Celtic Interconnector

Route Options Review

In the Vicinity of Churchtown

March 2021

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EXECUTIVE SUMMARY

The Celtic Interconnector is a subsea link that will enable the exchange of electricity between the electrical transmission grids in Ireland and France. The key elements of the project onshore in Ireland comprise:-

- A landfall at Claycastle Beach, Youghal, Co. Cork;
- A High Voltage Direct Current (HVDC) Underground Cable (UGC) between Claycastle, and a converter station, to be sited at the Industrial Development Agency (IDA) landholding at Ballyadam, east of Carrigtohill;
- A converter station at Ballyadam, to convert HVDC electricity to High Voltage Alternating Current (HVAC), as used on the Irish electricity grid, and vice versa;
- A HVAC UGC between the Ballyadam converter station and the grid connection point at the existing Knockraha substation, near Watergrasshill, Co. Cork.

The Irish onshore elements of the project have been developed in accordance with EirGrid's six-step Framework for Grid Development. The project is now in Step 5 of the process, where an identified "Best Performing Option" forms the focus for technical and environmental assessment. This will culminate with submission of applications for Statutory consent.

This Route Options Review concerns the area and environs of Churchtown, between Castlemartyr and Midleton, Co. Cork. The Review comprises a focused description and a comparative evaluation of the various alternative HVDC UGC route options in this area. The undertaking of this Review fulfils a commitment to the Churchtown Residents Group (CRG).

This Review has been undertaken by a team of Technical, Environmental, Ecological, Planning, Engineering, Agricultural and other specialists in EirGrid, having regard to both issues and concerns raised by the CRG, and in engagement with representatives from key stakeholders such as Cork County Council (CCC), Iarnród Eireann (IE), Transportation Infrastructure Ireland (TII), and the Cork Roads Design Office (RDO).

There are 5 main HVDC UGC alternatives that are considered in this report:

- The Churchtown Road (Shanty Path) and local roads;
- The disused Midleton-Youghal railway corridor;
- The existing N25 corridor extending west of Midleton;
- The built-up area of Midleton;
- Typical off-road / cross-country options in the vicinity of Churchtown.

These route alternatives are qualitatively evaluated by reference to Technical, Economic, Environmental, Socio-Economic and Deliverability criteria, as well as having regard to public and stakeholder engagement and feedback.

Following consenting, construction of the project will be undertaken by an appointed Contractor who will prepare a detailed design of the development – exactly where the cable will be laid within the consented area, and any other specific matters for its construction and installation. In consultation with EirGrid, the Contractor will also prepare a detailed

Construction Environmental Management Plan (CEMP), Traffic Management Plan (TMP), Waste Management Plan, other Management Plans and/or associated Method Statements.

The laying of UGC is a standard construction technique undertaken by a range of utility and other services providers. On public roads, traffic control measures will be implemented as appropriate, including road diversions, closures and stop / go traffic management. Joint bays (underground chambers) are used to pull various lengths of UGC through pre-installed ducts and to connect ("joint") together those lengths of UGC into a single overall circuit. Off-road passing bays, constructed adjacent to a joint bay, facilitates the through movement of traffic. For off-road UGC laying, a working area of approximately 30 metres is required, with a permanent strip of 14 metres required to be kept free from obstruction or vegetation that could potentially damage the UGC or restrict access to it over the course of its operation.

The HVDC UGC will generate a static magnetic field. These fields are called Electromagnetic Fields (EMFs). To avoid any potential public risk in close proximity to electrical infrastructure, national and international health and regulatory authorities have recommended exposure limits for EMFs. It is EirGrid's policy to design and operate the electricity transmission system such that these limits are not exceeded. The static magnetic field directly over the HVDC UGC, when the cable is at maximum circuit loading, is predicted to be comparable with the naturally occurring earth's magnetic field. This is multiples lower than the recommended continuous exposure limit set out in international guidelines.

The Review concludes that the Churchtown Road route option is the Best Performing Option of the various alternatives for the following reasons:-

- From a Technical perspective, the option is not unduly complex in comparison with the other options; avoidance of impact on an existing watermain within the road is a standard matter of detailed design and construction methodology;
- From an Economic perspective, the option is of generally greater length in comparison with the other options; however, its relatively straightforward construction relative to the other options is likely to result in equal or lower overall construction costs;
- From an Environmental perspective, the option is laid within the public road, within an area that has no flood risk. Temporary noise, disturbance and disruption is likely to be inevitable for all options – this is mitigated by the linear progression of construction;
- From a Socio-Economic perspective, all options have different issues. Community sentiment, anxiety and concerns regarding the provision of HVDC UGC within the road in the Churchtown area is acknowledged. Such concern is primarily articulated in terms of potential health impacts arising from the presence of magnetic fields. However, it is confirmed that levels arising in this area will be many multiples below established international guideline risk limits.
- From a Deliverability perspective, the option is equivalent or lesser than the other options, all of which have different factors arising.

1. Introduction

1.1 Project Overview

The Celtic Interconnector is a subsea link that will enable the exchange of electricity between the electrical transmission grids in Ireland and France.

The transmission grids in both Ireland and France are operated at High Voltage Alternating Current (HVAC). High Voltage Direct Current (HVDC) is used for the transmission of electricity over large distances where HVAC is not technically or economically feasible.

The main elements of the planned Celtic Interconnector project in Ireland are:

- A High Voltage Direct Current (HVDC) submarine cable of approximately 500 km in length laid between Brittany in France, and East Cork in Ireland;
- A landfall area at Claycastle Beach, Youghal, Co. Cork, where the HVDC submarine circuit will come onshore;
- A HVDC onshore underground cable (UGC) circuit between the landfall area and a converter station compound, planned to be located at the Industrial Development Agency (IDA) Ballyadam landholding, east of Carrigtohill; this will convert the electricity from HVDC to HVAC and vice versa;
- A HVAC UGC circuit between the converter station compound and the connection point to the National Grid at the existing ESB Networks (ESBN) Knockraha substation. This will require a new Cable Sealing End Compound to facilitate this connection;
- A fibre optic link, with associated power supply, will also be laid along the route for operational control, communication and telemetry purposes.

1.2 Project Development

The Celtic Interconnector project has been in development for some ten years; a significant portion of this time involved investigating, and ultimately confirming, the feasibility of the project. The Irish onshore elements of the project have been developed in accordance with EirGrid's six-step Framework for Grid Development, as summarised in Figure 1.1. The Framework ensures that project development occurs in a consistent and structured manner, with adequate and appropriate opportunities for public and stakeholder participation in project decision-making.

Figure 0.1: EirGrid Six-Step Framework for Grid Development (Source: EirGrid)

The Framework approach, in summary, is that each "Step" concludes with outcomes (such as decisions, next steps etc.) that build upon each other. Deliverables within the Steps, such as reports, brochures etc., are available on the project website at www.eirgridgroup.com.

With particular regard to the identification of siting and routing options for the Celtic Interconnector project, EirGrid, together with its onshore Consultants Mott MacDonald, have undertaken Steps 3 and 4 of the Framework, with associated deliverables including:

- **STEP 3:** *Onshore Constraints Report April 2019*, identifying multiple options for converter station sites and landfall locations. The report did not identify route options;

- **STEP 3:** *Preferred Options Report August 2019*, identifying a shortlist of converter station sites and landfall locations. Again the report does not identify route options, however it confirms (Section 1.3 of the Step 3 report) that connections will be by way of UGC, and that (Section 3.3.2 of the Step 3 report) it is EirGrid's preference to install the UGC within existing public roads;

- **STEP 4A:** *Consultant's Development Options Report November 2019*, identifying an "Emerging Best Performing Option" (EBPO) for the project in Ireland, and for the first time identifying project route options (Section 3 of the Step 4A report). While route sections had been initially identified to inform consideration of the Step 3 site/landfall options, these were considered in more detail in this report in respect of each shortlisted converter station site and landfall location. Appendix C of the Step 4A report identifies all the various route sections considered. Section 3.2.3 of the Step 4A report specifically notes that various potential options had a common convergence in the area of Churchtown, such that the report considered potential HVDC routes from the Churchtown area to each Landfall Location, and HVDC routes from the Churchtown area to each Converter Station Site;

- **STEP 4B:** *Consultant's Development Options Report November 2020*, identifying the "Best Performing Option" (BPO) for the proposed onshore development in Ireland, mapped at Appendix B of the Step 4B report, and reproduced at Figure 1.2 below. Of note, the Step 4B report concludes (Section 5.1) that *"this identified BPO is subject to change as studies and assessments are ongoing ….. however, it will form the basis for ongoing design and assessment up to presentation of a proposal for consenting…"*.

The project is now in Step 5 of the Framework process, whereby the BPO forms the focus for technical and environmental assessment (see Figure 1.2). This will culminate with submission of applications for Statutory consent – in Ireland consents will be sought from the Strategic Infrastructure Division (SID) of An Bord Pleanála (onshore element), and from the Department of Housing, Local Government and Heritage (foreshore element).

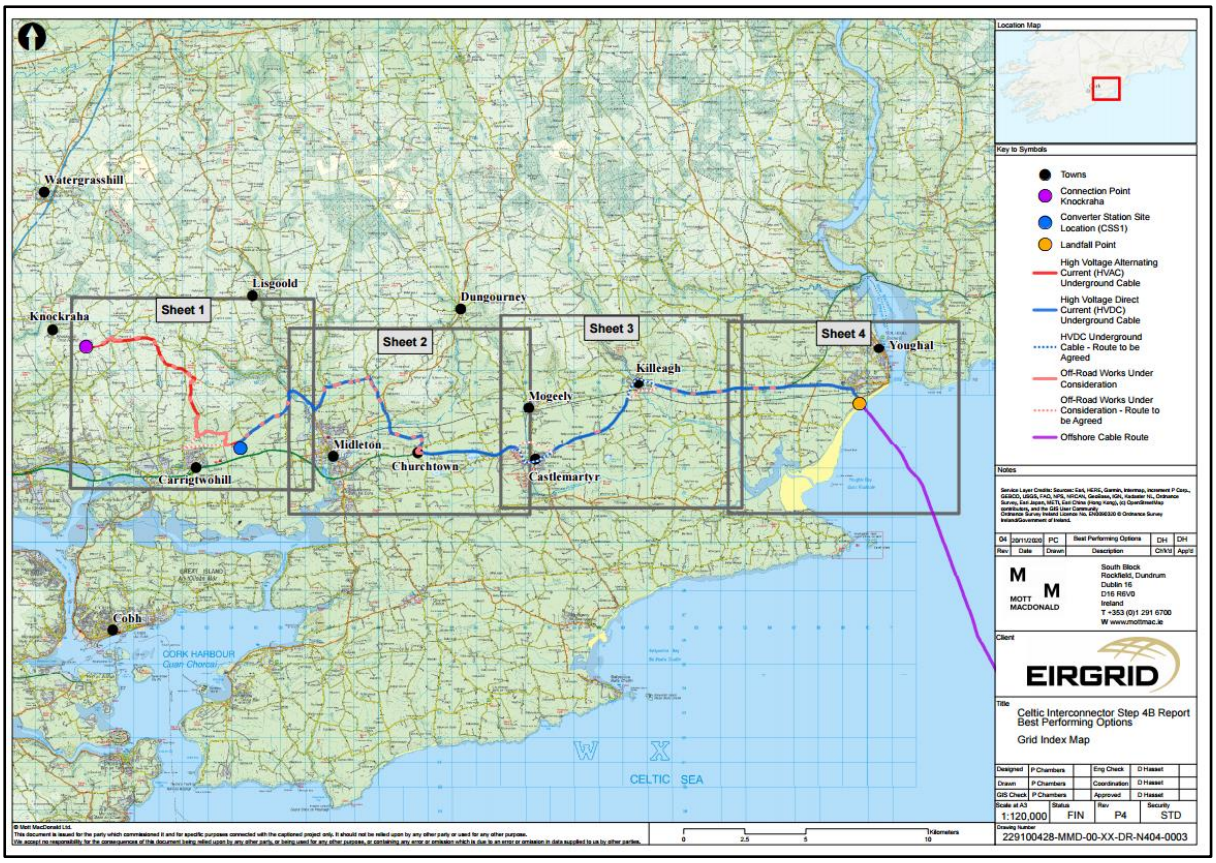

Figure 0.2: Map of Best Performing Option (BPO) for the Celtic Interconnector project, from Appendix B of the Step 4B *Consultant's Development Options Report November 2020* (Source: Mott MacDonald)

1.3 Purpose and Scope of this Route Options Review

As noted above, in November 2020 EirGrid closed Step 4 with publication of the BPO. This was communicated via two webinars, press advertising, a press release, an email to registered email addresses (circa 600), a letter to registered stakeholders (circa 1500), social media, and direct contact to elected representatives as well as to community organisations who had engaged on the project. This was also covered by local and national print and radio media.

Due to Covid restrictions, there was (and remains) a significant constraint to direct external engagement activities (e.g. door to door calls). However, to ensure the message of the BPO had been received by individuals and communities along the project route, EirGrid issued a further letter in February 2021 to registered property owners on the project route, which included direct contact details of the project Community Liaison Officers. This was issued by EirGrid to the Property Registration Authority Ireland (PRAI) official sourced database of landowners on the project route. (Circa 650).

EirGrid was subsequently contacted by a number of residents in the Churchtown / Roxborough area (hereinafter referred to as "Churchtown") with a number of stated concerns, including that:-

- The project consultation process had excluded the Churchtown residents until now;
- The residents of Churchtown had no knowledge of the project until now;
- The laying of the HVDC UGC within the local road at Churchtown would have adverse health impact from Electro-Magnetic Fields (EMF); and,
- EirGrid should amend the BPO UGC route in the Churchtown area.

EirGrid subsequently had two online meetings with the Churchtown Residents Group (CRG) in March 2021 to listen to, and respond to, concerns raised. EirGrid also met twice with the East Cork Municipal District Council (MDC) in March 2021, where many of the CRG concerns were also raised.

At these meetings, EirGrid committed to undertake a review of route options identified in the Step 4A and Step 4B route identification processes. This review would also include consideration of off-road/cross-country routes, which had not previously been considered given EirGrid's stated preference to install UGC within existing public roads as noted in Section 1.2 above. This review was planned to be completed by the end of March 2021.

The Route Options Review concerns the area and environs of Churchtown. This comprises a focused description of the various alternative route options in this area (see Figure 1.3), and a comparative evaluation of same, identifying the considered Best Performing Option for the HVDC UGC in the vicinity of Churchtown as of March 2021. While other queries were raised during meetings with the Churchtown Residents Group relating to other potential landfall areas etc., these are not included within this Review, as they are considered to have been adequately considered through the project development process. Similarly, the choice of technology is not being considered in this Review, for example the use of Overhead Line (OHL), nor is the choice of converter station location or connection point (substation).

This Review has been undertaken by a team of Technical, Environmental, Ecological, Planning, Engineering, Agricultural and other specialists in EirGrid, having regard to both the issues raised by the CRG, and in engagement with representatives from key stakeholders such as Cork County Council (CCC), Iarnród Eireann (IE), Transportation Infrastructure Ireland (TII), and the Cork Roads Design Office (RDO).

There are therefore 5 main HVDC UGC alternatives that are considered in this Review – these are mapped as indicative/illustrative options and outlined below. For comparative purposes, all options are considered from the general intersection point of the planned off-road HVDC UGC route at Castlemartyr with the Mogeely Road, to the site of the planned converter station at the north-eastern portion of the IDA Ballyadam landholding – Table 1.1 below identifies the approximate distances of these options:-

- **The Shanty Path and Local Roads (Figure 1.3)** – extending westwards on the N25 to the Two Mile Inn junction; a short off-road section in the vicinity of the junction of the N25 at Two Mile Inn to avoid the existing junction; within the local road in Churchtown (known as the Shanty Path); local road network to north of Midleton and south-westwards to the converter station site;

- **The disused Midleton-Youghal railway corridor (Figures 1.4-1.9)** - currently under development by Cork County Council as a Greenway; access point options at Mogeely and Ballinascartha**;** egress point options at the Shanty Path, Midleton – R627, and extension along the existing Cork-Midleton railway line to the converter station site;

- **The existing N25 corridor (Figure 1.10)** - extending west of N25 junction at Two Mile Inn; to the south of Midleton to the area of the IDA Ballyadam site at Carrigtohill**)**; within the Ballyadam site; this portion of the N25 is currently planned for a major road improvement;

- **The built-up area of Midleton (Figures 1.11-1.12)** - extending west of N25 junction at Two Mile Inn; access options from N25 via the R907 Youghal Road and the R630; extending north to the local road network of the local road network;

- **Typical off-road/cross-country option in the vicinity of Churchtown (Figure 1.13)** – a study area has been identified for this option, as well as indicative/typical UGC options extending on a south-east – north-west alignment (Option 1) and a south-north alignment (Option 2); both options extend from the N25 to the off-road location of the current BPO, west of the Shanty Path, south of the disused railway corridor.

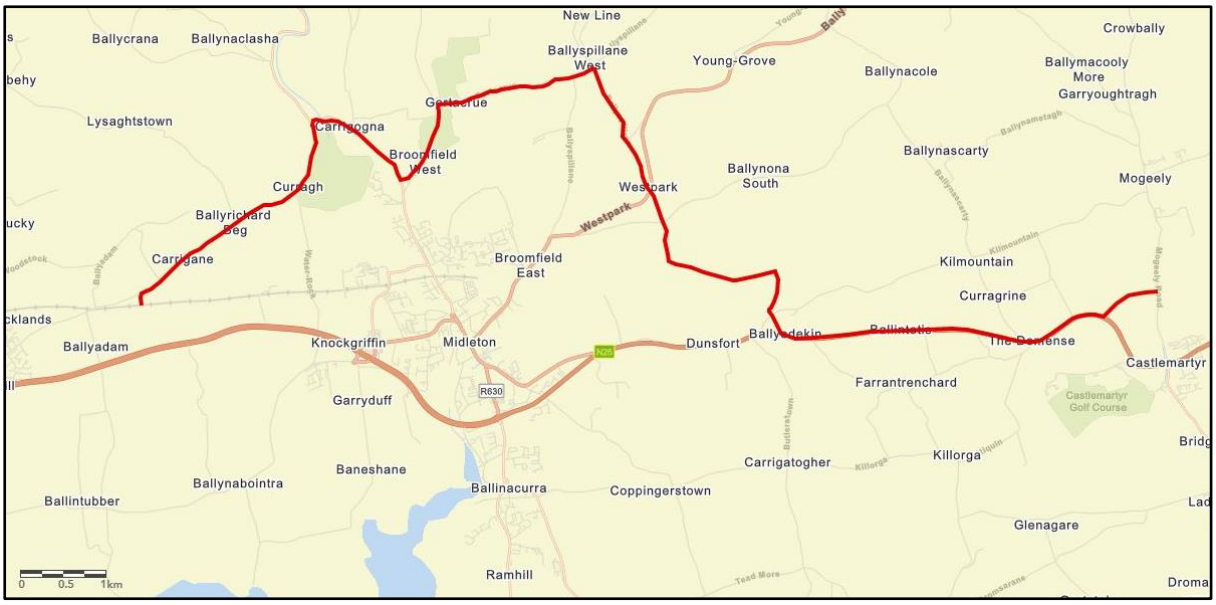

Figure 0.3: Map of Option along N25, Shanty Path and Local Roads (Source: EirGrid/ESRI)

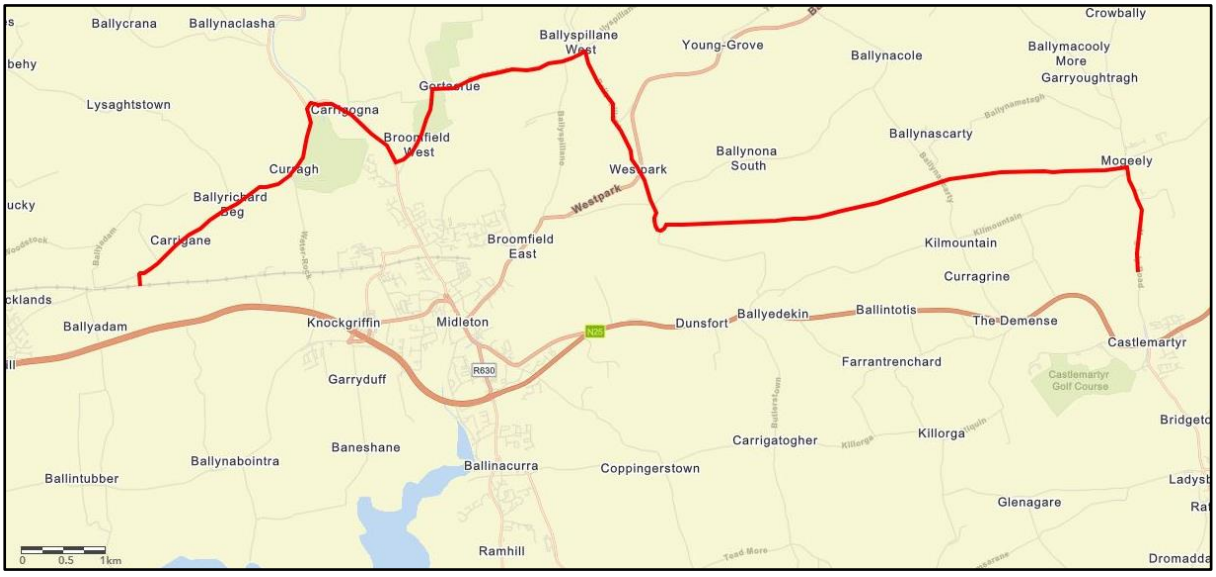

Figure 0.4: Map of Option along Disused Railway Corridor from Castlemartyr to Shanty Path and Local Roads (Source: EirGrid/ESRI)

