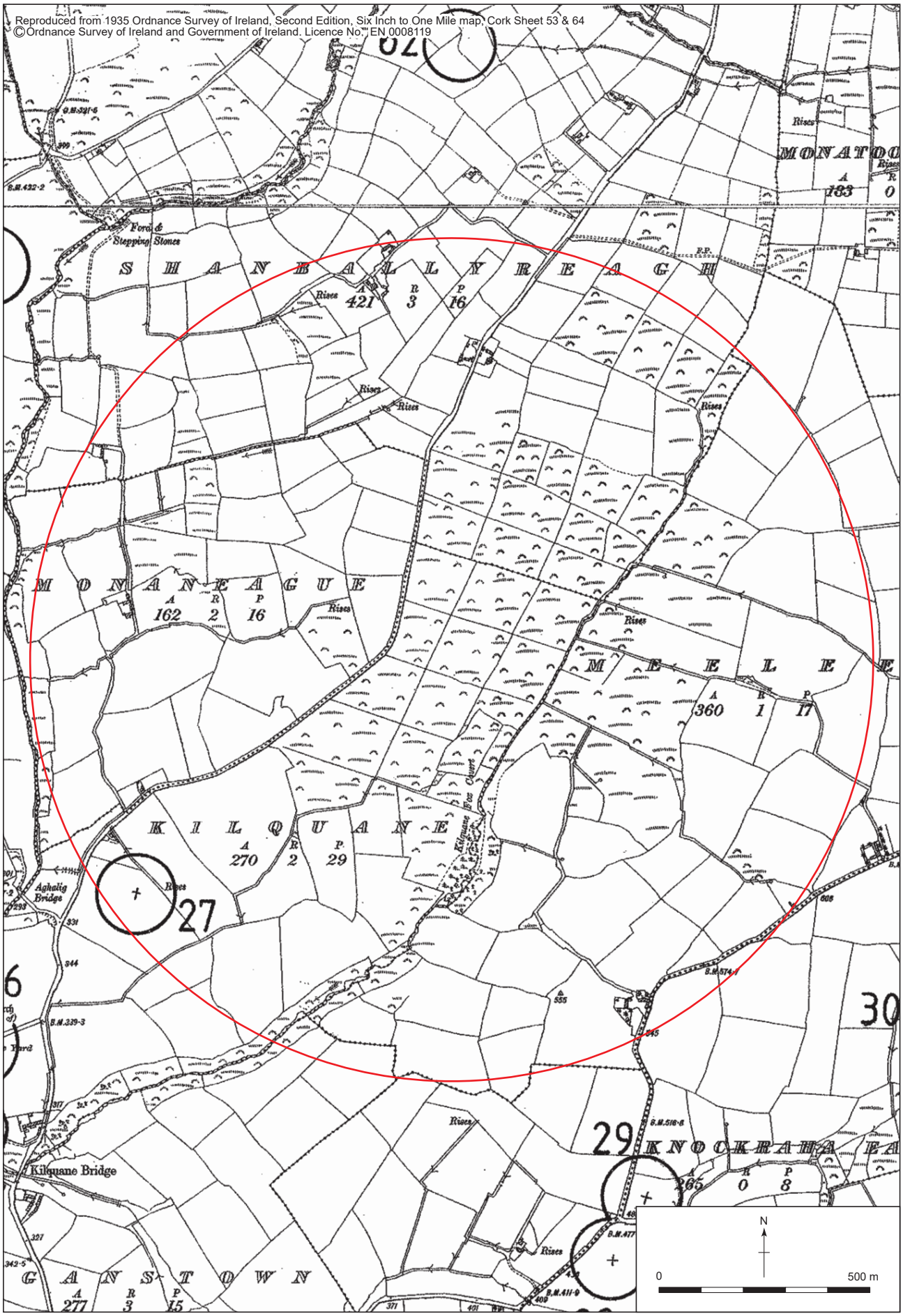

Figure 28 - Option 12: RMP map.

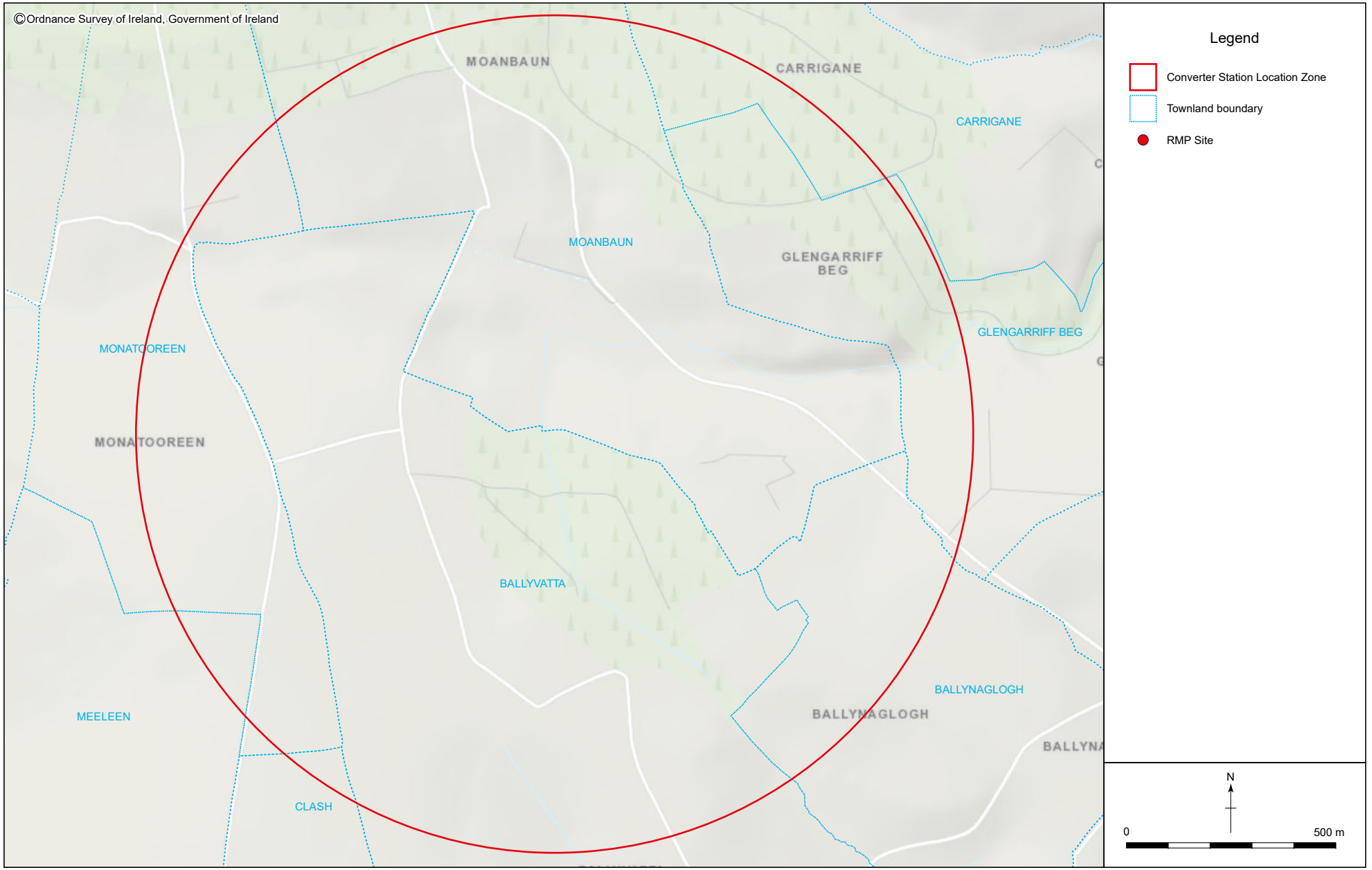

Figure 29 - Option 14: Archaeological Constraints.