Figure 0.5: Map of Option along Disused Railway Corridor from Castlemartyr to Midleton and Local Roads (Source: EirGrid/ESRI)

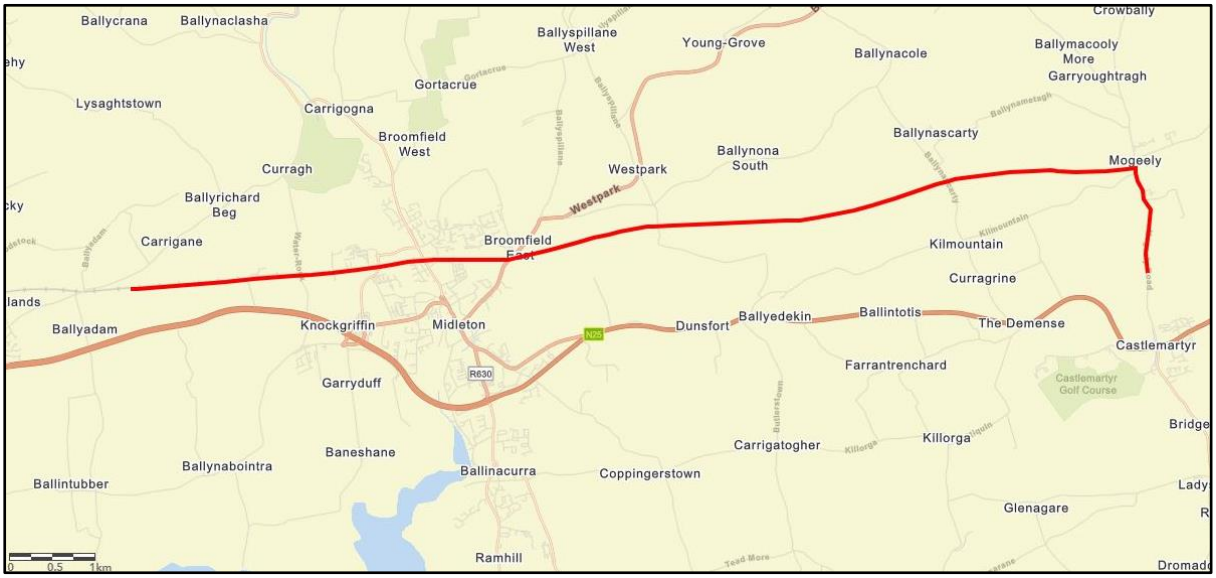

Figure 0.6: Map of Option along Disused Railway Corridor from Castlemartyr to Ballyadam via existing operational railway line corridor (Source: EirGrid/ESRI)

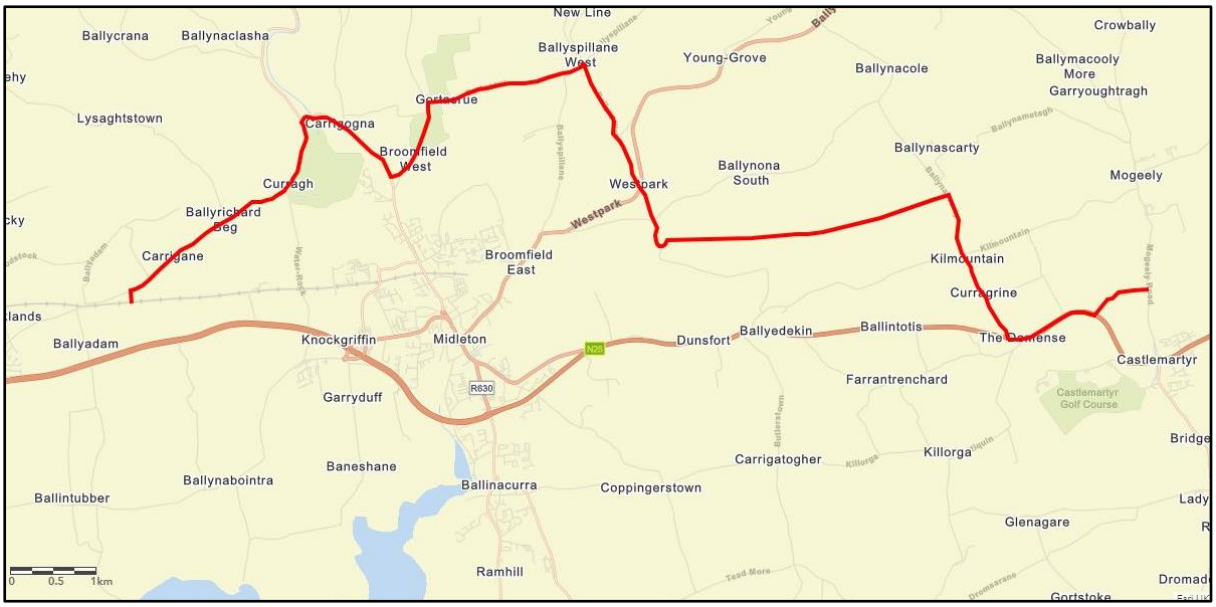

Figure 0.7: Map of Option along Disused Railway Corridor from Ballinascartha to Shanty Path and Local Roads (Source: EirGrid/ESRI)

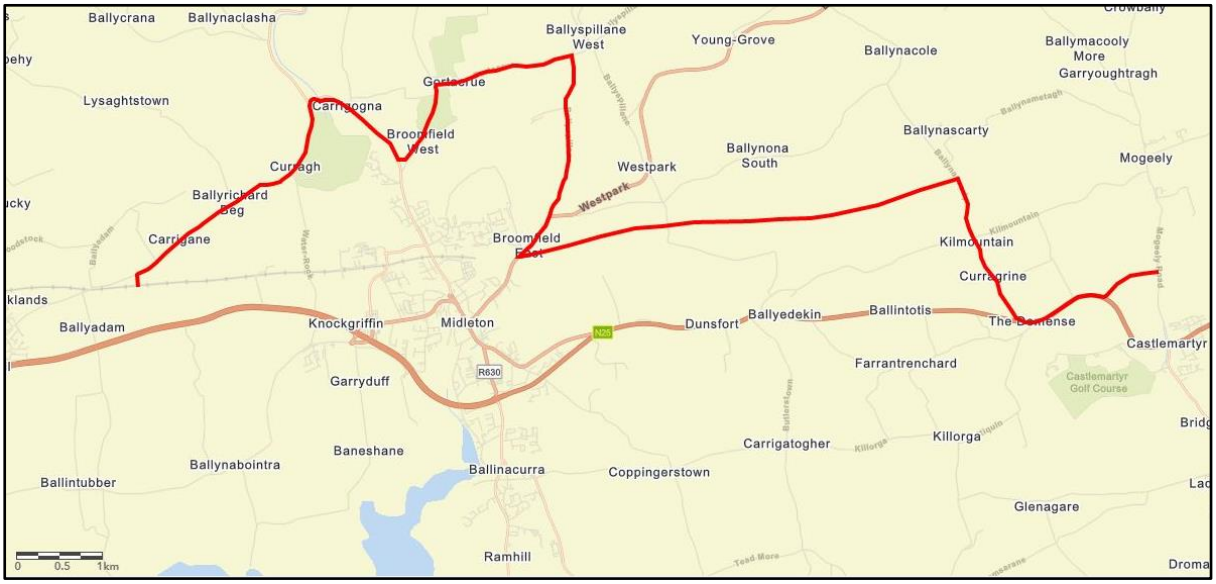

Figure 0.8: Map of Option along Disused Railway Corridor from Ballinascartha to Midleton and Local Roads (Source: EirGrid/ESRI)

Figure 0.9: Map of Option along Disused Railway Corridor from Ballinascartha to Ballyadam via existing operational railway line corridor (Source: EirGrid/ESRI)

Figure 0.10: Map of Option along N25 to Ballyadam (Source: EirGrid/ESRI)

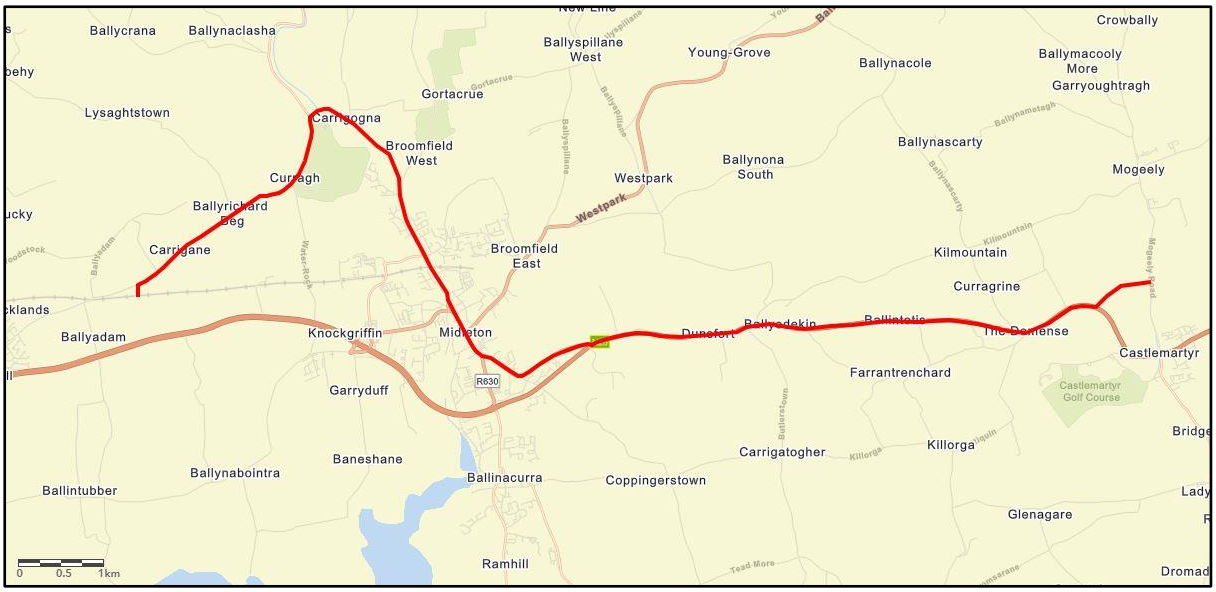

Figure 0.11: Map of Option along N25 via Midleton (R907) and Local Roads (Source: EirGrid/ESRI)

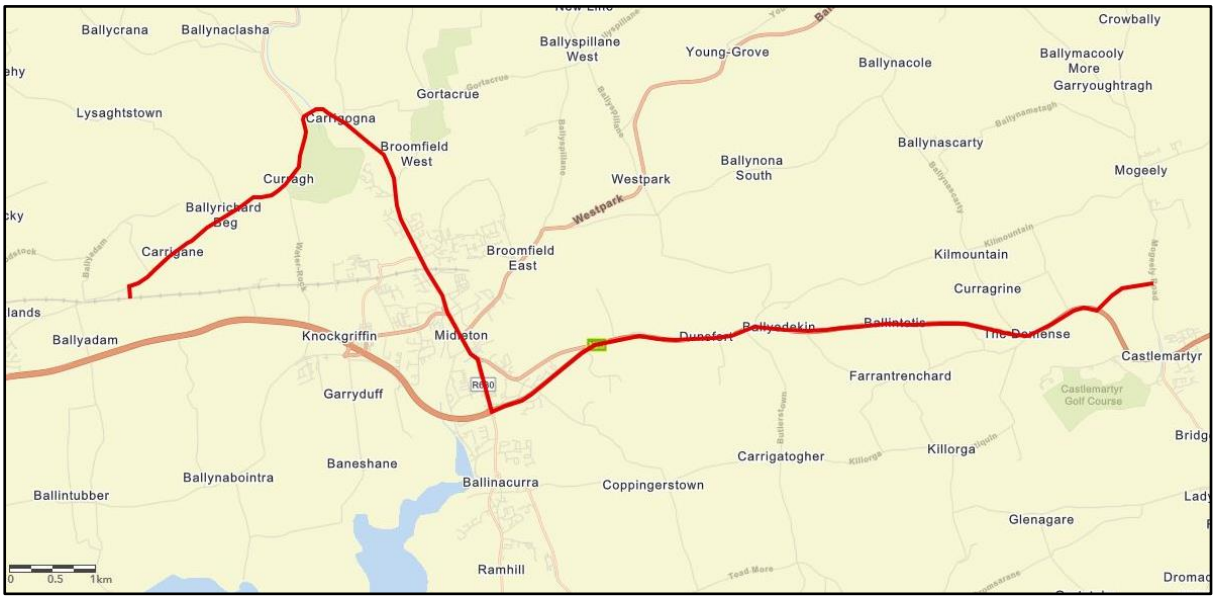

Figure 0.12: Map of Option along N25 via Midleton (R630) and Local Roads (Source: EirGrid/ESRI)

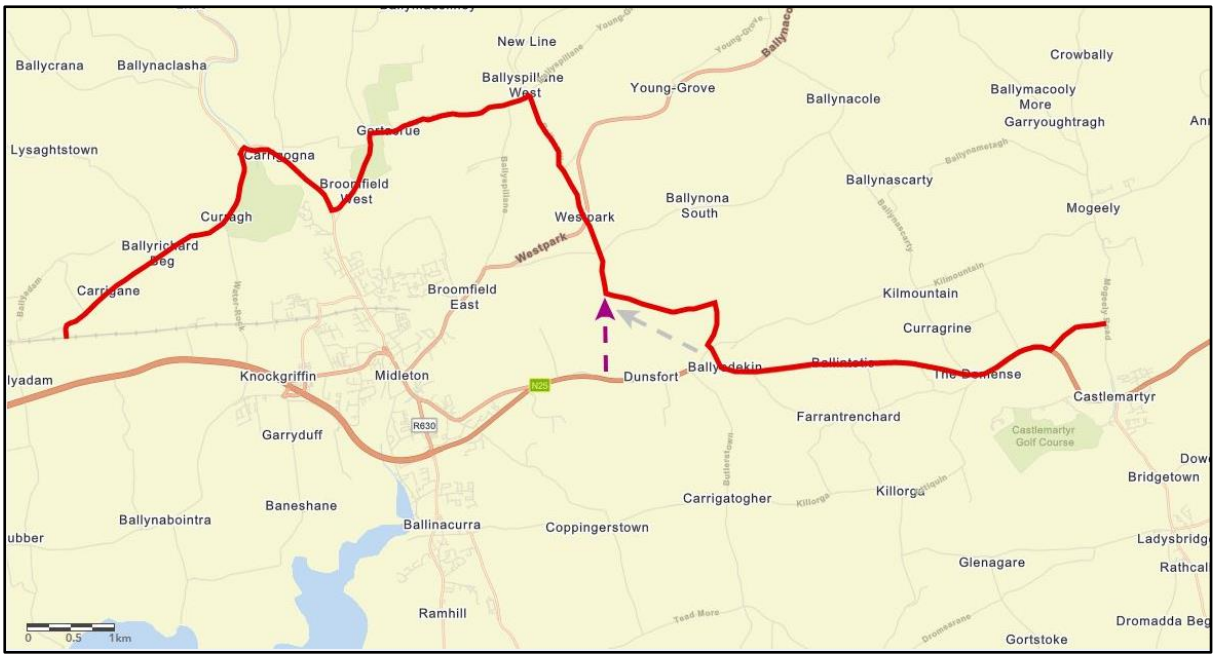

Figure 0.13: Map of off-road study area, showing indicative alignments for off-road UGC options in the Churchtown area (Source: EirGrid/ESRI)

Route Alternative	Approximate Distance between Off-Road HVDC UGC and Converter Station Site at Ballyadam (Km)
Shanty Path and Local Roads	16.8
Disused & Operational Railway Corridor (Castle Martyr to Ballyadam	13.2
Disused & Operational Railway Corridor (Ballinascartha to Ballyadam	13.4
Disused Railway Corridor Castlemartyr to Midleton (R627)	18.5
Disused Railway Corridor Ballinascartha to Midleton (R627)	18.6
Disused Railway Corridor Castlemartyr to Shanty Path	16.9
Disused Railway Corridor Ballinascartha to Shanty Path	17.1
N25 West of Midleton	13.9
Midleton via R907	15.2
Midleton via R630	15.9
Typical Off-Road Option 1	16.4 (of which 2.1 off-road)
Typical Off-Road Option 2	17.2 (of which 2.7 off-road)

Table 0.1: Approximate Distance (Km) of alternatives considered in this Route Options Review - calculated from off-road HVDC at intersection with Mogeely Road, Castlemartyr to the Converter Station at IDA Ballyadam Landholding.

2. Approach and Methodology

2.1 Multi Criteria Analysis (MCA)

In accordance with EirGrid's Framework for Grid Development, a comprehensive and consistent multi criteria analysis has been applied to decision making over the various Steps of project development, including in the consideration of a variety of alternatives. It is appropriate that a similar approach is adopted in this Route Options Review in considering alternative options for that portion of the HVDC UGC in the vicinity of Churchtown.

The multi criteria analysis considers the following criteria relating to project development, as illustrated in Figure 2.1, as well as in relation to public and stakeholder feedback received:

- Technical;
- Economic
- Environmental
- Socio-Economic
- Deliverability

These align with EirGrid's statutory obligations under Article 8 of the European Communities (Internal Market in Electricity) Regulations, 2000 (SI 445/2000, which requires EirGrid as State electricity Transmission System Operator (TSO) *"to operate and ensure the maintenance of and, if necessary, develop a safe, secure, reliable, economical and efficient electricity transmission system, and to explore and develop opportunities for interconnection of its system with other systems, in all cases with a view to ensuring that all reasonable demands for electricity are met and having due regard for the environment"*.

Figure 2.1: EirGrid's Assessment Criteria (Source: EirGrid)

2.2 The Performance Matrix

The MCA approach facilitates a balanced consideration of the technical, economic, environmental, socio-economic and deliverability aspects of a development project.

The overall evaluation in MCA is based on expert judgement; this is informed by various tools such as publically available datasets and established guidelines or other documents, as well as feedback received from public and stakeholder engagement. In this instance, the MCA also has had regard to assessment and analysis undertaken to date in respect of the Celtic Interconnector project, as captured in the various reports available on the project website at www.eirgridgroup.com.

The key decision-making tool in the MCA approach is the performance matrix (Figure 2.2). This is a qualitative tool which uses the standard set of criteria to assess all options by means of colour coding. Evidence substantiating the colour coded matrix is also documented. This ensures visibility and transparency in the evaluation process.

Criterion	Option 1	Option 2	Option 3	....	Option N
Technical				....	
Economic				....	
Environmental				....	
Socio-Economic				....	
Deliverability				....	

Key
Light Yellow
Green
Dark Green
Blue
Dark Blue

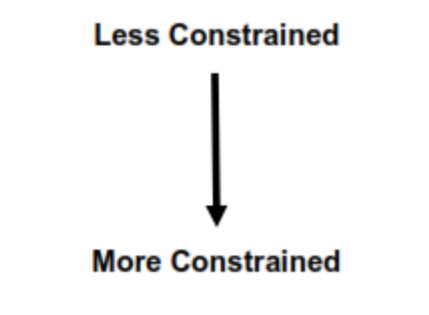

Figure 2.2: Typical Performance Matrix and identified criteria (qualitative scoring of options indicative only and do not relate to this Route Options Review)

3. Relevant Matters of Construction and Operation

3.1 The Appointed Contractor

The Celtic Interconnector, including the HVDC UGC between the landfall area at Claycastle Beach and the converter station at Ballyadam, is being planned by EirGrid together with its specialist technical and environmental consultants. However, the actual construction of the project will be undertaken by an appointed Contractor.

Consents for the proposed development are usually accompanied by stipulated conditions set out by the decision-making authority. In the case of the DC UGC, the decision-maker is the Strategic Infrastructure Division (SID) of An Bord Pleanála. These conditions require significant matters of detail to be agreed post-consent between the developer and the planning authority – in this case Cork County Council (CCC). CCC will ultimately be responsible for ensuring all conditions are discharged and complied with.

As part of this post-consent process, the Contractor will carry out detailed surveys and other site investigations, and ultimately draw up a detailed design of the consented development – exactly where the cable will be laid (within the area of the consented development) , and any other specific matters for its construction and installation.

The contractor will also prepare a detailed Construction Environmental Management Plan (CEMP), Traffic Management Plan (TMP), Waste Management Plan (WMP), and other Management Plans and/or associated Method Statements. In particular:-

- The CEMP is a 'live' document which is reviewed regularly and revised as necessary to ensure that the measures being implemented are effective. The primary objective of the CEMP is to safeguard the environment, site personnel and nearby sensitive receptors – including people and properties - from site activity which may cause harm or nuisance. The CEMP sets out a project framework to ensure key mitigation measures and conditions of the consent process are translated into measurable actions, and are appropriately implemented during the construction phase of the development. As part of this framework, EirGrid will oversee the Contractor's delivery of transparent and effective monitoring of the receiving environment during construction to inform and manage on-going activities on site and to demonstrate effectiveness of the measures outlined therein.
- The TMP will be developed and implemented to mitigate any potential construction traffic impacts on the public road network. All construction activities, including construction traffic, will be managed through the CEMP.

When agreed with the planning authority, these Management Plans and Method Statements are also approved by a Clerk of Works (CoW) and Environmental Clerk of Works (EnCoW) prior to commencement of any works. The EnCoW is responsible for ensuring that all environmental and ecological mitigation measures detailed in the contractor's CEMP and any associated Method Statements, are implemented in full, as well as on-site monitoring

and reporting. The EnCoW may be supported by further technical specialists, to monitor, and oversee protection (e.g. for ecology, archaeology or water quality).