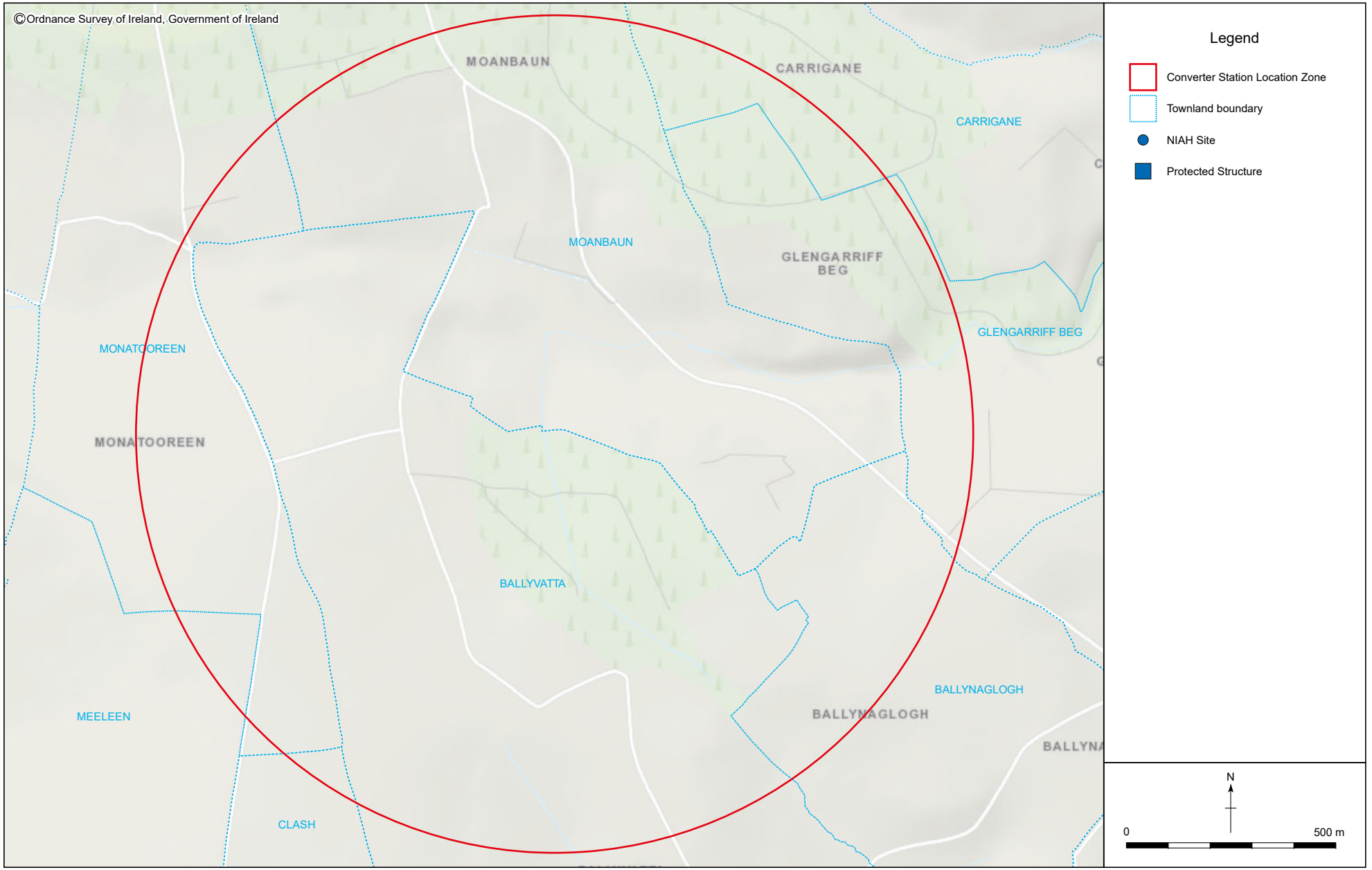

Figure 30 - Option 14: Architectural Constraints.