Overseen by EirGrid, the Contractor will also make all monitoring reports available to the planning authority and other statutory bodies as required.

The Contractor will also have responsibility for ongoing liaison with communities and landowners regarding matters of construction of the project. However, EirGrid's Community Liaison Officers (CLOs) and Agricultural Liaison Officers (ALOs) will also continue to actively participate on the project, and be available to landowners, residents and communities.

3.2 Cable Route Installation Schedule

The laying of underground cables is a standard construction technique undertaken by a range of utility and other services providers. Cables will typically be installed in two phases, as follows:

- Duct and joint bay installation; and
- Cable pulling and jointing

Duct and joint bay installation (see Section 3.3 below) are the most construction-intensive and invasive elements of cable route installation, as digging of a trench will be required. For on-road cable laying, this phase will have the largest impact on traffic disturbance, including the potential need for rolling road closures (to through traffic) and diversions. While the specifics of any cable laying schedule are dependent upon the nature and location of the project, it is generally the case that cable ducts can be laid in a road at a rate of approximately 50m plus per day. Joint bays, generally located at intervals of 750 metres along the HVDC route of the Celtic Interconnector (shorter intervals occur where the route alignment is more complex), are typically installed in 1 – 2 days with the road fully reinstated.

Road reinstatement along the route of the cable trench follows the completion of the trenching and ducting as it moves along the route. Cable pulling and jointing, which commence when the trenching and ducting is well advanced along the route, is executed from the joint bay locations. Where this activity would likely require a road closure to be undertaken, the provision of a passing bay at the location of the joint bay will facilitate through movement of traffic along the road by means of a single traffic signalled lane at the joint bay.

3.3 Underground Cable Construction

The following sections describe the key project elements of the DC UGC route. It should be noted that this construction methodology is the same as for any Alternating Current (AC) UGC route – for example as proposed for the Celtic Interconnector between the converter station at Ballyadam and the grid connection point at Knockraha, Co. Cork, or as undertaken on other cable-laying projects in Ireland.

Underground Cable Laying in Public Roads

The UGC will be pulled into pre-installed ducts laid within a trench. The installation conditions of the cable, including depth, affect its performance. The standard trench dimensions for a DC UGC is approximately 0.8m wide x 1.3m deep. The final specific trench dimensions will be confirmed by the appointed DC UGC contractor at detailed design stage.

Traffic control measures will be implemented as appropriate, including road diversions, closures and stop / go traffic management. Once the traffic control measures are in place, the road surface will be saw-cut to the width of the trench and excavated to the required depth, generally using an excavator with hydraulic breaker. Where underground services are present, excavation around these services may require to be by hand digging. The trench walls are temporarily supported, typically with wooden shuttering boards. When a trench length of approximately 20m to 50m has been excavated and temporarily supported, a layer of bedding material (sand, concrete or sand / cement mix) is laid onto the base of the trench.

The ducts are then installed onto the bedding in the correct arrangement, and the trench is backfilled and compacted with thermally suitable back-fill material and marker boards for protection. Following duct installation, the road above the trench will be reinstated to match the environment in which it is installed to the standard required by the relevant authority at that location, in this case Cork County Council (CCC).

The duct installation will progress sequentially starting at one joint bay and moving towards the next joint bay along the route. The construction area moves along in tandem with the progress of the duct installation, with only the relevant portion of the section cordoned off while under construction.

Figure 3.1 shows a typical trench in a public road for a pair of HVDC cables after installation of ducts and prior to back fill. Marker boards can be seen within the trench prior to road reinstatement.

Figure 3.1: Typical DC trench laid in the public road (source EirGrid)

For trench excavation works in roads where space is relatively unconstrained, an excavator is typically used to load a truck with excavated material. The truck extracts the material away from site for appropriate remediation or storage. For roads with a width greater than 3m, an average rate of construction for the cable route is approximately 50m per day. In places, it may be slower than this, particularly where utilities are present and digging by hand may be required; however, across the period of construction, 50m a day is considered a representative average for the proposed works.

Joint Bays and Passing Bays

Cable is manufactured and delivered to site on drums, in lengths of approximately 750 metres. This requires the installation of joint bays along the cable route to connect consecutive lengths of cable together and to facilitate cable pulling.

Joint bays are underground chambers which are used to pull the various lengths of UGC through the pre-installed ducts, and to connect ("joint") together those lengths of UGC into a single overall circuit. A HVDC UGC joint bay is typically 8m x 2.5m x 2m (Figure 3.2).

Provision will also be made for the installation of communications chambers and link box chambers at joint bay locations. The communications chambers are used to join a fibre optic communications cable, while the link box chambers are used to accommodate the link box, which earths the outer sheaths of the power cables. The chambers are provided with removable lids and access to the chambers will be required on a permanent basis to facilitate maintenance. Typically, these chambers are located within the verge to minimise traffic disruption during routine maintenance; this would be similar to other fibre optic or telephone cables.

The open concrete chamber will temporarily support the retained ground on the outside of the chamber during the ducting activities. Once these activities are completed, the open chamber will be temporarily backfilled with appropriate material and the road temporarily reinstated to the satisfaction of the planning authority until such time as cable installation occurs (see further below).

Figure 3.2: Typical Joint Bay under construction.

Joint bays are not readily accessible during operation, as there is no ongoing maintenance required; however, they need to be immediately accessible in the unlikely event of cable failure requiring cable replacement. The extent to which traffic management or other measures would be required in this situation will depend on the location of the joint bay within the roadway.

During the construction phase of the project, where a joint bay is located in a road of a width requiring its closure to undertake the cable pulling and jointing, the provision of a passing bay at the location of the joint bay will facilitate the through movement of traffic along the road by means of single traffic signalled lane at the joint bay. Where a passing bay is not provided in these circumstances, a road closure is required to undertake the work.

The installation of the passing bay entails the removal of the top layer of ground to the side of the carriageway and temporarily storing it locally to the side for reinstatement following the works. The passing bay will then be constructed to a standard agreeable to the planning authority.

This passing bay can then be used for diverted traffic whilst the joint bay works are conducted. Figures 3.3 and 3.4 show passing bays that have been developed for other cable projects.

Figure 3.3: Photograph of Passing Bay under construction (Source: EirGrid)

Figure 3.4: Photograph of Passing Bay in operation. The steel structure in the middle of the picture behind the Harris fence has been placed on top of the joint bay to form an enclosed workspace where cable jointing is taking place. (Source: EirGrid)

In identifying locations for joint bays and associated passing bays along the route, EirGrid will always take care to minimise the amount of mature trees that are required to be removed, having regard for third party landowners, ecological, and landscape impact.

Overseen by EirGrid, the Contractor will carry out suitable reinstatement of all vegetated areas, having regard for sensitive ecological features, and opportunities for biodiversity enhancement of road verges, and hedgerows, relative to pre-construction.

Cable Installation and Jointing

As noted above, the cables will be brought to site on cable drums. Once the drum is set up, a winch system including pulling cable will be attached to the nose of the cable and rollers will be used to guide the cable end towards the duct (Figure 3.5).

Figure 3.5: Photograph of cable installation into the pre-laid ducts at a joint bay (Source: EirGrid)

The cable jointing process is technically complex, and essential to the effective operation of the cables. For this reason, a temporary waterproof shelter system is either placed or constructed around the joint chamber, to protect the cable from moisture and to provide a clean environment in which the jointing process can be undertaken (see Figure 3.6).

Within the joint bay, the cables are pulled into each end of the chamber. The cable ends jointed together within the chamber. Jointing is expected to take approximately one to two weeks per joint bay. It should be noted that jointing usually occurs some significant period of time following cable pulling, and is carried out by specialist personnel.

Following jointing, the joint bay will be backfilled and the road surface permanently reinstated to the standard required by the planning authority at that location.

Figure 3.6: Typical HVDC Cable Jointing Bay enclosure (Source: EirGrid)

Underground Cable Laying in Agricultural Lands

Underground cables laid within agricultural lands (grassland and tillage land) require the same essential components, and follow the same construction methodology as for cable laying in public roads – including trenching and ducting, provision of joint bays, and cable installation and jointing.

EirGrid typically does not acquire these lands but undertakes the works on the basis of a wayleave or easement. This approach provides the necessary rights to lay the cable and provisions for the reinstatement of land. The works on the lands will be undertaken in accordance with a project specific Code of Practice. This provides for a best practice approach to soil management during the works. This approach is a driver for the changes to the construction methodology when compared to that for laying cables in the road

For off-road or cross-country sections of the Celtic interconnector, a temporary working strip of minimum 30m in width is proposed. While the cable trench is typically 1m in width, the 30m working strip is required for the following reasons;

- To facilitate the storage of topsoil which must be removed from;
    - The footprint of the temporary construction access track (typically up to 5m in width)
    - The footprint of the cable trench
    - A buffer strip between the temporary access track and the trench (for safety)
    - Subsoil storage area
    - Materials storage areas
- To facilitate the laying of the temporary construction access track alongside the cable trench to allow for the movement of construction equipment and materials along the section of the route on the farmland.
- To facilitate the excavation of the cable trench and the installation of the cable ducting.
- To facilitate the storage of distinct layers of subsoils excavated from the cable trench in segregated piles for later reinstatement to the original soil profile.

Figure 3.7 shows a typical temporary working strip on agricultural land for electricity cable installation. Stripped topsoil can be seen stored to the left of the strip, temporary construction access road in the centre right with subsoil stripped areas either side for trench installation, materials storage and sub-soil storage.

As noted above, where cables are placed in a public road, the road itself serves to facilitate the movement of vehicles, and the material excavated from the trench is removed off site and so no soil storage areas are required. Similarly, when trenching, ducting and joint bay installation has been completed on a given section of public road, the road can be reinstated for full public use. Cable pulling and jointing works, which as also noted above may not occur for some period (often many months) afterwards at the joint bays, are serviced with materials and equipment by the public road itself.

However, on agricultural land, the temporary access road must remain in place until cable pulling and jointing works have been completed, as it is required to facilitate the movement of materials, equipment and personnel to and from the joint bay locations sited on the land.

For this reason, it is anticipated for the Celtic Interconnector project that any off-road working strip will be unavailable to an affected landowner for a period of up to 18 months - from initial fencing-off to removal of the fence following establishment of grass on the reinstated strip.

Usually, a cross-country cable alignment seeks to follow field boundaries so as to minimise impact on farm operations. There will however be a requirement to cross a number of fields, ditches, hedgerows, or other features as necessary. For minor watercourses, where Horizontal Directional Drilling (HDD) is not employed, watercourse crossings employs an open trench method, which requires removal of field boundaries in the area of the cable alignment, with associated culverting of drainage ditches etc. Such works are normally carried out ‘in the dry’, employing suitable methods to avoid significant impacts to fisheries, in consultation with Inland Fisheries Ireland. When crossing larger watercourses, HDD is generally employed underneath the watercourses, avoiding the need for instream works. Use of HDD methods does, however, require temporary use of an off-road area of land at

either side of the crossing (c. 50 x 60m), to establish reception and launch pits for the cable, and to facilitate other works and storage etc.

In accordance with Best Practice Guidance (*CIRIA Environmental good practice on site guide (4th edition) 2015*), a minimum set back distance of 10 metres will be maintained between the works area and any streams (other than where these require to be culverted), in order to ensure the environmental protection of those waterbodies. The demarcation of the works area with construction fencing will ensure that no works will occur outside this area.

Overseen by EirGrid, the Contractors' Environmental Clerk of Works, will design and implement watercourse and other ecological protection measures as appropriateto the conditions at each working location. The Contractor would agree such measures as part of the CEMP, to be agreed with Cork County Council and (where additionally required), other stakeholders including Inland Fisheries Ireland, and the National Parks and Wildlife Service.

In addition to complying with planning conditions, the Contractor will be required to obtain and comply with any relevant licences associated with works impacting bridges, watercourses, or ecological features.

Figure 3.7: Typical UGC construction in agricultural lands (Source: EirGrid)

Reinstated agricultural areas will be seeded as agreed with a landowner.

3.4 Other Matters

Operation and Maintenance

On completion of works on agricultural land a permanent easement measuring 14m in width is required. This is centred on the cable trench and extends for the full length of the cable on the off road section.

The easement serves to ensure the safety and security of the cable and to facilitate access to the cable and any repair or maintenance that may be required in the future by restricting land uses (e.g. development and tree planting) within this area. Normal farm cropping practices can resume on the easement strip on completion of the work and reinstatement of the land.

Cable Laying and Trees

The presence of trees on or in immediate proximity to cable routes requires careful consideration and management. During periods of low or no rainfall, increased drying of the soil due to root capillary action may affect the thermal capability of the cable system. Tree root systems may also get entwined around the cables causing damage to the ducts and cables. As a result, it is generally the case that sufficient distance is required to occur between a cable alignment and trees.

For narrow roads, the cable alignment may need to be installed in the centre of a carriageway, or may need to switch from one side of the road to another to reduce the impact on trees and also to accommodate the trench excavation works. This is a matter that is confirmed at the post-consent detailed design of a cable project.

If cables have to be laid in close proximity to trees, and in particular to large / mature trees, excavation by hand may need to be employed in order to ensure protection of root systems. Hand excavation is typically slower than mechanical excavation techniques.

4. EMF and DC Underground Cables

4.1 Introduction

This section has been prepared with regard to expertise within and available to EirGrid, and with reference to a number of relevant documents including:-

- EirGrid: *The Electricity Grid and Your Health* – available at https://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-The-Electricity-Grid-and-Your-Health.pdf

- EirGrid: *Electric and Magnetic Fields (EMF) Facts and the East West Interconnector* – available at https://www.eirgridgroup.com/site-files/library/EirGrid/EMF%20Factsheet.pdf

- EirGrid: *Evidence Based Environmental Studies – Study 1 EMF* – available at https://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Evidence-Based-Environmental-Study-1-EMF.pdf

- ESB: *EMF and You - Information about Electric & Magnetic Fields and the electricity network in Ireland* - available at https://esb.ie/docs/default-source/default-document-library/emf-public-information_booklet_v9.pdf?sfvrsn=0

- Tennet: *Living near HighVoltage Installations Electrical and magnetic fields* – available at https://www.tennet.eu/fileadmin/user_upload/Company/Publications/Corporate_Brochures/Living_near_High-Voltage_Installations.pdf

- Ecofys: Study on the Comparative Merits of Overhead Electricity Transmission Lines Versus Underground Cables prepared for the Department of Communications, Energy and Natural Resources Ireland – available at http://www.soni.ltd.uk/media/documents/Projects/Publications/6-ECOFYS-Study-Final-report-June2008.pdf

- The website of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and various guidelines – at www.icnirp.org

Electric and magnetic fields, often referred to as EMFs, are produced both naturally and as a result of human activity. Natural sources of EMFs include the earth's geomagnetic field and electric fields from storm clouds. When electric current flows, both electric and magnetic fields are produced and therefore are present wherever electricity is used, such as in the home, office or farm (see Figure 4.1), and in the vicinity of equipment that makes up the electricity supply system.

A “field” is defined by the force it exerts on an object placed in it; for example, a gravitational field is used to describe the force of attraction that the Earth exerts on living beings and objects situated within its influence.

Electric and magnetic fields can be considered as the regions around electrical equipment in which these effects can be felt or measured. Electric fields are produced by voltages, irrespective of how much current is flowing and indeed whether any current is flowing at all. Magnetic fields are produced by currents, irrespective of the voltage.

EMFs can be harmful at very high levels - levels much greater than those to which we are normally exposed. For this reason, independent and authoritative international panels of scientific experts have reviewed studies on possible health effects from EMFs for decades. These have consistently concluded, based on the weight of evidence available, that the power frequency electric and magnetic fields encountered when electrical equipment is properly designed and constructed do not cause adverse health effects in humans in normal living and working conditions.

As noted in Figure 4.1, the EMF emitted by HVDC transmission infrastructure is at an extremely low frequency which is at the non-ionising end of the electromagnetic spectrum.

EirGrid designs, develops and operates the transmission grid in accordance with stringent safety recommendations which are made by national and international agencies. Several of these recommendations come from the International Commission for Non-Ionizing Radiation Protection (ICNIRP). This is an independent body, funded by public health authorities around the world. ICNIRP has investigated the safety of EMFs, and provides guidance on safe levels of exposure. This is addressed in more detail further in this section.

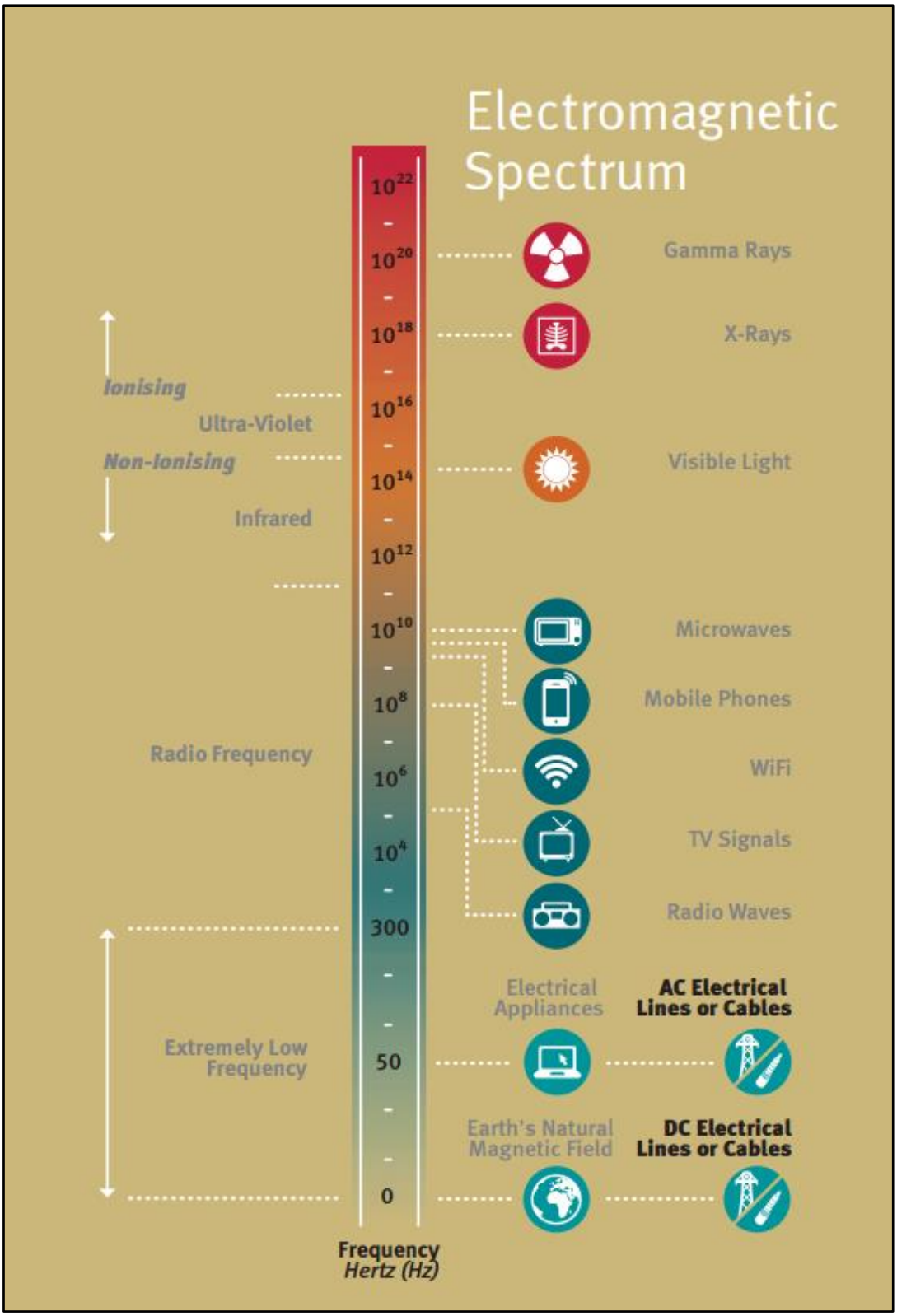

Figure 4.1: EMFs from different sources (source: EirGrid)

4.2 EMF and Underground Cables

It is a fact that electricity cables have been placed underground in Ireland since the 1960's. There are currently approximately 320 km of underground transmission cabling in Ireland, with multiples of this figure of underground cabling associated with the lower-voltage distribution system. In addition, new underground cabling projects are being completed or planned on an ongoing basis both by EirGrid as developer of the electricity transmission system, and by ESB Networks (ESBN) as developer of the electricity distribution system.

This figure does not include the High Voltage Direct Current (HVDC) underground cable (UGC) of EirGrid's East West Interconnector (EWIC) which is approximately 44.5 km in length on land in Ireland, and is laid primarily in public roads between the interconnector landfall at Rush North Beach, through the main street of Rush, Co. Dublin, and the EWIC converter station at Woodland, near Batterstown, Co. Meath.

The Celtic Interconnector HVDC UGC will use cross-linked polyethylene (XLPE) insulated cables with a grounded metallic sheath. The typical construction of such a cable is shown in Figure 4.2.