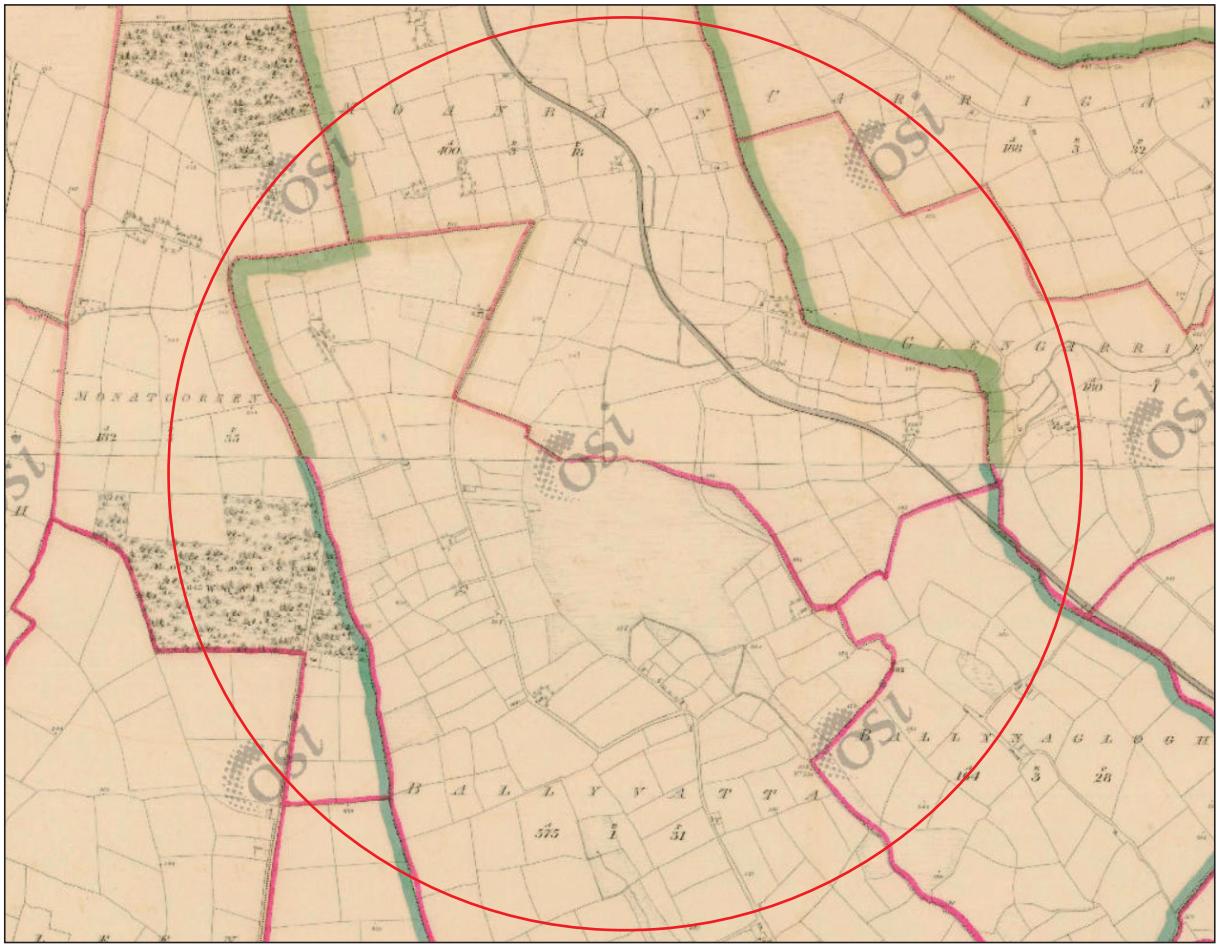

Figure 31 - Option 14: First Edition 6-inch Ordnance Survey map.

Figure 32 - Option 14: Second Edition 25-inch Ordnance Survey map.

Figure 33 - Option 14: RMP map.

Plate 1 - Option 1 View from N25, looking northeast

Plate 2 - Option 6 View along forestry track in centre of Zone 6, looking east

Plate 3 - Option 6 View across fields towards forestry from local E-W road in south of Zone 6, looking northeast

Plate 4 - Option 6 View across fields from local E-W road in south of Zone 6, looking northwest

Plate 5 - Option 6 View across fields from local N-S road in west of Zone 6, looking east

Plate 6 - Option 6 View towards ringfort (CO065-001) from local road in northeast of Zone 6, looking southwest

Plate 7 - Option 6 Leamlara Church (Protected Structure 00393), looking north

Plate 8 - View from junction of townlands Ballynanelagh & Knockraha East towards bomb factory site (not visible), looking west

Plate 9 - Site of the bomb factory in Ballynanelagh townland, looking ENE at the ‘kink’ in the townland boundary

Plate 10 - View from junction of townlands Ballynanelagh & Knockraha East, looking southwest

Plate 11 - East side of existing substation, view from E-W orientated road transecting Zone 9, looking north

Plate 12 - East side of existing substation, view from E-W orientated road transecting Zone 9, looking southeast