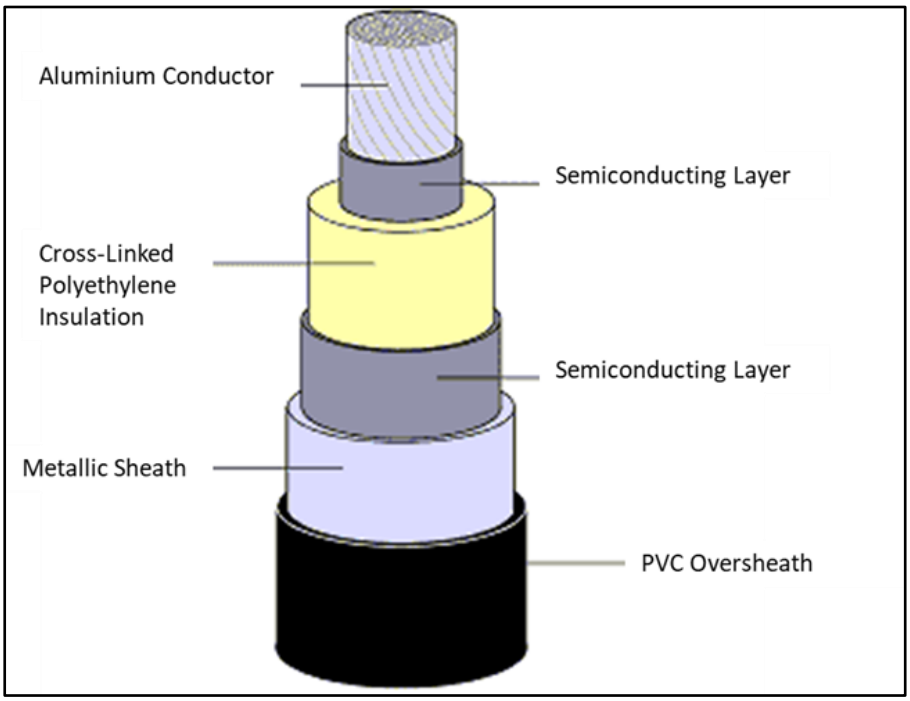

Figure 4.2: Typical XLPE Cable Construction (Source: Nexans)

The inner 'core' of the cable will be constructed of copper or aluminium wires. This 'core' is referred to as the conductor and will carry the electrical currents that will transfer power along the interconnector. The conductor is surrounded by an insulating XLPE jacket, which will be of sufficient electrical strength to withstand the voltage applied to the conductor. The insulation is then enclosed within a continuous metallic sheath, which acts as a water barrier and ensures that the insulation is exposed to a uniform electrical field.

The metallic sheath is grounded (connected to the mass of earth) at joint bay locations along the length of the cable. This has the effect of ensuring that the electric field is entirely contained within the structure of the cable. As the metallic sheath is connected to ground, there can be no significant electric field between it and any other object connected to ground. For this reason, cables with a continuous metallic sheath cannot generate external electric fields, provided that the metallic sheath is grounded. Consequently, electric field exposure does not need to be considered as a potential impact of the cable installation.

The cable will generate static magnetic fields, which will not be screened by the metallic sheath. The current in HVDC cables, being equal and opposite in direction, results in a very low magnetic field

4.3 EMF Policy and Guidance

In Ireland the following bodies are responsible for policy and guidance relating to EMF;

- The Department of Environment, Climate and Communications is responsible for national policy, including that relating to the health effects of non-ionising radiation, including EMF;

- The Environmental Protection Agency (EPA) is responsible for the provision of advice and guidance in relation to public exposure to EMF. In May 2019, Regulation S.I. 190 of 2019 was signed into law to extend the functions of the EPA to cover public exposure to EMF. These functions include: (a) to provide advice to the Government and the public on exposure to EMF (including on relevant standards for public protection); (b) to monitor scientific/technological developments likely to impact on public exposure to EMF; and (c) to carry out independent monitoring of public exposure to EMF to support its advisory role;

- The Health & Safety Authority (HSA) regulates exposure to EMF in the workplace. The regulations, set out in SI No 337 of 2016, require employers to carry out a risk assessment on EMF exposure in workplaces.

All of these bodies reference the ICNIRP international guidelines, which are endorsed by the World Health Organisation (WHO) and the European Union (EU).

For static magnetic fields, the 2009 ICNIRP guidelines define a recommend general public exposure limit in terms of a measured magnetic field of 400,000 microtesla. However, it is noted that exposures in excess of 500 microtesla may affect cardiac pacemakers or other implanted devices. It is EirGrid's policy, in accordance with National policy, to design and operate the electricity transmission system such that these limits are not exceeded.

4.4 EMF and the Celtic Interconnector

The effects of EMF diminish rapidly with increasing distance from the source. The potential of the Celtic Interconnector to contribute to public exposure to EMFs has therefore been assessed at a number of worst-case locations including immediately above the centre line of the DC cable circuit.

In accordance with EU recommendations, public exposure to EMFs is assessed at a height of 1m above ground. This represents the likely effect of the fields on the central nervous core of the body. As noted above, the HVDC cable will generate static magnetic fields, which will not be screened by the metallic sheath. However, the effects of these fields at 1m above ground level can be accurately predicted.

The static magnetic field directly over the UGC, when the cable is at maximum circuit loading, is predicted to be comparable with the naturally occurring earth's magnetic field. This is multiples lower than the exposure limits which the ICNIRP guidelines recommend for magnetic fields as set out above (400,000 microtesla).

Based on the calculations of the magnetic flux density and the design of the cable infrastructure, there will be no impact on residential properties from the HVDC UGC alignment as the ICNIRP guidelines are not exceeded. The HVDC Cable route therefore is assessed as having no significant adverse effects arising from EMF.

4.5 EMF and the Precautionary Principle

It is noted that the conclusions set out in Section 4.4 are based on scientific calculation and certainty rather than expert judgement and opinion. In such a context, it is considered that the precautionary principle does not apply. As noted in the Ecofys *Study on the Comparative Merits of Overhead Electricity Transmission Lines Versus Underground Cables*:-

> *"The precautionary principle is exercised where scientific information is deemed to be insufficient, inconclusive or uncertain, and where there are indications that potential negative impacts on the environment, or human, animal or plant health may [be] dangerous and inconsistent with the standard level of protection."* (P.143).

It is clear that in this instance, the scientific information is sufficient, conclusive and certain that the maximum magnetic field generated from the HVDC UGC will be comparable with the naturally occurring earth's magnetic field. The calculated level will be many multiples below the ICNIRP guidance limit of 400,000 microtesla.

Given the above, there is no requirement for any precautionary principle to be employed. There will be no impact to people within residential properties at any distance from the HVDC UGC alignment, nor indeed to anyone standing on the road directly over the UGC. The HVDC UGC therefore is calculated as having no adverse effects arising from EMF.

5. Option A – Local Road Route (Shanty Path)

5.1 Original Consideration

The Step 4B *Development Options Report* (November 2020) identified the local road in the Churchtown area (known as the Shanty Path, as part of the Best Performing Option (BPO) DC UGC route.

5.2 Route Options Review – Description of the Existing Development Context

The existing public road extends initially north-westwards off the Mogeely Road before aligning to the north-east and then north (Figure 5.1 / 5.2). An off-road crossing in the vicinity of the junction of the Mogeely Road and the N25 at Two Mile Inn is proposed in order to avoid traffic impact at the junction due to cable laying works. A cluster of dwelling properties are located on both sides of the road in proximity to this junction (Figure 5.3 / 5.4).

Figure 5.1: Local Road (known as the Shanty Path) at Churchtown (Source: EirGrid – see also Figure 1.3)

Figure 5.2: Junction of the Shanty Path with the Mogeely Road (Source: Google Street View)

Figure 5.3: Dwelling properties in proximity to the junction of the Shanty Path with the Mogeely Road (Source: Google Street View)

Figure 5.4: Aerial photo of Dwelling properties in proximity to the junction of the Shanty Path with the Mogeely Road (Source: EirGrid/ESRI)

Further along this local road, the carriageway turns to the south-west, and extends in a relatively straight alignment. A line of dwellings are located primarily on the northern side of this portion of the road (one property is located on the southern side of the road). Agricultural lands intersperse the dwelling properties, with dense roadside hedging occurring on either side of the road (Figure 5.5 / 5.6).

The road alignment then turns to the north-west, with dwelling properties again primarily located along the north-eastern side of the road (Figure 5.7). At the western end of this stretch, dwelling properties are located on both sides of the road. Farm buildings and other agricultural structures are located in this area on the northern side of the road (Figure 5.8).

At the north-western end of this portion of the road, the alignment turns to run once again in a north-south orientation northwards towards Roxborough (also identified as Waterpark), including where the road intersects with the existing disused railway corridor (now being developed as a Greenway), and crosses the Dungourney River (which contains good salmonid habitats). The planned route of the BPO will cross the Greenway and River by way of Horizontal Directional Drill (HDD).

Figure 5.5: Roadside hedging and vegetation along both sides of the Shanty Path (Source: Google Street View)

Figure 5.6: Aerial photo of dwelling properties along east central portion of the Shanty Path (Source: EirGrid/ESRI)

Figure 5.7: Aerial photo of dwelling properties along west central portion of the Shanty Path, including farm buildings and structures at its western end (Source: EirGrid/ESRI)

Figure 5.8: Farm buildings and agricultural structures at the western of the Shanty Path in Churchtown

Irish Water records confirm the presence of a watermain within the road, serving the properties thereon. This is identified in Figure 5.9 below as a red line – the information is provided directly from Irish Water Geographical Information System (GIS) data. The specific location of water infrastructure in the road is a matter that would be confirmed in post-consent detailed design by an appointed contractor.

Figure 5.9: Existing watermain within the Shanty Path in Churchtown (Source: Mott MacDonald)

5.3 Route Options Review – Multi-Criteria Evaluation

Technical

Having regard to the construction methodology in Section 3 above, the laying of the DC UGC in the public road is a relatively straightforward process. The alignment and carriageway width are not unduly onerous. Potential passing bay locations are available in between existing dwelling properties in order to facilitate the temporary movement of vehicles around joint bays. Moreover, the junction of the Mogeely Road with the N25 at Two Mile Inn is being avoided which mitigates potential adverse traffic impact at this junction.

Having regard to the construction methodology for underground cables this option will require temporary traffic management measures. In operation, the cable route, being within the public road, will facilitate immediate access if required for urgent maintenance.

The crossing of the existing Greenway and Dungourney River by way of HDD is an established construction methodology. In addition, the existence of a watermain and associated infrastructure within the public road will need to be taken into account by the appointed contractor in the detailed design and construction methodology for laying the DC UGC and constructing the joint bays. This may involve a local and temporary impact upon provision of water. Overall, however, an experienced cable contractor for any utility such as will be appointed in this instance, would be well used to such scenarios, and will deal with this matter effectively, in agreement with Cork County Council as part of the Construction and Environment Management Plan (CEMP).

Having regard to all the above, from a Technical perspective, this option is denoted as **LIGHT GREEN**

Economic

This route option is approximately 16.8 km in length between the planned off-road UGC at the Mogeely Road in Castlemartyr, and the converter station within the IDA Ballyadam lands.

Given that this comprises a relatively standard cable laying project, notwithstanding the existing watermain in the public road, it is considered that there are no potential complexities in construction that will increase the cost of the construction project.

Having regard to the above, this option is denoted as **DARK GREEN**

Environmental

The route option in the Churchtown area occurs primarily within an existing road corridor (the southern portion between the Mogeely Road and the N25 at Two Mile Inn crosses one agricultural field, adjacent to a concrete manufacturing facility. This is a significant benefit from an environmental perspective, minimising potential impact on biodiversity, cultural heritage, soils and groundwater etc.

The issue of impact on traffic and vehicular movement, while an environmental topic under the Environmental Impact Assessment (EIA) Directive, has been considered in respect of the Technical criterion above, and is not therefore considered here.

It is noted by reference to modelled Catchment Flood Risk Assessment and Management (CFRAM) flood mapping (see Figure 5.10 below), that there is no flooding envisaged in the Churchtown area of the public road, even under a 1:1000 year scenario

There may arise some issues of temporary noise and other disturbance, including temporary disruption for residents along the local road. Given the linear nature of the project, this impact will not occur at any particular location for any significant duration.

Ecological surveys (field and desktop) to date have not identified any significant ecological impacts along this route option in the vicinity of Churchtown which cannot be adequately mitigated.

Passing bays and off-road sections intersect a number of areas of high and extreme groundwater vulnerability (and in a single case, rock or porous ‘karst’ at or near the surface).

The route does not directly intersect any national monument sites, however it does cross ‘Zones of Notification’ for up to three national monuments, triggering a notification to the National Monuments service in advance of construction.

Having regard to the above, this option is denoted as **LIGHT GREEN.**

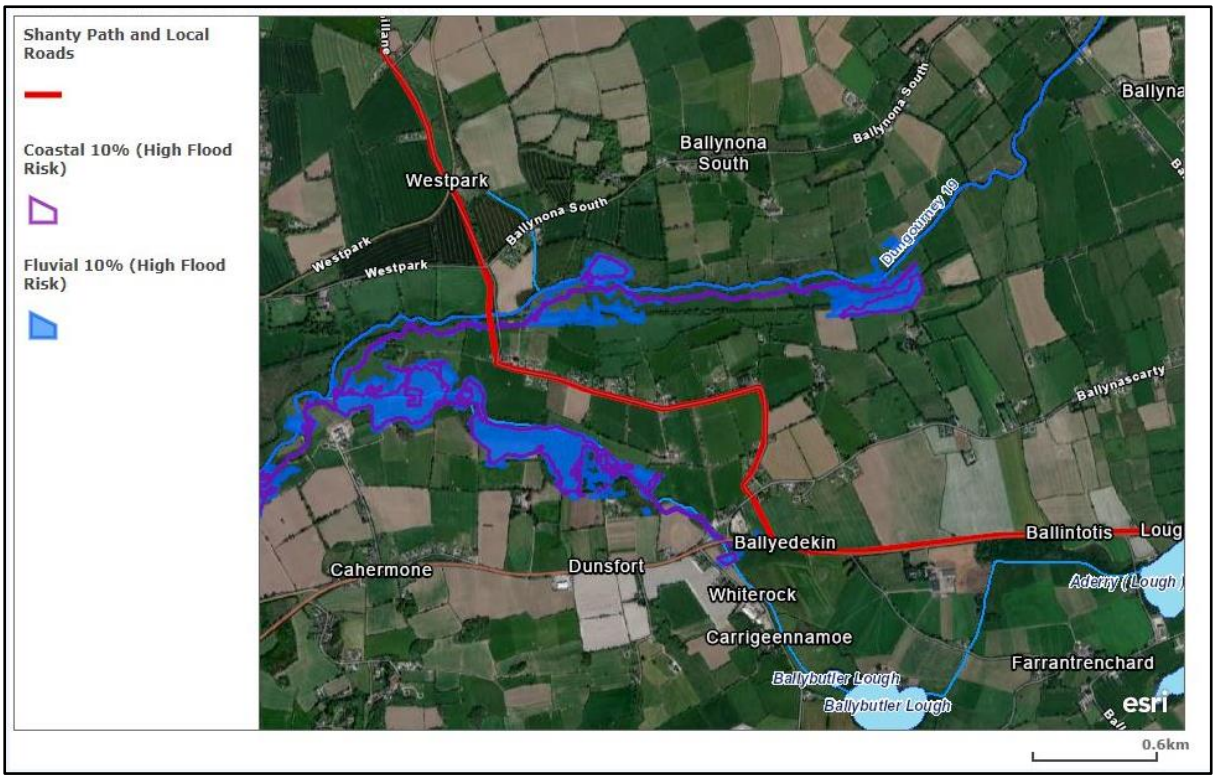

Figure 5.10: CFRAM Flood Risk modelling in the Churchtown area (source: ESRI)

Socio-Economic

The Shanty Path local road serves a number of existing dwellings and other properties within the Churchtown community. In addition to concerns regarding traffic and other disruption addressed above, the community has raised a number of other concerns with EirGrid, in particular relating to the potential health impact from EMF. These matters are a cause of concern and anxiety to residents within the Churchtown (and Roxborough) communities.

As addressed at Section 4 of this Review, the operation of the DC UGC by EirGrid will occur within established International guidelines that will ensure that magnetic field strength directly above the UGC, and at any distance therefrom, will be at levels many multiples below any potential risk levels. Notwithstanding this, the potential health effects arising from the proposed development are a matter of significant concern to the community.

Having regard to the above, in consideration of the stated concerns of the Churchtown community, but also the fact that the operation of the UGC will ensure that there in fact will not be any health impacts regarding EMF, and that this local road will be reinstated to a high quality, this option is denoted as **DARK GREEN.**

Deliverability

The laying of the HVDC UGC in the public road will require the agreement of Cork County Council. This is a standard requirement for all utility and services providers.

Construction of the HVDC UGC in proximity to the existing watermain, will need to be factored into detailed design, with appropriate construction methodologies prepared by the appointed contractor. This is a standard constraint that can be ably dealt with by an experienced cable contactor as will be appointed in this instance.

Public sentiment regarding the laying of the HVDC UGC is likely to be negative both during the consenting process, and during construction of the project,

Having regard to the above, this option is denoted as **DARK GREEN**

Overall Evaluation: Local Road Route

Criterion	**Local Road Route**
Technical	
Economic	
Environmental	
Socio-Economic	
Deliverability	

6. Option B – Disused Railway Corridor / Greenway Route

6.1 Original Consideration

The Step 4A Report (November 2019), identifying the Emerging Best Performing Option (EBPO) for the Celtic Interconnector project stated at Section 3.1.2 as follows:-

"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".

The subsequent Step 4B Development Options Report (November 2020) also addressed the potential use of the existing disused railway corridor, currently being developed as Greenway by CCC, and stated at Section 4.2.2:-

"….the Greenway along the disused Midleton to Youghal railway line has been developed by Cork County Council based on the ownership of the alignment remaining with Iarnród Éireann. 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 is in the order of 40-60 years.

This presents a number of issues 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.

Work has now commenced on the Greenway project with the clearance of vegetation and obsolete railway sleepers. The Greenway is expected to be complete and operational as a regional tourism resource by the end of 2022, some years prior to construction of the onshore HVDC cable, and indeed completion of the Celtic Interconnector project.

While engagement is ongoing with the Cork County Council Greenway development team in terms of crossings of the Greenway by the HVDC cable at a number of locations along its route, it remains the case that the Greenway is not of itself a viable option for routing the HVDC land circuit of the Celtic Interconnector".

6.2 Route Options Review – Description of the Existing Development Context

This Review considers use of a local portion of the existing disused Midleton-Youghal railway corridor as an alternative in the vicinity of Churchtown. This consideration therefore needs to address both where the corridor can be accessed from the BPO alignment of the DC UGC on the N25, and also where it can be egressed off the corridor.

The potential for the HVDC UGC to extend along the disused railway corridor from Youghal is acknowledged, and this formed the basis of previous considerations by EirGrid in Step 4 of project development as summarised above. It is considered that the evaluation within this section applies both to local usage of the corridor, and to its full usage from Claycastle.

In terms of access to the corridor from the N25, it is considered that there are two options – one at Mogeely, and the other at Ballinascartha, north-west of Kilmountain Cross (Figure 6.1). These are outlined in more detail below:-

- **Mogeely**: The DC UGC is planned to occur on an off-road alignment to avoid the centre of Castlemartyr. This option would extend northwards along the Castlemartyr-Mogeely road (Figure 6.2), passing roadside dwelling properties located along this road, as well as the entrance to the existing Dairygold industrial premises before turning west onto the corridor in the vicinity of the former station (Figure 6.3).

- **Ballinascartha:** This option would extend northwards along a local road from the N25 (Figure 6.4); the local road has a relatively narrow carriageway, heavily tree-lined at southern end (Figure 6.5) before giving way to field hedgerows. The local road facilitates a relatively dispersed roadside residential pattern, with greater concentration of dwellings in the vicinity of Kilmountain Cross, where the road crosses the local road between Mogeely and Two Mile Inn (N25). The crossing of the

Mogeely Road will require crossing of the existing drainage infrastructure serving the Dairygold facility. At Ballinascartha, the corridor is set below a roadside bridge (Figure 6.6), most likely requiring access across private lands.