Plate 13 - South side of existing substation, view from E-W orientated road transecting Zone 9, looking south

Plate 14 - View from local road in southwest area of Zone 9 towards existing substation on hilltop, looking northeast

Plate 15 - Option 10 View across fields in west of Zone 10, looking southwest

Plate 16 - Option 10 View along road in west of Zone 10, west of forestry, looking north

Plate 17 - Option 10 View from local road in south of Zone 10 towards forestry on hill, looking north

Plate 18 - Option 10 View from eastern area of Zone 10, looking north

Plate 19 - Option 12 View of western edge of forestry in the middle of Zone 12, looking north

Plate 20 - Option 12 View across elevated fields from the road on western edge of forestry, looking west

Plate 21 - Option 12 View from townland boundary with Knockraha East, looking west

Plate 22 - Option 12 View of forestry from the road on its western edge, looking southeast

Plate 23 - Option 12 View towards forestry from roadway along Meeleen-Clash townland boundary, looking west

Plate 24 - Option 12 View towards forestry within Zone 12 from Kilquane graveyard, looking northeast

Plate 25 - Option 14 View across fields in the northern area of Zone 14, looking south

Plate 26 - Option 14 View along edge of forestry in the north of Zone 14, looking southeast

Plate 27 - Option 14 View towards forestry in the north of Zone 14, looking west

Plate 28 - Option 14 View across fields west of forestry in central area of Zone 14, looking north

Plate 29 - Option 14 View from local road in the north of Zone 14 towards forestry in Ballyvatta, looking southeast

Plate 30 - Option 14 View across northern area of Zone 14, looking northeast

Appendix 1 –Legislative and Policy framework

EIA Legislation

EIA Directive 85/337/EEC as amended by 97/11/EC, 2003/35/EC and 2009/31/EC requires that certain developments be assessed for likely environmental effects before planning permission can be granted. This original directive and its amendments were consolidated informally in EIA Directive 2011/92/EU and further amended 2014/52/EU.

Directive 2014/52/EU that among other factors, information is to be provided on:

'cultural heritage, including architectural and archaeological aspects' (Annex IV, Section 3)

Each of these assets is addressed within this assessment report.

Cultural Heritage Legislation

Archaeological Monuments/Sites
Archaeological heritage is protected primarily under the National Monuments Acts 1930-2004. Section 2 of the 1930 National Monuments Act defines the word 'monument' as including:

'any artificial or partly artificial building, structure, or erection whether above or below the surface of the ground and whether affixed or not affixed to the ground and any cave, stone, or other natural product whether forming part of or attached to or not attached to the ground which has been artificially carved, sculptured or worked upon or which (where it does not form part of the ground) appears to have been purposely put or arranged in position and any prehistoric or ancient tomb, grave or burial deposit, but does not include any building which is for the time being habitually used for ecclesiastical purposes'

Under the 1994 Act, provision was made for a Record of Monuments & Places (RMP). The RMP is a revised set of SMR (Sites and Monuments Record) maps, on which newly-discovered sites have been added and locations which proved not to be of antiquity have been de-listed by the National Monuments Service.

In effect, the National Monuments Acts 1930-2004 provide a statutory basis for:

- Protection of sites and monuments (RMPs)
- Sites with Preservation Orders
- Ownership and Guardianship of National Monuments
- Register of Historic Monuments (pre-dating 1700AD)
- Licensing of archaeological excavations
- Licensing of Detection Devices
- Protection of archaeological objects
- Protection of wrecks and underwater heritage (more than 100 years old)

In relation to proposed works at or in the vicinity of a recorded archaeological monument, Section 12 (3) of the National Monuments (Amendment) Act 1994 states:

'When the owner or occupier (not being the Commissioners) of a monument or place which has been recorded [in the Record of Monuments and Places] or any person proposes to carry out, or to cause or

permit the carrying out of any work at or in relation to such monument or place, he shall give notice in writing of his proposal to carry out the work to the Commissioners and shall not, except in the case of urgent necessity and with the consent of the Commissioners, commence the work for a period of two months after having given the notice.'

Archaeological artefacts
Section 2 of the 1930 National Monuments Act (amended) defines an archaeological object as (in summary) any chattel in a manufactured or partly manufactured state or an unmanufactured state but with an archaeological or historical association. This includes ancient human, animal or plant remains.