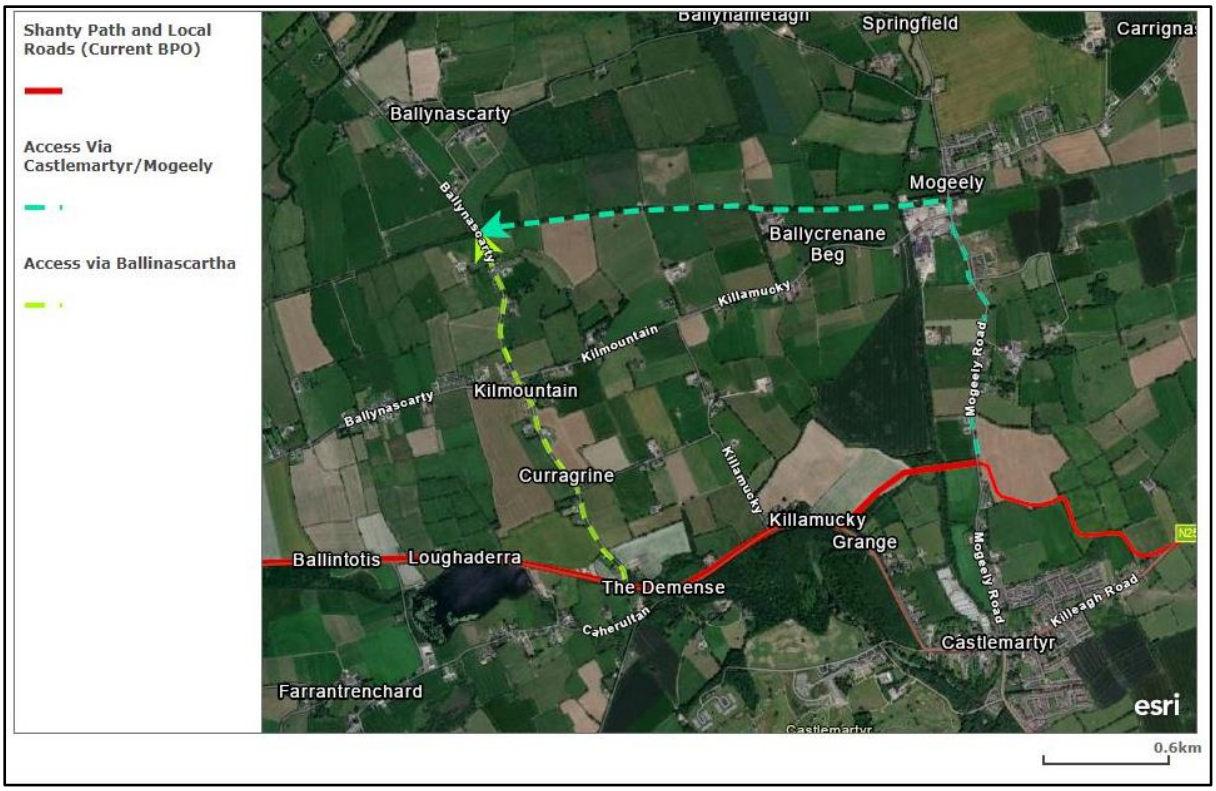

Figure 6.1: Access options to existing disused railway corridor, at Mogeely (east), and Ballinascartha (west) (Source: EirGrid/ESRI)

Figure 6.2: Mogeely Road, with Dairygold premises (top centre) (Source: EirGrid/ESRI)

Figure 6.3: Disused railway corridor off the western side of the Mogeely Road (Source: Google Street View)

Figure 6.4: Local road to Ballinascartha from N25 including crossing of Mogeely Road at Kilmountain Cross (Source: EirGrid/ESRI)

Figure 6.5: The southern portion of local road to Ballinascartha from N25 (Source: Google Street View)

Figure 6.6: Existing bridge over the disused railway corridor at Ballinascartha (Source: Google Street View)

In terms of egress from the corridor, it is considered that there are three options – one at Roxborough, north of Churchtown onto the Shanty Path, one at Midleton east of the existing operational railway station, and one extending to the planned converter station site within the IDA landholding at Ballyadam. These are outlined in more detail below:-

- **Roxborough**: This option would exit onto the Shanty Path, in proximity to the corridor of the Dungourney River (Figure 6.7).

- **Midleton**: This option would exit onto the R627 at the vicinity of its junction with an access road to the Meadowlands/Broomfield residential area. The road serves significant residential development at the edge of the built up area of Midleton. The R627 connects via a junction with a local road in the area of Ballyspillane (Figure 6.8). Given the level differences between the public road and the disused railway corridor, this would most likely require access across private lands.

- **Ballyadam:** This option would extend along the existing operational railway into Ballyadam:- this portion of the rail line includes 3 level crossings, 4 bridges/ overpasses, and a bridge over a river corridor (Figure 6.9).

Figure 6.7: Access from Greenway onto Shanty Path at Roxborough, north of Churchtown (Source: Google Maps)

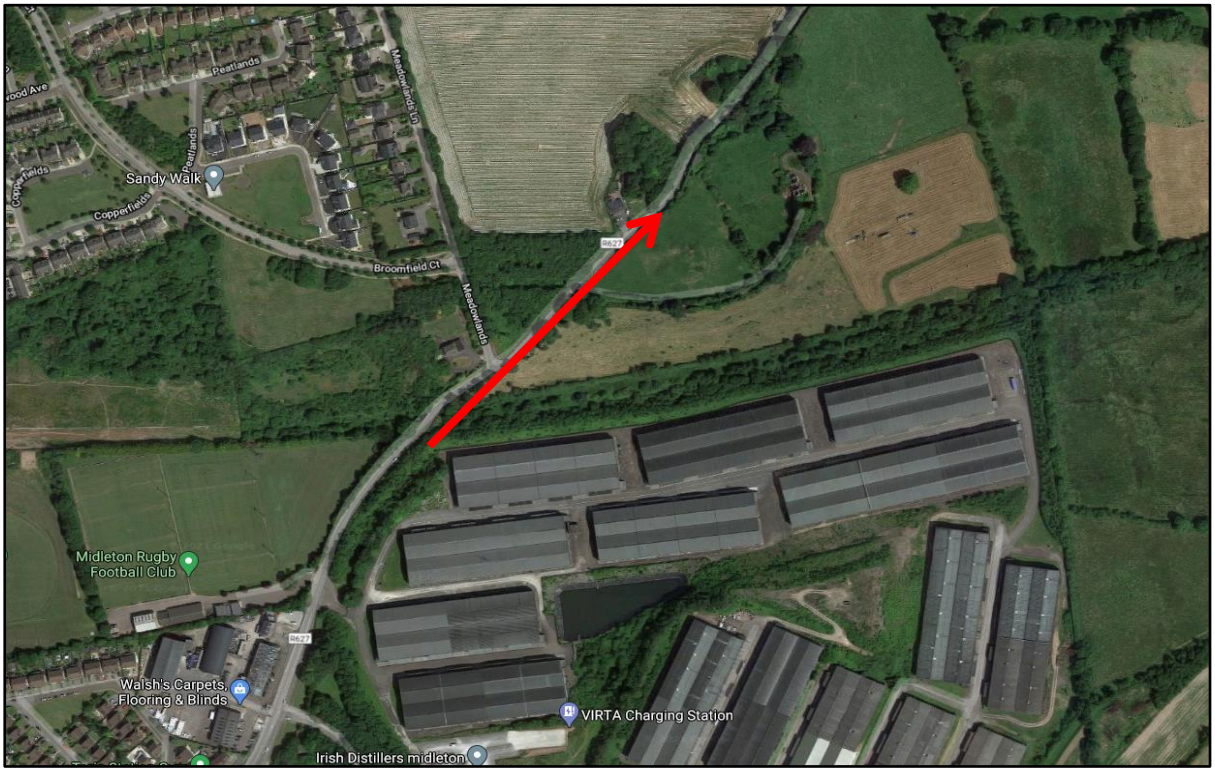

Figure 6.8: Access from Greenway onto R627 in Midleton (Source: Google Maps)

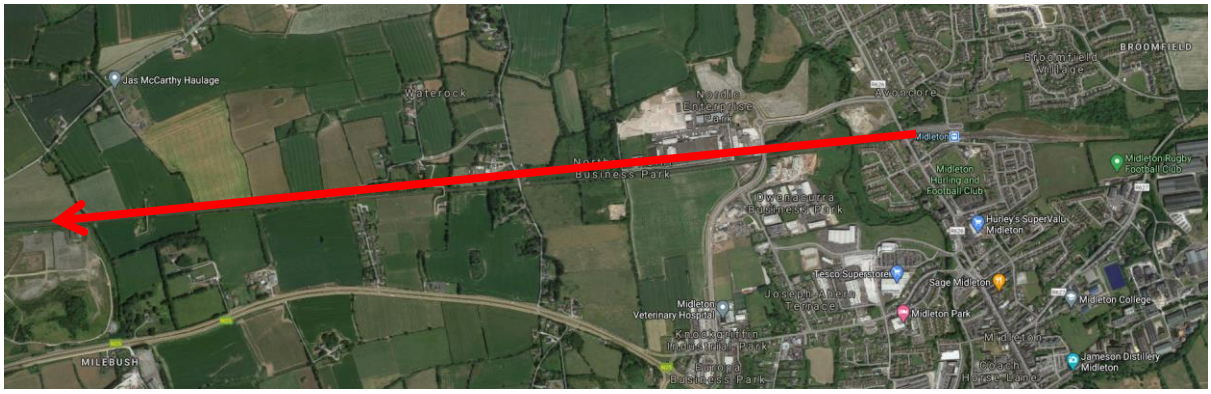

Figure 6.9: Access to Ballyadam via the existing operational Cork-Midleton railway line (Source: Google Maps)

EirGrid has been in engagement with Cork County Council regarding the development of the Midleton-Youghal Greenway along the alignment of the disused railway corridor for over four years. An update meeting to confirm the status of the project was held in March 2021.

The Greenway was the subject of a Part 8 consent, and is currently under construction. It is planned that the Greenway will be operational by 2022/2023 – it is understood by EirGrid that this timeline is important to meeting conditions of project funding. The Greenway is likely to be in operation prior to construction of the Celtic Interconnector project if consented.

The Part 8 proposal included provision of standard ducts, with no end user envisaged. However, a strategic decision was subsequently taken not to include the ducts within the final scheme. In any event, such ducts could not have adequately served the DC UGC, as the ducts for the UGC would require a bespoke form and construction methodology to ensure the protection of the cable. Moreover, the Part 8 proposal did not make any provision for associated joint bays and other necessary cable infrastructure.

The Greenway is being constructed on the ballast – the former trackbed of the railway line. It was noted by CCC that there are challenges within the corridor relating to its topography, with natural drainage channels formed away from the ballast. It was also noted that the corridor is relatively narrow in places.

CCC re-confirmed that the railway property is operated by Iarnród Eireann and ownership is vested in Coras Iompair Eireann (CIE). Permission to develop, maintain and manage the Greenway by CCC is subject to a 20 year licence from CIE, who retain control of the existing disused railway corridor. The ownership status of the property will therefore remain unchanged and this arrangement will provide for the protection of the railway corridor for future rail use should this be considered viable by Iarnród Eireann. There are no current plans to re-open the corridor as an operational railway.

EirGrid also had an update meeting with Iarnród Eireann regarding the principle of using the disused railway corridor for the DC UGC. It was also confirmed at this meeting that there are currently no plans to reopen the existing disused railway corridor; however, there is a general interest in expanding the railway network around Cork, in the context of climate change management. It was also noted that the corridor is currently a single-line. It is likely that any future re-use would include, if possible, for a twin-tracked solution, requiring a larger land take, most likely using any remaining available land within the corridor.

It was noted that, while theoretically possible to the use of the corridor for the DC UGC of the Celtic Interconnector project, this would be subject to agreed conditions/caveats similar to the Greenway project. Of particular importance, if there was a future conflict between any existing UGC of the Celtic Interconnector project and a planned railway design (including signalling cables etc.), the interconnector cables would have to be removed and relocated. It was further noted in this regard that the design and layout of the cables is of significant importance, vis-à-vis their potential to interfere with signalling and other rail infrastructure.

6.3 Route Options Review – Multi-Criteria Evaluation

Technical

The infrastructure of the Celtic Interconnector project has an envisaged lifespan of 40-60 years. Over this time, and indeed beyond should that infrastructure be replaced, the integrity of the infrastructure is of paramount importance. It would be of profound significance should the UGC require to be removed to facilitate the future operation of the corridor as a railway. This scenario cannot be ruled out by Iarnród Eireann, and this would continue to present a significant future risk to the Celtic Interconnector project should the DC UGC be laid and operated within the existing corridor of the disused railway corridor.

Moreover, it has been confirmed by CCC that the integrity of the corridor is technically challenging in places for the laying of the DC UGC, in terms of its topography, constrained width, and the presence of natural drainage channels. This has implications for the complexity of construction methodology for the UGC, including its design and also the use of what will be an operational Greenway as the only means of access to the construction corridor. For example, a crane will be required at each joint bay location to lift in pre-cast joint bays; the Greenway surface, or any road that is likely to be required to be constructed within the corridor, would have to be certified as capable of carrying such vehicles.

It must be anticipated that the Greenway would require to be taken out of operation of the duration of the construction of the UGC.

Consideration could be given to the construction of ducting at this point in time, as per the Part 8 consent. However, as noted above, the provision of ducting for DC UGC is of a particular design and specification. Moreover, the installation of ducts would require to be overseen by EirGrid's Client Engineering team; and departure from those specific design requirements could create a liability for CCC as developer of those ducts. Also, as noted above, joint bays will also be required along the corridor, and these were not included within the Part 8 Greenway proposal that now has the benefit of statutory consent.

While there are options for egress of the UGC from the disused corridor, all have various consequences of technical complexity. The egress onto the Shanty Path occurs in close proximity to the corridor of the Dungourney River. The current Best Performing Option (BPO) crosses both the disused railway corridor and the river by way of Horizontal Directional Drill (HDD) to avoid potential adverse environmental impact. The egress at Midleton occurs at a location where there is a significant level difference between the disused railway corridor and the existing road (R627). The egress at Ballyadam requires the UGC to traverse the area of

the existing Midleton railway station, and the adjacent level crossing; along the existing operational railway line the corridor is relatively constrained and contains considerable amount of above ground operational signalling, level crossing and other equipment (presumably related services are also located underground). The provision of HVDC UGC infrastructure including joint bays within the rail corridor would most likely require the cessation of the existing operational railway for the duration of the construction phase.

Having regard to all the above, from a Technical perspective, this option is denoted as **DARK BLUE**

Economic

There are various permutations of route option all of which have different lengths depending on the access and egress points onto the disused rail line corridor (see Section 1 of this Review). However, in general these range between approximately 13.2 km and 18.6 km in length extending to the converter station within the IDA Ballyadam landholding. These are 3.6 km less to 1.8 km greater less than the baseline BPO.

However, given the potential complexities in construction arising from the topographical and physical challenges of the UGC construction on the disused rail line corridor and egress therefrom, as well as assumed compensation to CCC for closure of the Greenway for the duration of the construction period and the subsequent reinstatement of the Greenway back to its original condition, it is not unreasonable to consider that these will increase the cost of the construction project.

Having regard to the above, and relative to the BPO, this option is denoted as **DARK GREEN.**

Environmental

The route option is assumed to occur primarily within the built area of the existing Greenway corridor. This is a benefit from an environmental perspective.

Any egress onto the Shanty Path, and associated construction in the vicinity of the Dungourney River other than HDD has the potential to adversely impact upon this sensitive river system, and thereby the (salmonid) Owenacurra River, and the two European sites in Cork Harbour downstream..

In terms of flood risk, Figure 6.10 shows modelled Catchment Flood Risk Assessment and Management (CFRAM) flooding under 1:10 year (i.e. high risk) scenarios for both coastal and fluvial flooding.

Both sources of flooding, derived from the Dungourney River, affect the portion of the disused railway corridor to the north of Churchtown. This creates potential pollution risks during construction to the two European sites c. 2km downstream in Cork Harbour.

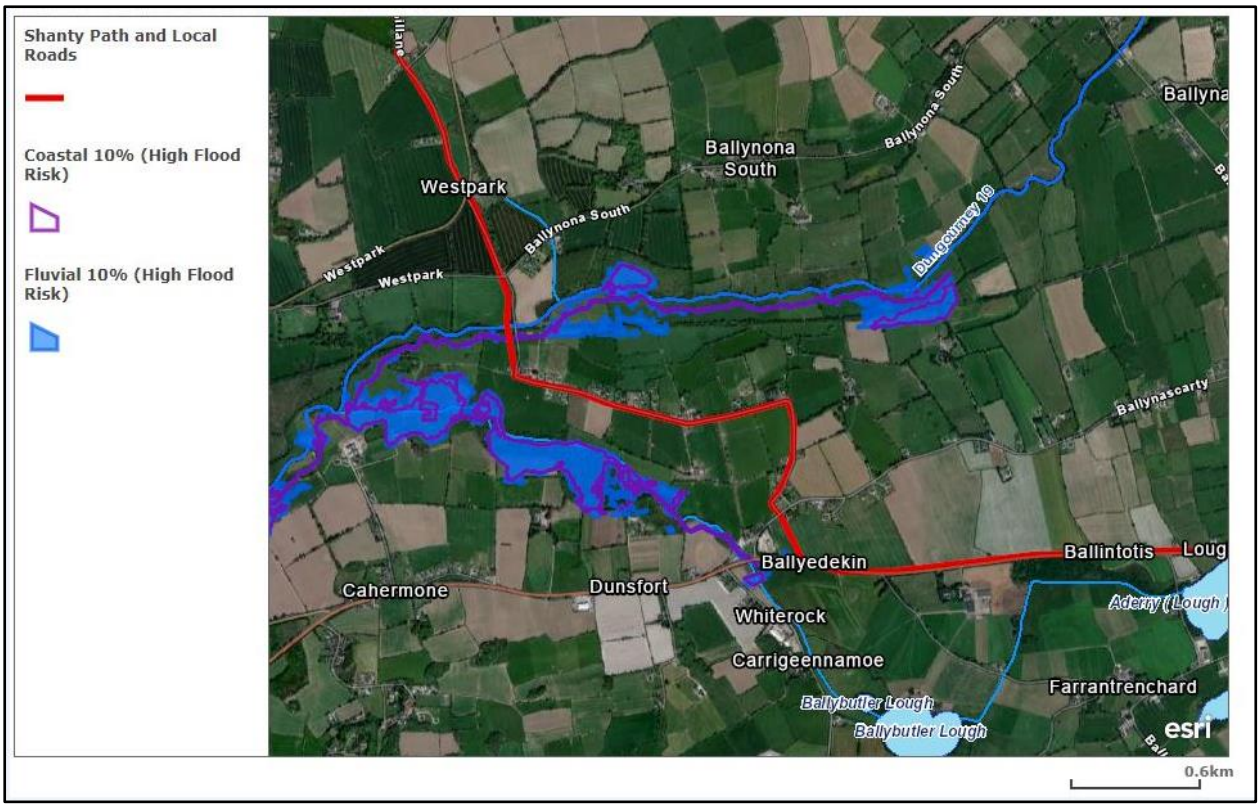

Figure 6.10: CFRAM Flood Risk modelling in the Churchtown area. Disused railway corridor runs through centre of this image (source: EirGrid/ESRI)

None of the greenway options intersect European sites (i.e. SACs or SPAs);. The greenway options also do not intersect nationally designated sites for nature; unlike all other options. However the 'greenfield' footprint of all options, would be significantly greater for any of the greenway routes, than for other routes, since the hedged and grassed banks of the railway would dominate the working area.

The route options (and indeed all other route options) require a number of watercourse crossings, which may include one or more open cut examples with potential for aquatic ecology impacts in the absence of mitigation.

A variety of ecological features could be impacted in the absence of mitigation. The railway line embankments offer significant burrowing opportunities and could be found to contain badger or other protected mammal breeding sites, following formal survey. Railway lines are also commonly contaminated with invasive species, which are readily dispersed by railway traffic. Mitigation measures are available to mitigate potential impacts to acceptable levels.

The access via Ballinascartha, and egress via the R627 are the least favoured in terms of hydrogeology, overlying extensive areas of extreme and high groundwater vulnerability, and karstic rock at/near surface. Temporary works on lower ground adjacent to the railway corridor, and any off-line areas could also intersect such areas. Due to the elevated ground along the railway, options along the railway/greenway itself generally intersect fewer areas of significant groundwater vulnerability, compared to other routes.

Finally, none of the greenway options intersect any national monument sites, or Zones of Notification for same.

Having regard to the above, this option is denoted as **LIGHT BLUE.**

Socio-Economic

The Technical challenge of laying the DC UGC within the residual area of the disused railway corridor is likely to mean that it will require to be laid within the built area of what will be an operational Greenway. Even if the cables can be routed off the Greenway, it is likely that construction traffic will access the construction site via the public access areas.

Overall, it is considered prudent to assume that the Greenway would require to be closed for the duration of the construction works along the corridor. The Greenway is a significant tourism and amenity project for the County. Its closure has the potential to have a significant socio-economic impact.

Once laid in the ground and operational, the DC UGC cannot be relocated without significant impact to the operation of the Celtic Interconnector project. The potential reopening of this currently disused railway line over the next decades (bearing in mind the Celtic Interconnector project has a 40-60 year lifespan) cannot be discounted, as patterns of settlement, commuting and public transport evolve over this period.

While options arise for the access and egress to the disused railway corridor, it is noted that this could require access across private lands, placing a burden on these lands.

Having regard to the above, this option is denoted as **LIGHT BLUE**

Deliverability

The laying of the cable within what will comprise an operational Greenway is likely to be of profound concern to Cork County Council who hold a licence for its operation.

There is risk that consent might be delayed or not forthcoming from An Bord Pleanála, as decision-making authority, in view of the fact that there are alternatives which would avoid the likely impact upon the operation of the Greenway, and potential future use of the corridor as an operational commuter railway line.

Having regard to the above, this option is denoted as **DARK GREEN.**

Overall Evaluation: Disused Railway Corridor

Criterion	**Disused Railway Corridor**
Technical	
Economic	
Environmental	
Socio-Economic	
Deliverability	

7. Option C – N25 west of Midleton

7.1 Original Consideration

The Step 4A *Consultant's Development Options Report November 2019* addressed the potential for use of the N25 between Youghal and Carrigtohill at Section 3.1.3 and stated:-

> *"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".*

The Step 4B *Development Options Report* (November 2020) concluded as follows in respect of a cable option on the N25 west of Midleton:-

> *"…the N25 National Road between Carrigtwohill and Midleton is planned for significant upgrading, including widening to full dual carriageway status, and provision of a new or modified interchange in the vicinity of the Ballyadam landholding. This major infrastructure project is currently the subject of public consultation, and no specific plans for the road scheme have been published. This results in an unacceptable level of uncertainty for the Celtic Interconnector Project with regard to the locations for laying of the underground HVDC cable"*.