Section 9 (1) of the National Monuments (Amendment) Act 1994 states that any such artefact recovered during archaeological investigations should be taken into possession by the licensed archaeological director and held on behalf of the state until such a time as they are deposited accordingly subsequent to consultation with the National Museum of Ireland.

Architectural Sites
In 1997 Ireland ratified the Granada Convention on architectural heritage. This provided the basis for a national commitment to the protection of the architectural heritage throughout the country. The Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999 and Local Government (Planning and Development) Act 2000 made the legislative changes necessary to provide for a strengthening of the protection of architectural heritage. The former Act has helped to provide for a forum for the strengthening of architectural heritage protection as it called for the creation of a National Inventory of Architectural Heritage which is used by local authorities for compiling the Record of Protected Structures (RPS). The Record of Protected Structures (RPS) is set out in each respective county's Development Plan and provides statutory protection for these monuments.

Section 1 (1) of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999 states:

'architectural heritage means all—
(a) structures and buildings together with their settings and attendant grounds, fixtures and fittings,
(b) groups of such structures and buildings, and
(c) sites, which are of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest"

The 1999 Act was replaced by the Local Government (Planning and Development) Act 2000 where the conditions relating to the protection of architectural heritage are set out in Part IV of the Act. Section 57 (1) of the 2000 Act states that:

'…the carrying out of works to a protected structure, or a proposed protected structure, shall be exempted development only if those works would not materially affect the character of –
(a) the structure, or
(b) any element of the structure which contributes to its special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest'

Policy Framework

Cork County Development Plan 2014 - This Plan sets out an overall strategy for the proper planning and sustainable development of Cork County over a 6 year period.

County Development Plan Objective HE 3-1: Protection of Archaeological Sites
a) Safeguard sites and settings, features and objects of archaeological interest generally.
b) Secure the preservation (i.e. preservation in situ or in exceptional cases preservation by record) of all archaeological monuments including the Sites and Monuments Record (SMR) (see www.archeology.ie) and the Record or Monuments and Places as established under Section 12 of the National Monuments (Amendment) Act, 1994, as amended and of sites, features and objects of archaeological and historical interest generally. In securing such preservation, the planning authority will have regard to the advice and recommendations of the Department of Arts, Heritage and Gaeltacht as outlined in the Frameworks and Principles for the Protection of the Archaeological Heritage.

County Development Plan Objective HE 3-2: Underwater Archaeology
Protect and preserve the archaeological value of underwater archaeological sites and associated features. In assessing proposals for development, the Council will take account of the potential underwater archaeology of rivers, lakes, intertidal and subtidal environments.

County Development Plan Objective HE 3-3: Zones of Archaeological Potential
Protect the Zones of Archaeological Potential (ZAPs) located within historic towns and other urban areas and around archaeological monuments generally. Any development within the ZAPs will need to take cognisance of the potential for subsurface archaeology and if archaeology is demonstrated to be present appropriate mitigation (such as preservation in situ/buffer zones) will be required.

County Development Plan Objective HE 3-4 Industrial and Post Medieval Archaeology
Protect and preserve the archaeological value of industrial and post medieval archaeology such as mills, limekilns, bridges, piers, harbours, penal chapels and dwellings. Proposals for refurbishment, works to or redevelopment/conversion of these sites should be subject to careful assessment.

County Development Plan Objective HE 3-5 Burial Grounds
Protect all historical burial grounds in County Cork and encourage their maintenance and care in accordance with appropriate conservation principles.

County Development Plan Objective HE 3-6: Archaeology and Infrastructure Schemes
Have regard to archaeological concerns when considering proposed service schemes (including electricity, sewerage, telecommunications, water supply) and proposed roadwork's (both realignments and new roads) located in close proximity to Recorded Monuments and Places and their known archaeological monuments.

Appendix 2—Terms and definitions used

The following sets out the definitions of the terms which are used throughout the report:

(i) The phrase 'cultural heritage' is a generic term used in reference to a multitude of cultural, archaeological and architectural sites and monuments. The term 'cultural heritage', in compliance with Section 2(1) of the Heritage Act (1995), is used throughout this report in relation to archaeological objects, features, monuments and landscapes as well as all structures and buildings which are considered to be of historical, archaeological, artistic, engineering, scientific, social or technical interest.

For the purpose of this assessment, each identified cultural heritage site is assigned a unique cultural heritage number with the prefix 'CH'.

(ii) A feature recorded in the 'Record of Monuments and Places' (RMP) refers to a recorded archaeological site that is granted statutory protection under the National Monuments Act 1930-2004. When reference is made to the distance between an RMP and the proposed development site (see below), this relates to the minimal distance separating the site from the known edge of the RMP. Where the edge of the RMP is not precisely known, the distance relates to that which separates the site from the boundary of the RMP zone of archaeological potential as represented on the respective RMP map; where this is applied, it is stated accordingly.

(iii) An 'area of archaeological potential' refers to an area of ground that is deemed to constitute one where archaeological sites, features or objects may be present in consequence of location, association with identified/recorded archaeological sites and/or identifiable characteristics.

(iv) The term 'proposed development site' refers to the defined area of land within which the proposed development, including access tracks etc, may be constructed.

(v) In relation to the term 'study area' please see Section 1.3 above.

(vi) The term 'receiving environment' refers to the broader landscape within which the study area is situated. Examination of the site's receiving environment allows the study area to be analysed in its wider cultural context.

(vii) The terms 'baseline environment' and 'cultural heritage resource' refer to the existing, identifiable environment against which potential impacts of the proposed scheme may be measured.

Appendix 3—Glossary and definition of archaeological terms

Barracks A building or group of buildings used to house members of the police or armed forces. These date from the late 17th century AD onwards.

Brewery A commercial complex of buildings for the brewing of beer. These date from the 19th century AD onwards.

Bridge A structure of wood, stone, iron, brick or concrete, etc., built to span a river or ravine in order to facilitate the crossing of pedestrians or vehicles. These date from the medieval period (5th - 12th centuries AD) onwards.

Burial ground An area of ground, set apart for the burial of the dead, not associated with a church. These date from the medieval period (5th - 16th centuries AD) onwards. See also Children's burial ground and Graveyard.

Castle (unclassified) A castle that cannot be more precisely classified. They can date from the late 12th to the 16th century AD. See also Castle - Anglo-Norman masonry castle; Castle - hall-house; Castle - motte; Castle - motte and bailey; Castle - ringwork; Castle - ringwork and bailey; Castle - tower house.

Chapel A free-standing building which is used for private worship. These date from the late medieval period (c. 1400 to the 16th century AD) onwards.

Church A building used for public Christian worship. These can be of any date from c. 500 AD onwards.

Corn store A large building used for the storage of grain. These date to the 18th and 19th centuries AD.

Country house The rural residence of the landed gentry. These houses date from the late 17th century to the first half of the 19th century AD.

Courthouse A building in which a judicial court is held. These date from the 16th century AD onwards.

Enclosure An area defined by an enclosing element (e.g. bank, wall, fosse, scarp), or indicated as such cartographically, and occurring in a variety of shapes and sizes, possessing no diagnostic features which would allow classification within another monument category. These may date to any period from prehistory onwards.

Fulacht fiadh Prehistoric site potentially used for a variety of purposes such as cooking, brewing, bathing, textile dying etc. Characterised by a crescentic mound of burnt stone; usually located in damp areas, where the trench (trough) for cooking would fill with water; usually found in groups (plural: *fulachta fiadh*).

Graveyard The burial area around a church. These date from the medieval period (5th-16th centuries) onwards.

Headstone An upright stone placed over the head of a grave. These date from 17th century AD onwards.

Hermitage A secluded place, either a man-made structure or a natural feature, such as a cave, where a hermit lived. These date from the medieval period (5th-16th centuries AD).

Historic town A settlement of pre-AD 1700 date that occupied a central position in the communications network, functioned as a market centre and had an organised layout of streets with a significant density of houses and associated land plots. In addition, examples of one of the following monument classes should be present: town defences; castle/tower house; house (which functioned as a manor house); parish church/cathedral; religious house(s); administrative institution (e.g. town hall, market-house); judicial institution (e.g. courthouse, prison); monuments indicating specialised technological production (e.g. mill, kiln, tannery, ironworking site); bridge; hospital; school; quays. Where only documentary evidence survives to suggest a town was present then the term 'Historic town possible' applies.

Holy well A natural spring or well associated with a saint or a tradition of cures.