7.2 Route Options Review – Description of the Existing Development Context

The N25 National Road between Carrigtohill and Midleton is planned for major upgrading, including widening to full dual carriageway status. The project (known as the Carrigtohill-Midleton Scheme), is being progressed by Cork Roads Design Office (RDO) on behalf of TII.

TII has confirmed to EirGrid that the N25 is part of the *Trans European Network for Transport (TEN-T) Comprehensive Network* and, as such, is required to be upgraded to TEN-T standard by 2050. The N25 Carrigtohill-Midleton Scheme is specifically identified in the National Development Plan 2018 – 2027 as contributing towards the achievement of

National Planning Framework's National Strategic Outcome 2 – Enhanced Regional Accessibility. It is listed as a scheme to be progressed over the life of the plan.

TII has also confirmed to EirGrid that the section of N25 between Carrigtohill and Midleton is the only remaining section of legacy dual carriageway with median crossing points and direct access from domestic dwellings. As this section of route carries up to 30,000 vehicles every day, the existence of accesses and crossing points along this section is considered by TII to constitute an unacceptable risk to road safety. Therefore, in accordance with National Development Plan Objectives, TII and Cork County Council are progressing the planning and design of the N25 Carrigtohill-Midleton Scheme.

The Cork RDO has confirmed that the N25 Project is currently at route options stage (Phase 2), with public consultation undertaken in respect of four broad design and alignment options all of which will upgrade this existing portion of the N25 to full dual carriageway. The RDO has confirmed its intention to publish a preferred route option in May 2021. The four options are reproduced in Figures 7.1 – 7.4 below; these are available on the project website - https://www.n25carrigtohillmidleton.ie/public-consultation/

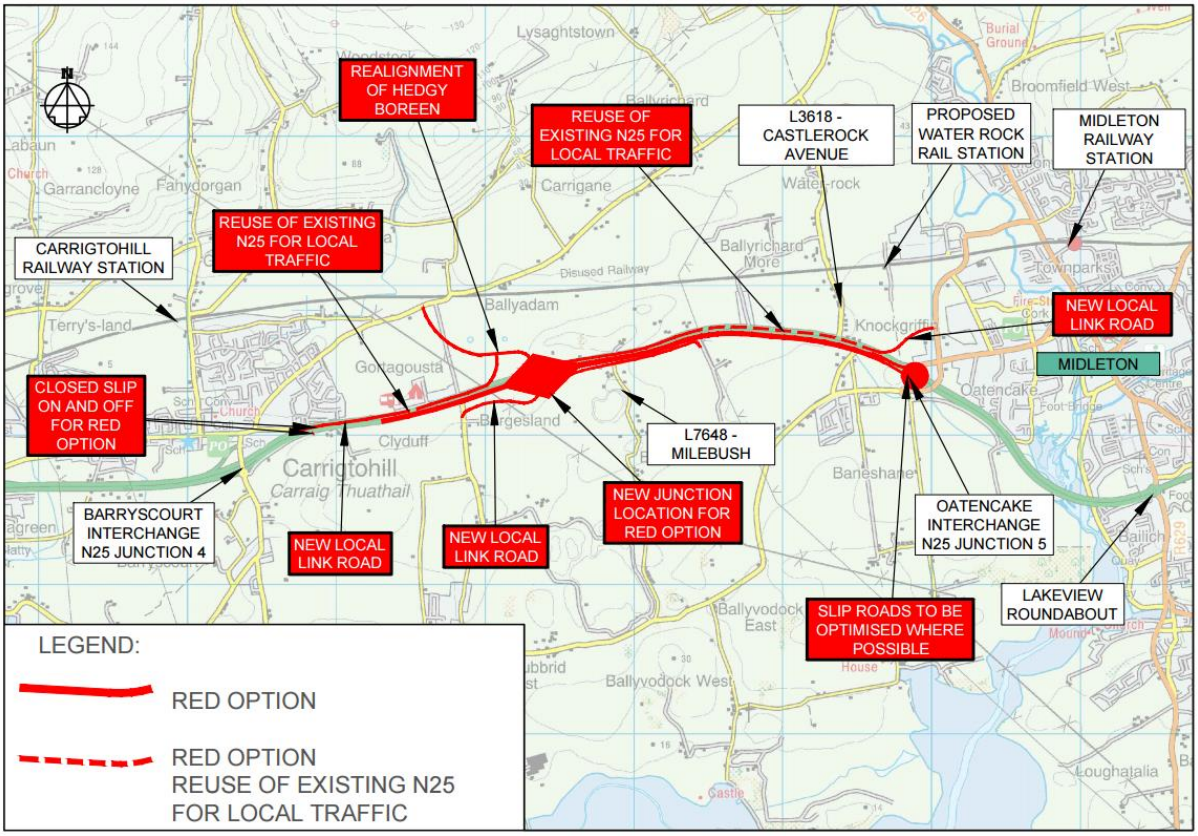

Figure 7.1: Red route option – "with new interchange at Ballyadam" (Source: project website)

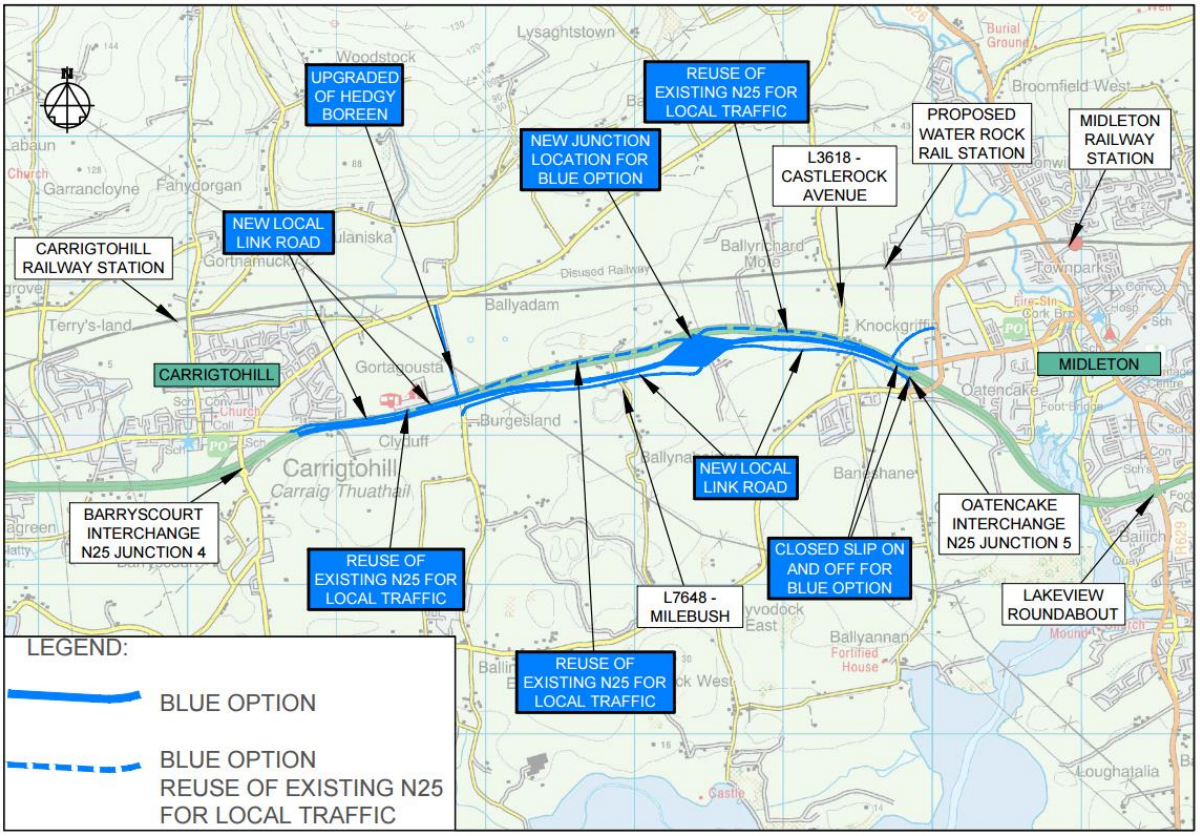

Figure 7.2: Blue route option – "with new Interchange at Milebush" (Source: project website)

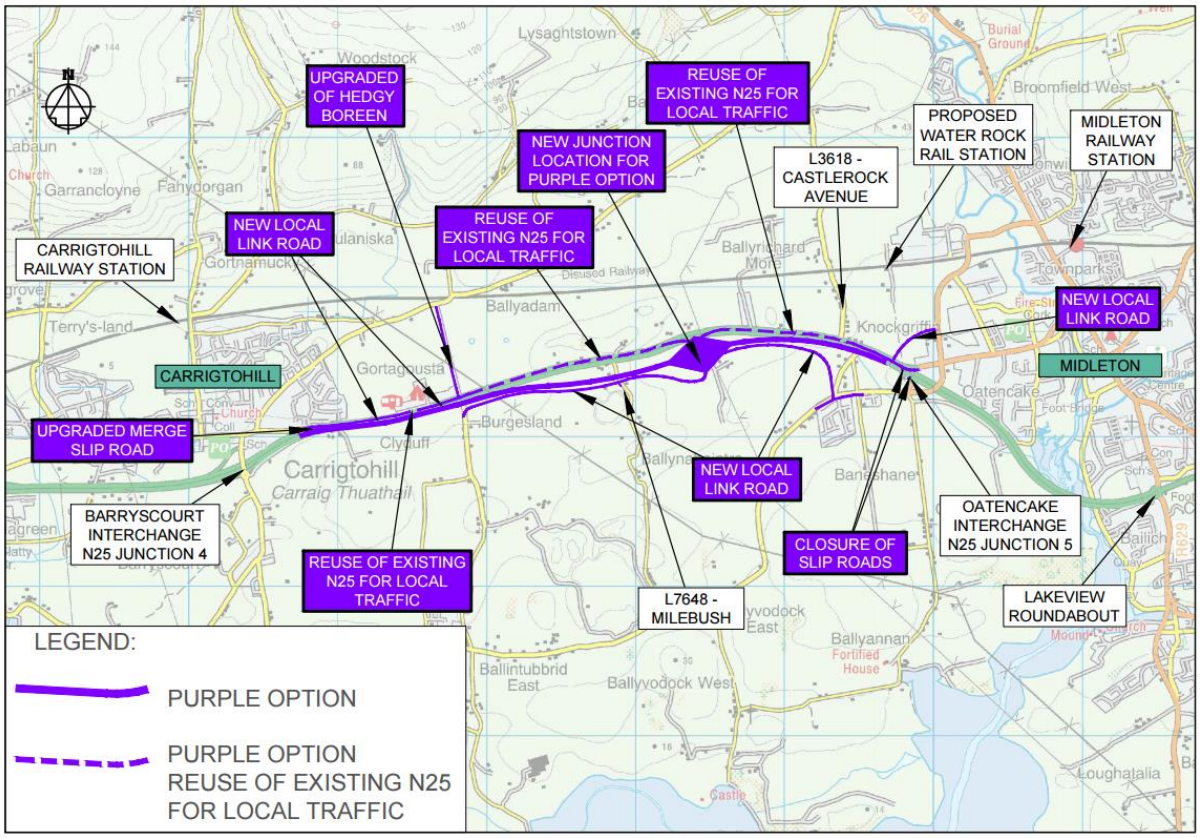

Figure 7.3: Purple route option "with new Interchange at Milebush"

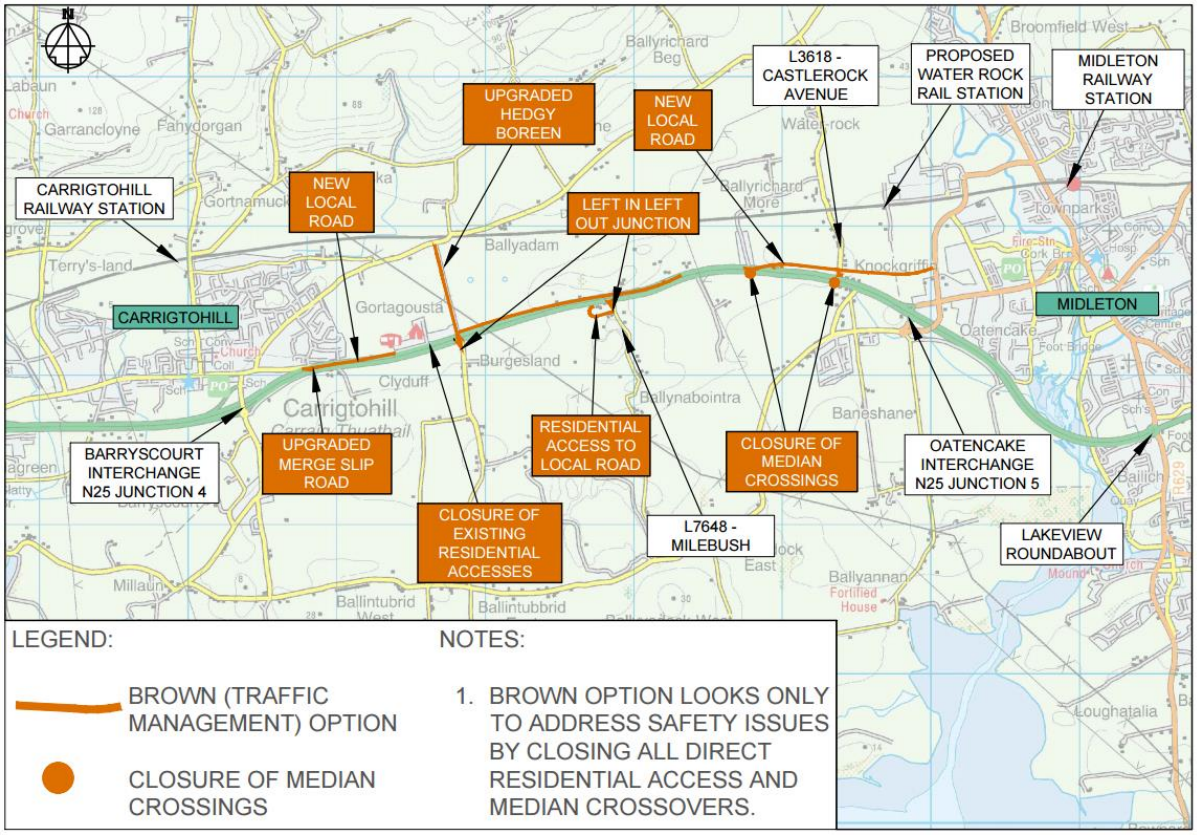

Figure 7.4: Brown route option "which is an alternative traffic management option focusing only on improved access"

The Cork RDO has given EirGrid an update on anticipated timeline of project activities – this builds on information available on the project website. In summary, following the announcement of the preferred route option, the detailed design and environmental assessment stage (Phase 3) will commence, and it is envisaged that this will run until approximately March 2022. As such, it would be the case that there will be no detailed design information on the preferred route until Q1 2022.

The level of design work undertaken in this Phase will be sufficient to bring the project into the subsequent statutory process phase (Phase 4). Before entering the statutory consents phase, the project will require formal approval to proceed – from either TII or from National Government depending on the anticipated cost of the project. Assuming this is successful, it is anticipated that the proposed scheme will be submitted to An Bord Pleanála in Q2 2022. It is reasonable to envisage that this statutory process will take a minimum of 6-8 months. It is therefore envisaged that consent for the planned road scheme will occur sometime in 2023.

Following the consenting process, as with most other development projects, the scheme will enter a detailed design phase, including discharge of conditions of permission, preparation and implementation of management plans etc., all undertaken by an appointed contractor. This post-consent detailed design phase, and the subsequent construction activities will therefore occur in 2023 at the earliest.

During discussions between EirGrid and the RDO, it was noted that three of the four identified options (red, blue and purple) include "*Reuse of existing N25 for local traffic"*. As

noted above, a number of dwellings currently front and/or access directly onto the N25. It was noted by EirGrid that if this existing portion of the carriageway is being retained, it could potentially accommodate the DC underground cable of the Celtic Interconnector. The RDO has confirmed that reference to "*re-use the existing N25 for local traffic"* refers to retaining the existing road alignment to facilitate these dwellings; it is envisaged that there will still be significant construction works on these sections of road. Moreover, the sections reused may be discontinuous, are likely to be subject to significant changes in levels during detailed design, and will require significant new infrastructure to be constructed thereon, including drainage infrastructure, signage posts, safety barriers, gantries, cyclepaths and footpaths.

The figures from the project website reproduced above also currently identify that the same three options include a new interchange – assumed to be grade-separated – with associated off-ramp and on-ramp slip roads and flyover. As noted above, no design details for this interchange will be available for some considerable period of time, including specific location, levels etc. Moreover, it is EirGrid's experience from other road improvement projects where there is a conflict with existing electricity transmission infrastructure (e.g. the N22 Macroom-Ballyvourney road improvement scheme) that construction of a grade-separated interchange is one of the most significant, complex, and long-lead element of any such civil engineering project.

Overall in this regard, from a policy perspective, TII has confirmed to EirGrid that it is Government policy, included in Section 28 Ministerial Guidelines on Spatial Planning and National Roads (DoECLG, 2012), that development objectives must not compromise the route selection process. TII hold the view that the construction of a high-voltage interconnector along the route of the existing N25 corridor will represent an additional significant constraint to planning and design for the N25 Carrigtohill-Midleton Scheme and is very likely to add significant additional costs to the delivery of the scheme.

There is also the consideration of the need to maintain the strategic capacity and safety of the national roads network, including planning for future capacity enhancements, in National Strategic Outcome 2 of the National Planning Framework. In addition, the National Development Plan, 2018 – 2027, outlines the investment priority to ensure that the existing extensive transport networks, which have been greatly enhanced over the last two decades, are maintained to a high level to ensure quality levels of service, accessibility and connectivity to transport users. TII holds the view that introducing an additional constraint such as the Celtic Interconnector DC underground cable within this corridor could significantly affect planning and design for the N25 Carrigtohill-Midleton Scheme and potentially compromise scheme delivery, contrary to need to realise the objectives of the National Planning Framework and the National Development Plan.

In discussions between EirGrid and TII, it was also confirmed that, while formal consent from TII is required under Section 53 of the Roads Act for the installation of services in motorways and protected roads, it is established practice to treat other dual carriageways in a broadly similar fashion requiring consent from the relevant motorway maintenance contractor for works on the road. There is a clear rationale for this, in ensuring any such highly trafficked, strategic road asset can function to its most effective extent, without need for closure or other constraint to facilitate the activities of other parties. In relation to the N25 Carrigtohill-Midleton Scheme, while it is too early in the route selection process for a final decision to

have been made, TII have advised EirGrid that the option of making the scheme a protected road or motorway are both under consideration due to the strategic importance and traffic demand on this section of road.

The potential use of the N25 corridor for the Celtic Interconnector would bring the DC UGC to the southern boundary of the overall IDA landholding at Ballyadam. Reference to the N25 project options above would suggest that access into the landholding would either be via the existing vehicular access at the south-western boundary of the landholding, or off a new interchange extending into the site (red route option). In any such scenario, the cable would need to be laid across the IDA landholding to access the identified converter station location at the north-eastern boundary. No permanent road route has been confirmed within the overall landholding such as would be required to accommodate the DC UGC. This is because the IDA must retain flexibility in site layout and extent, and therefore in respect of associated site services and infrastructure, in order to facilitate any future employment generator on the overall landholding.

7.3 Route Options Review – Multi-Criteria Evaluation

Technical

While the discussion above has focussed upon the N25 west of Midleton, from a technical perspective, the UGC extending westwards on the N25 from the Two Mile Inn /Churchtown junction would require to cross over the significantly busy – and often congested at peak-time – Lakeview Roundabout. While the approach has verges on both sides and a central grassed median, these are populated with existing screen vegetation (presumably functioning in part as a noise barrier), as well as road services and infrastructure such as an overbridge, signposts and streetlamps with associated UGC (Figure 7.5 / 7.6).

Figure 7.5: Approach on N25 eastwards to Lakeview Roundabout

Figure 7.6: N25 Overbridge and other road infrastructure at Lakeview Roundabout

Having regard to the construction methodology for underground cables outlined in Section 3 above, it is likely that both options will require extensive, complex albeit temporary traffic management measures.

West of the Lakeview Roundabout, the N25 Improvement Project will not be in a position to provide any meaningful design information on the preferred route until at least Q1 2022. This is in or around the anticipated timeframe for consenting of the Celtic Interconnector project. Furthermore, the level of detail required to coordinate with the detailed design of the Celtic Interconnector DC UGC is not likely to be available until the post-consent tendering and construction phases which will be 2023 at the earliest. This is the anticipated timeframe for construction of the Celtic Interconnector project.

There is therefore a profound conflict between the anticipated timelines for construction of the Celtic Interconnector project and for the N25 road improvement project. It is noted that the Celtic Interconnector project is obliged to meet timeframes established with the European Commission with regard to the drawdown of significant grant assistance.

In addition to the above, as confirmed by both TII and the Cork RDO, it is the case that, given the nature of the construction works required along the N25, including the upgrading of those portions of the existing N25 that might be retained to service existing dwellings along the corridor, having the DC underground cable located and operational within the construction corridor in advance of these major planned construction and upgrading road works would inevitably form a significant and adverse constraint on the project. In particular, the cable would have to be fully assured of protection within what will comprise a major construction site. Moreover, the cable rating (i.e. the power that can be carried) is profoundly dependent on an assured burial depth, and this could be inadvertently or unavoidably altered by the road works over and adjacent.

There is equally no certainty with regard to the routing of the cable into and within the IDA overall landholding at Ballyadam. There are no plans and/or designs relating to road layout within the overall landholding, nor it is confirmed by the IDA will there be prior to such works being carried out to facilitate one or more future employment-generating occupants of the landholding. The road layout is also considerably influenced by the location or otherwise of an identified grade-separated interchange in the Ballyadam area, as identified on the Red Route option of the N25 improvement scheme.

In short, there is considerable uncertainty occurring for EirGrid, TII/Cork RDO and the IDA with regard to the design and layout of new road infrastructure between the Lakeview Roundabout and the planned converter station site at Ballyadam; and even if this could be overcome, there remains a clear and significant risk of damage to the cable, and thereby to the operation of the interconnector associated with all future planning and unplanned road infrastructure improvements both on the N25 and within the IDA Ballyadam landholding.

Having regard to all the above, from a Technical perspective, this option is denoted as **DARK BLUE**

Economic

This route option is approximately 13.9 km in length between the off-road crossing of the Mogeely Road at Castlemartyr and the converter station within the IDA Ballyadam landholding (noting that this is an approximate figure given the lack of any detail regarding road routes for this option). This is approximately 2.9 km less than the baseline BPO.

However, given the potential complexities in construction arising from factors such as the volume of existing roadside infrastructure, utilities and services in the area of the Lakeview Roundabout and the likely need for their relocation and/or replacement, as well as the complex construction methodologies that might be required to traverse within the N25 construction corridor and within the IDA Ballyadam landholding to ensure protection of the underground cable, it is not unreasonable to consider that these will increase the cost of the construction project.

Having regard to the above, and relative to the BPO, this option is denoted as **DARK GREEN**

Environmental

Irrespective of the issues raised above, the route option occurs primarily within an existing or evolving road corridor. This is a significant benefit from an environmental perspective.

The issue of impact on traffic and vehicular movement, while an environmental topic under the Environmental Impact Assessment (EIA) Directive, has been considered in respect of the Technical criterion above, and is not therefore considered here.

In terms of flood risk, Figure 7.7 shows modelled Catchment Flood Risk Assessment and Management (CFRAM) flooding under 1:10 year (i.e. high risk) scenarios for both coastal and fluvial flooding.

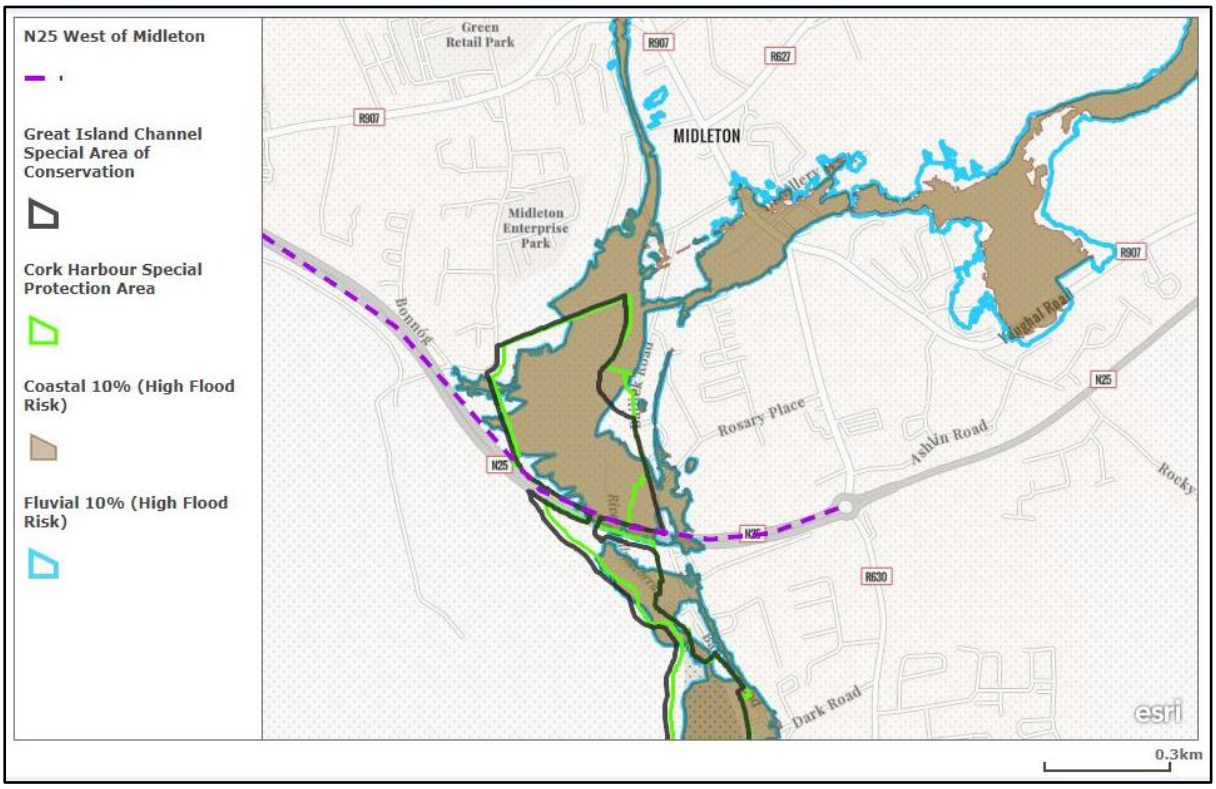

Figure 7.7: CFRAM Flood Risk modelling in the Midleton area (source: EirGrid / ESRI)

High Risk fluvial and coastal flood risk of the N25 from the Owenacurra River both impact the route option. The European designated waters of Cork Harbour flank the N25 at the area of flood risk, posing a significant pollution risk during construction to both sites.

As noted above the N25 west of Midleton intersects two European sites (i.e. SACs or SPAs). This is in contrast to all other routes. As such, in addition to flood risk, construction works could displace wintering birds for which the Cork Harbour SPA is designated. As for Option A, and all Midleton options, the route follows the N25 to the east, and as such the route adjoins, and has potential for pollution impacts to the Loughs Aderry and Ballybutler pNHA and Wildfowl sanctuary.

Notwithstanding the risks to European sites, the 'greenfield' footprint of the route however is relatively contained given that the UGC will be laid primarily within an existing corridor, resulting in reduced ecological impacts in that regard.

The route may not require open cut water crossings, with potential benefits for aquatic ecology.

A variety of ecological features could be impacted in the absence of mitigation. For instance, roadside hedges and verges could contain protected mammal or bird breeding sites, and roadside areas generally, and locally also commonly contain invasive species, such as Japanese knotweed.

Mitigation measures are likely to be available to mitigate all potential impacts identified, to acceptable levels. However the potential risks to European sites from flooding and bird disturbance present an elevated risk, relative to all other options.

The route frequently crosses areas of extreme and high groundwater vulnerability, with karstic rock at/near the surface in many roadside areas on the N25 nargins.

The option does not intersect any national monument sites, but passes close by another a number of sites, and therefore triggers Zones of Notification.

There may arise some issues of noise and other disturbance, including temporary disruption for residents along the N25 should the cable be laid in a portion of the existing carriageway to be retained. In addition, it may be the case that existing roadside vegetation along the N25 carriageway east of the Lakeview Roundabout might require to be removed to facilitate cable laying, thereby eliminating its function – even temporarily – as a noise barrier. However, such noise impact must be considered relatively minor in comparison with the baseline noise environment of a heavily trafficked National road. Moreover, there will also inevitably be noise arising from the planned road improvement scheme.

Having regard to the above, this option is denoted as **LIGHT GREEN.**

Socio-Economic

The Technical challenge of laying the DC UGC within the construction area of the planned N25 road improvement scheme, and within the currently undeveloped IDA Ballyadam landholding has been addressed above.

It is apparent that the construction of the DC UGC on this option, if feasible, could have socio-economic implications in terms of constraining the timing and/or extent of development of the N25 road improvement scheme, and the future development of the IDA lands. Development of both land areas are a key objective within statutory Development Plans, given their clear benefit for the socio-economic development of the region.

Once laid in the ground and operational, the DC UGC – which will be constructed in advance of both the N25 road improvement scheme and the wider development of the IDA landbank – cannot be relocated without impact to the operation of the Celtic Interconnector project. These future developments would therefore likely have to be designed around the DC UGC as a fixed constraint that cannot be impacted upon, with consequent significant implications for both development areas.

Having regard to the above, this option is denoted as **LIGHT BLUE.**

Deliverability

The laying of the cable within the existing N25 would presents very significant challenge in terms of deliverability, as there is no assurance of how the existing corridor relates to the planned future road corridor in terms of alignment, design and levels, all of which are critical to the operation of the Celtic Interconnector.

TII, Cork RDO, and the IDA have all raised reasonable concern with regard to the scenario of the DC cables being laid within the N25 corridor west of Midleton, Even if feasible, there would arise very significant complexity with regard to deliverability and operation of the UGC within this evolving development context.

There is risk that consent might be delayed or not forthcoming from An Bord Pleanála, as decision-making authority, in view of the fact that there are alternatives which would avoid the likely impact upon the planning, design and construction of the N25 improvement scheme, which is an objective of the National Development Plan, and upon the design and evolution of the IDA Ballyadam landholding, which is an employment objective of the Cork County Development Plan.

Having regard to the above, this option is denoted as **DARK BLUE.**

Overall Evaluation: N25 West of Midleton

Criterion	**N25 West of Midleton**
Technical	
Economic	
Environmental	
Socio-Economic	
Deliverability	

8. Option D – Midleton

8.1 Original Consideration

The Step 4B *Development Options Report* (November 2020) concluded as follows in respect of a cable option through the built-up area of Midleton:-

> *"Bringing the cable off the N25 at Midleton was considered to unduly impact on this large town - particularly in terms of traffic, disturbance, conflict with existing services, for no meaningful benefit in comparison with use of an alternative local road route"*.

8.2 Route Options Review – Description of the Existing Development Context

Midleton is situated primarily on the northern side of the N25. It has a well-defined central commercial and administrative core area centred on Main Street, extending north-westwards to the area of the Courthouse and Garda Station, and south-eastwards to the area of the Jameson Distillery complex. The town has a variety of land uses including residential, employment, retail, educational, leisure and amenity. It is the largest market town in the East Cork area. Figure 8.1, extracted from Google Maps, identifies the main built-up area of Midleton relative to the N25.

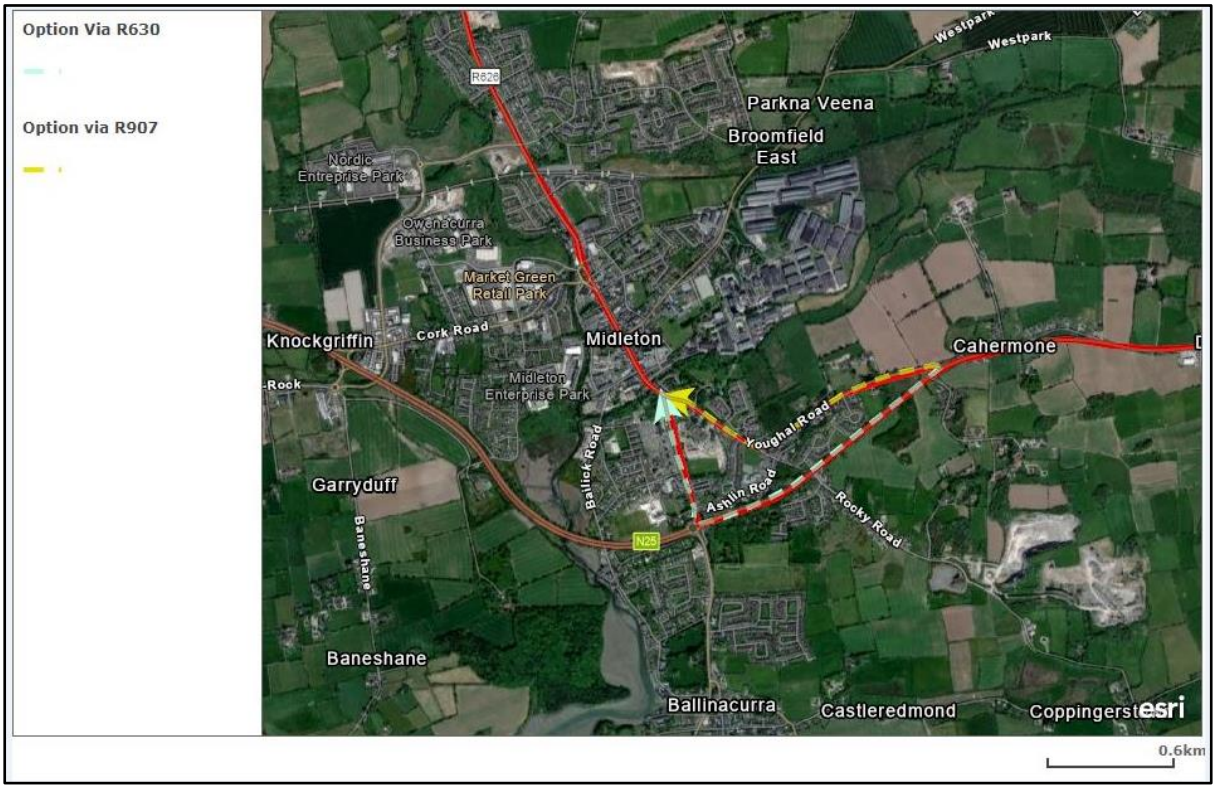

Figure 8.1: Aerial photograph of the main built-up area of Midleton and the N25 showing potential UGC route options (source: EirGrid/ESRI)

For the purposes of this Route Options Review, two cable route options are considered, both extending from the N25 through the built-up area of Midleton to the northern outskirts of the town, proximate to the East Cork Golf Club.

The first approach option to the central core of Midleton is along the R907 (Youghal Road), which comprises the eastern approach to the town, off the northern side of the N25. The wide junction of the N25 and R907 includes a right-turn vehicle lane from the N25, with access in both directions facilitated onto the N25 from the R907 (Figure 8.2).

Figure 8.2: Junction of the N25 (E30) and the R907 (source: Google Street View)

The R907 on its eastern approach to the town comprises a generally wide two-way carriageway, with a pavement on its southern side, and a soft verge of varying width on its northern side. This verge incorporates roadside trees in places.

In closer proximity to the town, the road is framed by development of a more built-up urban character, with pavements extending on either side of the road (Figure 8.3).

At the edge of the town core, the R907 merges with the R630 (denoted as St. Mary's Road), which extends northwards from the Lakeview Roundabout on the N25.

Figure 8.3: Alignment and character of the R907 (source: Google Street View)

The second approach option to Midleton is via the R630 (St. Mary's Road) extending northwards from the N25 Lakeview Roundabout (Figure 8.4). The road is lined on both sides with significant residential development. Pavements line both sides of the road with parking areas on its eastern side. A number of older cut-stone dwellings line the road on both sides in this area.

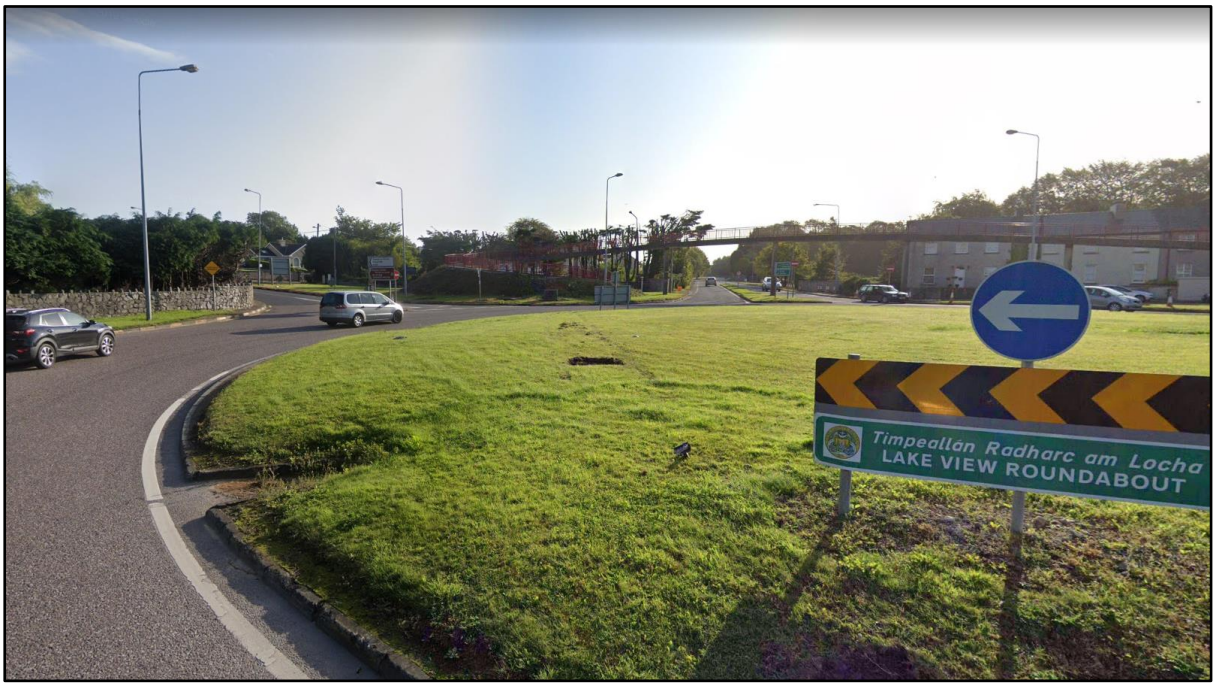

Figure 8.4: View to R630 from Lakeview Roundabout (source: Google Street View)

Further to the north on this road, the Church of the Most Holy Rosary is located off its eastern side, with a “yellow box” access painted on the road (Figure 8.5). A short distance thereafter, it merges with the R907

Figure 8.5: View on R630 at entrance to the Church of the Holy Rosary (source: Google Street View)

The R907 crosses the Dungourney River – a tributary of the Owenacurra River - at the entrance to the Jameson Distillery complex, before extending northwards along Main Street. This is a fine-grained street of two- and three-storey buildings with car parking on both sides of the road (Figure 8.6).

At the northern end of Main Street, in proximity to the town courthouse, there is a more complex one-way “roundabout” system. North of this, the R626 Mill Road serves the northern edge of the built-up area of the town, with a pavement on its western side, and car parking on its eastern side. Further north along this road is a level crossing with the Cork-Midleton railway line - Midleton Rail Station is located immediately to the east thereof.

North of the level crossing, the road extends northwards into the northern outskirts of the town, passing estate housing development as well as the Midleton Educate Together National School complex (Figure 8.7).

The junction of the R626 with a local road at the East Cork Oil premises marks the interface of the Midleton route option with the BPO DC underground cable route.

Figure 8.6: View on R907 north-westwards along Main Street (source: Google Street View)

Figure 8.7: View on R626 north-westwards to the northern outskirts of the town, with Midleton Educate Together National School on its north-eastern side (source: Google Street View)

8.3 Route Options Review – Multi-Criteria Evaluation

Technical

With regard to the approach road options to the central area of Midleton, the R907 (Youghal Road) is preferable to the significantly busy – and often congested – Lakeview Roundabout and R630. However, both are busy access roads, particularly at peak-time movements.

Having regard to the construction methodology for underground cables outlined in Section 3 above, it is likely that both options will require extensive, complex albeit temporary traffic management measures. This equally applies for the route within the Main Street area, and northwards on the R626.

While remaining to be confirmed, it can reasonably be assumed that the northern and southern approach roads, and the area centred on Main Street will have various concentrations of existing utility and other services within the road carriageway, In addition to this being challenging in terms of ensuring adequate capacity for the DC cables, it also presents significant complexity for the provision of joint bays within the road. Moreover, there is little if any opportunity for setting the joint bays off the main carriageway, given the existing roadside buildings and structures.

The cable will be required to cross a number of key constraints, in particular the existing bridge over the Dungourney River, and the existing level crossing with the Cork-Midleton railway line. It is uncertain that there is sufficient depth within the existing bridge deck to accommodate the cable trench, with little or no opportunity to divert off the carriageway to undertake a Horizontal Directional Drill (HDD) under the river. Similarly, with residential properties extending up to the level crossing, there is little if any opportunity for HDD under the level crossing. This means that the cable would require to be laid at grade with likely significant implications in terms of necessary disruption to operation of the rail service.

Moreover, there is significant potential for interference from the cables with the signalling system of this operational railway.

Having regard to all the above, from a Technical perspective, this option is denoted as **LIGHT BLUE.**

Economic

The route option via the R907 is approximately 15.2 km in length between the off-road junction at the Mogeely Road in Castlemartyr and the converter station site within the IDA Ballyadam landholding, via the local road at the northern end of the R626. The equivalent overall route distance of the option via the R630 in Midleton is 15.9 km. This is approximately 1.6 – 0.9 km less than the baseline BPO.

Given the potential complexities in construction arising from factors such as the volume of existing utilities and services in the roads and the need for their relocation and/or replacement, the complex construction methodologies that might be required to traverse the bridge and the level crossing, as well as potential restrictions on activities that might be

permitted during the day within the core area of this busy market town, it is not unreasonable to consider that these will increase the cost of the construction project.

Having regard to the above, and relative to the BPO, this option is denoted as **DARK GREEN.**

Environmental

The route option occurs primarily within an existing road alignment. This is a significant benefit from an environmental perspective. The issue of impact on traffic and vehicular movement, while an environmental topic under the Environmental Impact Assessment (EIA) Directive, has been considered in respect of the Technical criterion above, and is not therefore considered here.

The existing bridge over the Dungourney River is a traditional cut-stone structure with significant cultural heritage value. Care needs to be taken in construction methodology not to affect the fabric or integrity of the structure. Equally, the fabric of buildings of Main Street and the Jameson Distillery offers significant cultural heritage value.