Hospital A building for the care of the sick, aged, infirm and poor. These day from the medieval period (5th-16th centuries AD) onwards.

House (18th/19th century) A building for human habitation which dates to the 18th/19th century and which is not classifiable as either a country house or a vernacular house.

House (20th century) A building for human habitation which dates to the 20th century and which is not classifiable as either a country house or a vernacular house.

Library A building, room or suite of rooms where books, or other materials, are classified by subject and stored for use by the library's members. These date from the 17th century AD onwards.

Market-house A market building incorporating other function rooms, e.g. theatres, courtrooms, schoolrooms. In Ireland market-houses are sometimes colloquially referred to as tholsels. These date from the later medieval period (12th-16th centuries AD) onwards.

Mass-rock A rock or earthfast boulder used as an altar or a stone-built altar used when Mass was being celebrated during Penal times (1690s to 1750s AD), though there are some examples which appear to have been used during the Cromwellian Period (1650s AD). Some of these rocks/boulders may bear an inscribed cross. See also Penal Mass station.

Milling complex A series of post-1700 AD structures associated with milling, including any of the following: mill, millpond, millrace, engine house, industrial chimney, administrative buildings and workers' factory.

Mill (unclassified) A mill, including where present the millrace and millpond, where corn is ground or where raw material is processed. This classification is used, in the context of this database, when it is unclear whether the mill in question is a water mill or a windmill. These may date from the late medieval period (c. 1400 to the 16th century AD) onwards.

Pier/jetty A structure, extending out into the water, built of iron, wood or stone, for docking or accessing ships or boats. They may also serve to protect a harbour, influence the current or tide and are sometimes used as promenades. These may date to any period from prehistory onwards.

Prison An establishment where offenders are confined. These date from the late medieval period (c. 1400 to the 16th century AD) onwards.

Quay A stone or timber landing-place built parallel to, or projecting out from, the shoreline, to serve in the loading and unloading of vessels. These date from the Iron Age (c. 500 BC - AD 400) onwards.

Redundant record Records classed as 'Redundant record' are those that fulfil one or more of the following criteria: (1) a record identifying a location where, according to documentary sources (e.g., published reference, cartographic sources) or personal communication, a monument might have existed, but which, on inspection, was found not to be an archaeological monument (e.g. a natural feature); (2) a record classified using a term which is now obsolete (e.g. ecclesiastical remains); (3) a record created in error, a duplicate record or one which has no supporting evidence recorded on file or in the database; (4) an archaeological object (i.e. an artefact), e.g. a quernstone; (5) a record entered as a 'Shipwreck'. Shipwrecks are recorded in a separate database.

Ringfort Early medieval Christian (*c*. 500 AD to 1100) defended secular settlement consisting of a bank and external ditch defining a central circular area that contained dwelling structures of occupants; also called fairy fort, rath, lios, or cashel (the latter constructed of stone as opposed to earth).

School An establishment in which people, usually children, are taught. These date from the late medieval period (c. 1400 to the 16th century AD) onwards.

Shambles Structure/structures where animals were slaughtered and/or where meat and fish were sold. These date from the medieval period (5th-16th centuries AD) onwards.

Souterrain An underground structure consisting of one or more chambers connected by narrow passages or creepways, usually constructed of drystone-walling with a lintelled roof over the passages and a corbelled roof over the chambers. Most souterrains appear to have been built in the early medieval period by ringfort inhabitants (c. 500 - 1000 AD) as a defensive feature and/or for storage.

Standing Stone A stone which has been deliberately set upright in the ground, usually orientated on a north-east-south-west axis, although other orientations do occur, and varying in height from 0.5m up to 6m. They functioned as prehistoric burial markers, commemorative monuments, indicators of routeways or boundaries and date from the Bronze and Iron Ages (c. 2400 BC - AD 500), with some associated with early medieval ecclesiastical and burial contexts (c. 5th-12th centuries).

Tomb (chest tomb) A free standing, box-like funerary monument. These date from the 13th century AD onwards. Examples that are incorporated in a wall are classified as Wall monument. Examples with an effigy are classified as Tomb – effigial.

Town hall A large building used for the transaction of the public business of a historic town (pre-1700 AD), the holding of courts of justice, entertainments and other activities. In Ireland, town halls are sometimes colloquially referred to as tholsels.

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