The Dungourney River is a tributary of the Owenacurra River which ultimately flows into the two European sites comprising the Cork Harbour waterbody. Significant care in construction needs to be taken to ensure that there is no potential for cable laying activities to impact either directly nor indirectly on the quality of water in this river system.

High Risk fluvial and coastal flood risk from the Dungourney River impacts all routes through Midleton, at two locations along the main street. The option via the R907 Youghal Road performs least well from a flooding perspective, as a c. 200 m of this road additionally floods.

The environmental risk from this flooding is significantly amplified by the proximity of the European designated waters of Cork Harbour, c. 400 m downstream.

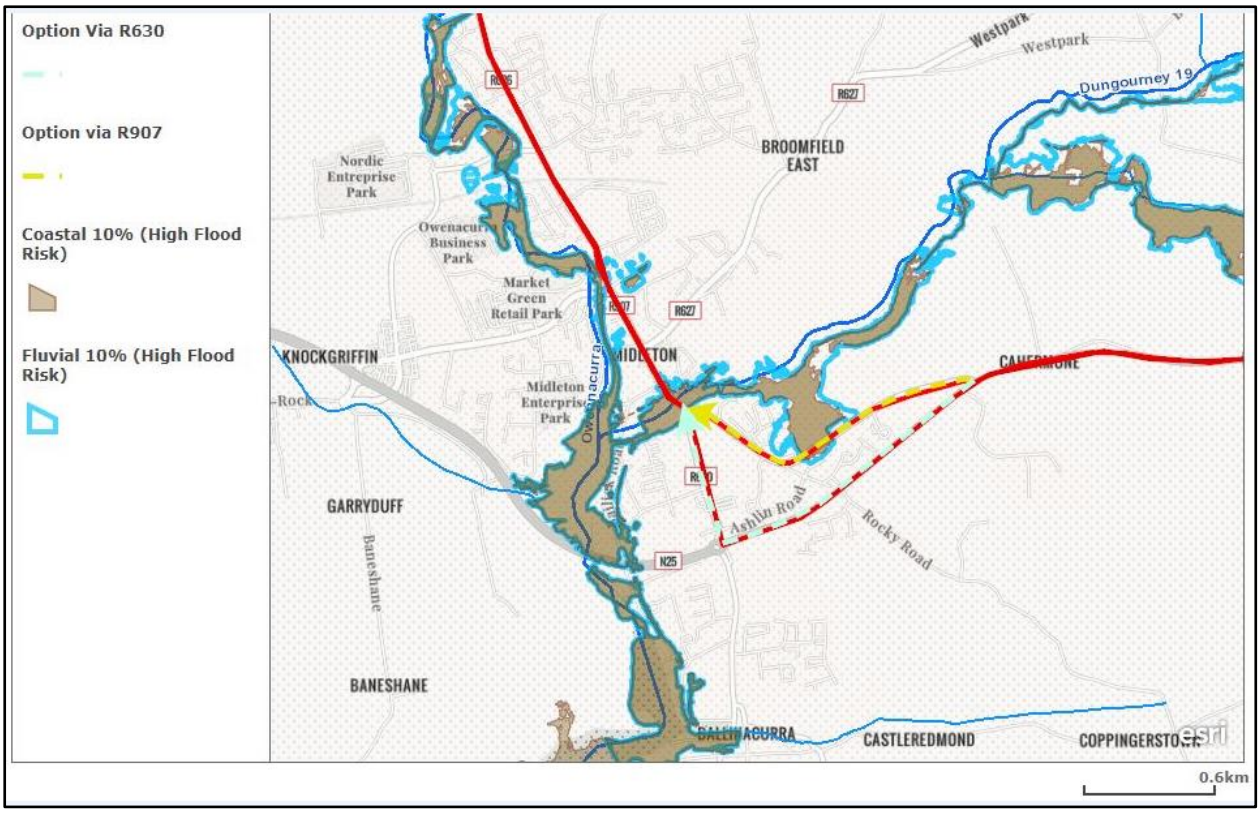

Figure 8.8: CFRAM Flood Risk modelling in the Midleton area (source: EirGrid/ESRI)

Despite the notable downstream pollution risk, the Midleton options do not intersect any European sites (i.e. SACs or SPAs.

Given its urban character, the 'greenfield' footprint of the option would be relatively small, with ecological impacts being reduced in this context.

A variety of ecological features could be impacted in the absence of mitigation. For instance, roadside hedges and verges could contain protected mammal or bird breeding sites, and roadside areas generally, and locally also commonly contain invasive species, such as Japanese knotweed.

Mitigation measures are likely to be available to mitigate all potential impacts identified, to acceptable levels. However the potential risks to European sites from flooding present an elevated risk, relative to some other routes.

Both access options onto Main street, whether via the R907 or the R630, are underlain by areas of significant groundwater vulnerability, with karstic rock additionally occurring at/near the surface along the R907.

The route does not intersect any national monument sites, but both options trigger Zones of Notification to National Monuments Service, for two monuments at the southern end of Midleton Main Street.

Having regard to the above, this option is denoted as **LIGHT GREEN**

Socio-Economic

Midleton is the most important market town, commercial, administrative, residential and employment centre of East Cork. Moreover, it is an important commuter settlement of Cork City. It has key destination nodes along the route of the cable option, including the Church of the Holy Rosary, the Jameson Distillery, the Main Street retail area and other edge-of-centre retail areas, Midleton Courthouse, Midleton Railway Station, and education centres.

The laying of the DC cable within this urban centre will inevitably have a very significant socio-economic impact on the settlement. This is likely to include restrictions on traffic (and potentially pedestrian) movement, operation of the rail line during cabling across the level crossing, as well as general noise and disruption. It is noted that any such activity will only occur for a temporary period at any particular location; however, it will occur along the main commuter and circulation routes within and to the north and south of the town, where traffic and pedestrian movements are at their busiest.

Having regard to the above, this option is denoted as **DARK BLUE.**

Deliverability

The laying of the cable in the public road through the town, and over the railway line will require the agreement of Cork County Council and Irish Rail. This may be challenging given the potential impact of the construction project on the fabric and activities of the town, and on the operation of the Cork-Midleton railway line.

Public sentiment regarding the potential impact upon the town and its activities is likely to be negative both during the consenting process, and during construction of the project within the urban area,

There is risk that consent might be delayed or not forthcoming from An Bord Pleanála, as decision-making authority, in view of the fact that there are alternatives which would avoid the likely impact upon the fabric and function of Midleton as a market town and large settlement of East Cork.

Having regard to the above, this option is denoted as **LIGHT BLUE**

Overall Evaluation: Midleton

Criterion	**Midleton**
Technical	
Economic	
Environmental	
Socio-Economic	
Deliverability	

9. Option E – Typical Off-Road (Cross Country) Option

9.1 Original Consideration

Typical off-road / cross-country UGC options were not considered in the Step 4 reports. It is a general preference to lay UGC in the public domain, for example in public roads, where the cable infrastructure is easily accessible for operation and maintenance purposes.

9.2 Route Options Review – Description of the Existing Development Context

For the purposes of this Review, a concise study area within which potentially feasible off-road routes could occur has been evaluated, rather than any specific off-road routes, as there are broad similarities among various off-road route options in this study area.

This study area (Figure 9.1) is framed to the east and north by the Shanty Path (see Section 5 above), to the south by the N25 corridor, and to the west by an indicative line running south / south-west from the area of the intersection of the Shanty Path with the disused railway corridor at Roxborough, to the N25.

For the purposes of this Review, two typical off-road options have been identified within this study area, both to the south of the Shanty Path (Figure 9.1). Both typical off-road options extend between the location where the current BPO enters this study area in the vicinity of the Two Mile Inn junction of the N25, and the intersection of the Shanty Path with the disused railway corridor at Roxborough.

It is important to note that, while identified as “off-road options” for comparative evaluation purposes, these do not comprise specific routes. They have not been confirmed by way of walkover or other survey. In addition, no engagement with landowners has occurred – given the nature of this review as a comparative evaluation, it was considered by EirGrid that it would not assist to compare public road options (generally having unrestricted access) with off-road options across private landholdings.

However, these typical off-road options reflect general practice for the laying of cables in agricultural lands within the identified study area, such as seeking to keep the alignment at the edge of fields where possible to minimise disruption to ongoing agricultural activities.

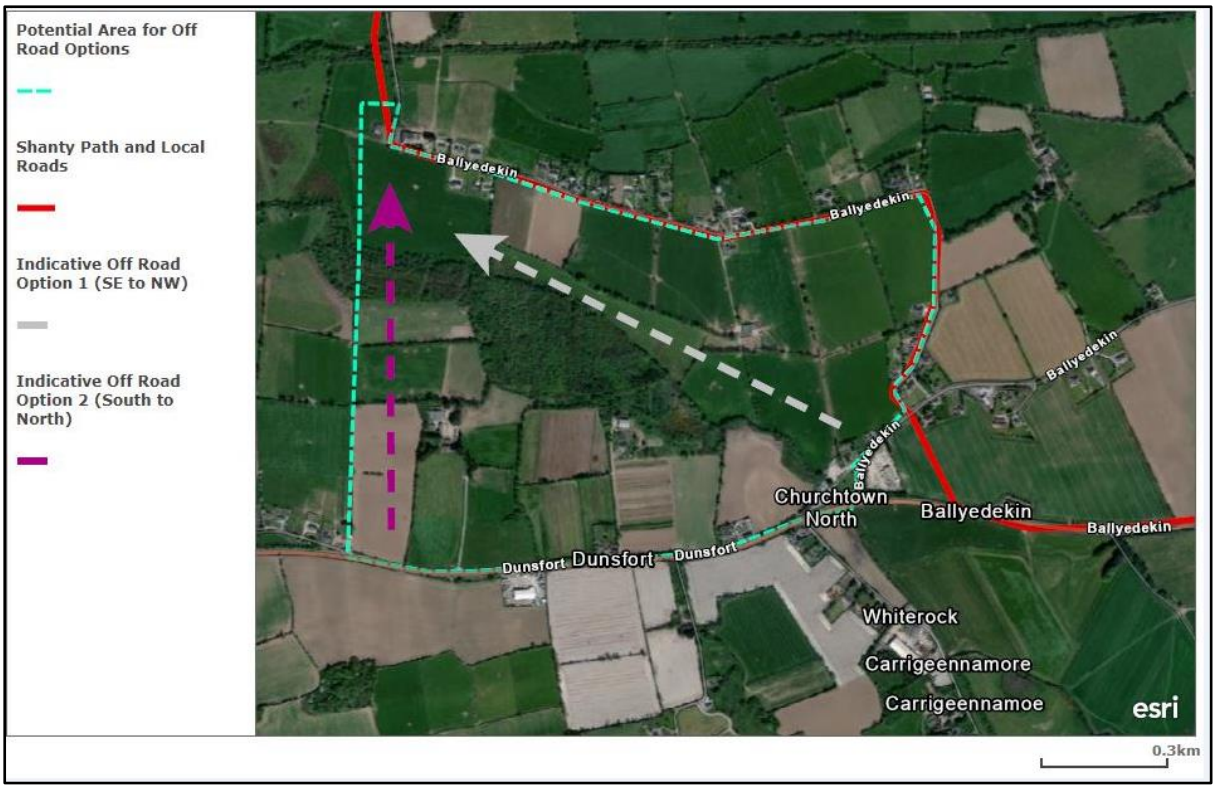

Figure 9.1: Off-road study area, showing indicative alignments for off-road UGC options in the Churchtown area (source: EirGrid/ESRI)

Typical off-road Option 1 initially extends south-east - north-west across agricultural lands immediately west of the junction of the Shanty Path with the Mogeely road. This alignment seeks to avoid cutting through the middle of agricultural fields. The option extends across open agricultural fields, generally following the north-eastern boundary of a woodland.

Typical off-road Option 1 merges with the identified BPO where it is planned to come off the local road (Shanty Path), to the south of the disused railway corridor (Greenway) and Dungourney River. The crossing of the disused railway corridor and river in this location will occur by way of Horizontal Directional Drill (HDD), and thus an off-road location is required.

Typical off-road Option 2 initially extends west along the northern side of the N25. The alignment then extends northwards, keeping to the edge of agricultural fields. It crosses the north-western end of the woodland mentioned in respect of Option 1 which includes a tributary of the Dungourney River crossing within the woodland (refer to Figure 9.2), before joining the alignment of Option 1 as it extends to the north-west and north-east before linking with the BPO off-road alignment to the south of the disused railway corridor and Dungourney River.

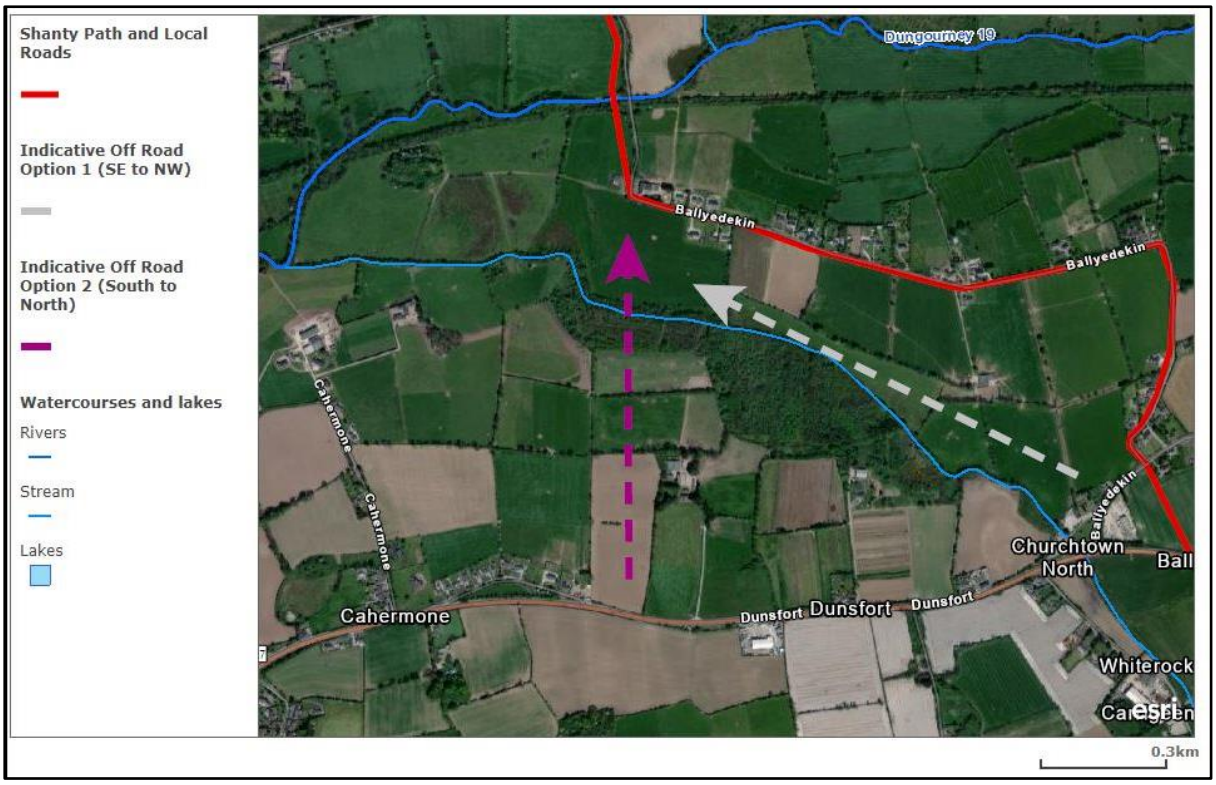

Figure 9.2: Dungourney River system in the Churchtown area (source: EirGrid/ESRI)

A third typical off-road option was initially identified, extending generally northwards from the N25 at a location some distance east of the Two Mile Inn junction. This option would have to cross the Mogeely road at a break in the roadside development along this road, before crossing the disused railway corridor and the Dungourney River which at this location are some considerable distance apart, and thus would require separate HDD operations. Even with this, the alignment would be some significant distance east of the other options and therefore considerably longer than the other identified indicative options. As such, this option was not progressed to form part of this review.

Both typical off-road options cross over a number of fields which have mature treeline and hedgeline boundaries. The typical off-road options may also cross agricultural drainage ditches which will be required to be culverted. The new culverts would be installed underneath the cable trench and will be back-filled to ground level with excavated material. Other than the woodland, the predominant land use in the vicinity of the option alignments comprises arable and grassland.

As noted in Section 3 above in respect of construction of UGC in agricultural lands, this will require the temporary loss of land to facilitate the development. For both options, a construction zone of minimum 30m width will be required along the UGC circuit route for a period of up to 18 months. The route of the UGC would be confirmed in consultation with affected landowners to minimise the impact on farm operations.

For both typical options, a temporary construction access track will be required to ensure access to the construction site for the full duration of the construction programme. These

access tracks will comprise granular stone, and will be removed upon completion of construction. One or more joint bays will be required along either of these options.

Permanent access will be required along the full route of the cable on the agricultural land including to all joint bays. This is provided for in a 14m wide easement (centred on the cable route) which also restricts land uses (e.g. development and tree planting) to ensure the safety and security of the cable and to provide adequate space for any future repair or maintenance.

Reinstated agricultural areas will be seeded to grass or left ready for sowing with tillage crops as agreed with the landowner. Normal farm cropping practices can resume thereafter.

Having regard for the County Cork Biodiversity Action Plan, wherever practicable, and unless otherwise agreed with EirGrid and the third party landowner, the contractor will be obliged both by EirGrid and by the local authority to reinstate earth banks and hedgerows along the off-road cable route to a species-rich native wildflower or hedgerow mix.

9.3 Route Options Review – Multi-Criteria Evaluation

Technical

The construction methodology for cable laying in off-road areas is set out in Section 3 above. There is an inherent greater technical complexity that must arise, such as the careful excavation and segregated storage of topsoil and subsoils. In addition, a temporary hardcore construction access road must be laid in advance of any cable laying works, as well as the clearance of portions of hedgerows and drainage ditches, with associated laying of culverts where necessary.

In order to minimise impact on agricultural activities, both options will be constructed in relative proximity to a tributary of the Dungourney River, which ultimately flows into the Owenacurra River at Midleton, and on downstream into the two European sites in Cork Harbour. While this is addressed further in respect of the Environmental criterion, from a technical perspective this brings a certain complexity, albeit not insurmountable, with the need for construction management measures that ensure there is no adverse impact on this existing river system.

In particular respect of typical off-road Option 2, this will require to cross through the area of woodland, and the Dungourney River tributary. The river crossing may require Horizontal Directional Drilling (HDD) in order to protect the integrity of the river. However, being located within the existing woodland, this makes any method of crossing the river more technically complex, and bespoke construction methodologies would be required for this, including felling of woodland and clearing of a launch pit area if HDD is required.

Having regard to all the above, from a Technical perspective, this option is denoted as **DARK GREEN.**

Economic

Typical off-road route Option 1, including the off-road section of approximately 2.1 km, is approximately 16.4 km in length between the off-road junction with the Mogeely Road in Castlemartyr and the converter station site at Ballyadam. The equivalent route distance for Typical off-road Option 2 is approximately 17.2 km, of which approximately 2.7 km is off-road. This is approximately 0.4 km less - 0.4 km greater than the baseline BPO.

Given the potential complexities in construction arising from the off-road option, including laying of the access road, clearance of the alignment, as well as securing of landowner easements and resulting compensation, it is not unreasonable to consider that these will increase the cost of the construction project.

Typical off-road Option 2 is likely to have greater costs than Typical off-road Option 1 associated with clearance of the existing woodland in the vicinity of the cable corridor, and the crossing of the Dungourney River in a manner that ensures its environmental protection (assumed to be by way of Horizontal Directional Drill - HDD).

Having regard to the above, and relative to the BPO, this option is denoted as **DARK GREEN** (primarily relating to Option 1; Option 2 may be Light Blue)

Environmental

Both typical off-road route options occur within a study area primarily comprising existing agricultural lands that have been subject to ongoing farm activity. No recorded cultural heritage features occur within this area that cannot be avoided by local routing, and the implementation of archaeological monitoring during construction of the UGC. In addition, noise and other disturbance is likely to be relatively low impact in this area.

As noted in the construction methodology, both options will require the temporary or permanent removal of portions of field hedgerows and ditches. This could also include the culverting of waterbodies within those ditches.

In addition, as noted in the construction methodology, environmental mitigation measures will be required to protect waterbodies – this includes the use of silt fences (or other appropriate measures), and an adequate separation distance between the waterbody and any part of the construction area.

Typical off-road Option 2 is likely to require the removal of a significant swathe of existing woodland to facilitate the construction of the UGC, including the crossing of the Dungourney River tributary. This swathe would be approximately 30m in width. While replanting could occur on a portion of this, as noted elsewhere in the Review document, a 14 metre wide corridor will require to be retained without trees. Tree-felling could impact bats and nesting birds; although the habitat diversity arising by the introduction of an unplanted strip may favour some species in the long-term.

Both typical off-road Options intersect recorded areas of high groundwater vulnerability. This designation applies to the wider area of the identified corridor options.

Figure 9.3 shows modelled flooding under 1:10 (high flood risk) scenarios, from both fluvial and coastal flooding. This shows that the Dungourney River and tributaries regularly flood the wider areas of both typical off-road options, due to coastal waters coming upstream from Cork Harbour, and river water originating upstream. This flooding could carry pollutants downstream to the European sites in Cork Harbour during construction.

Neither off-road option interacts with nationally designated sites, or national monuments.

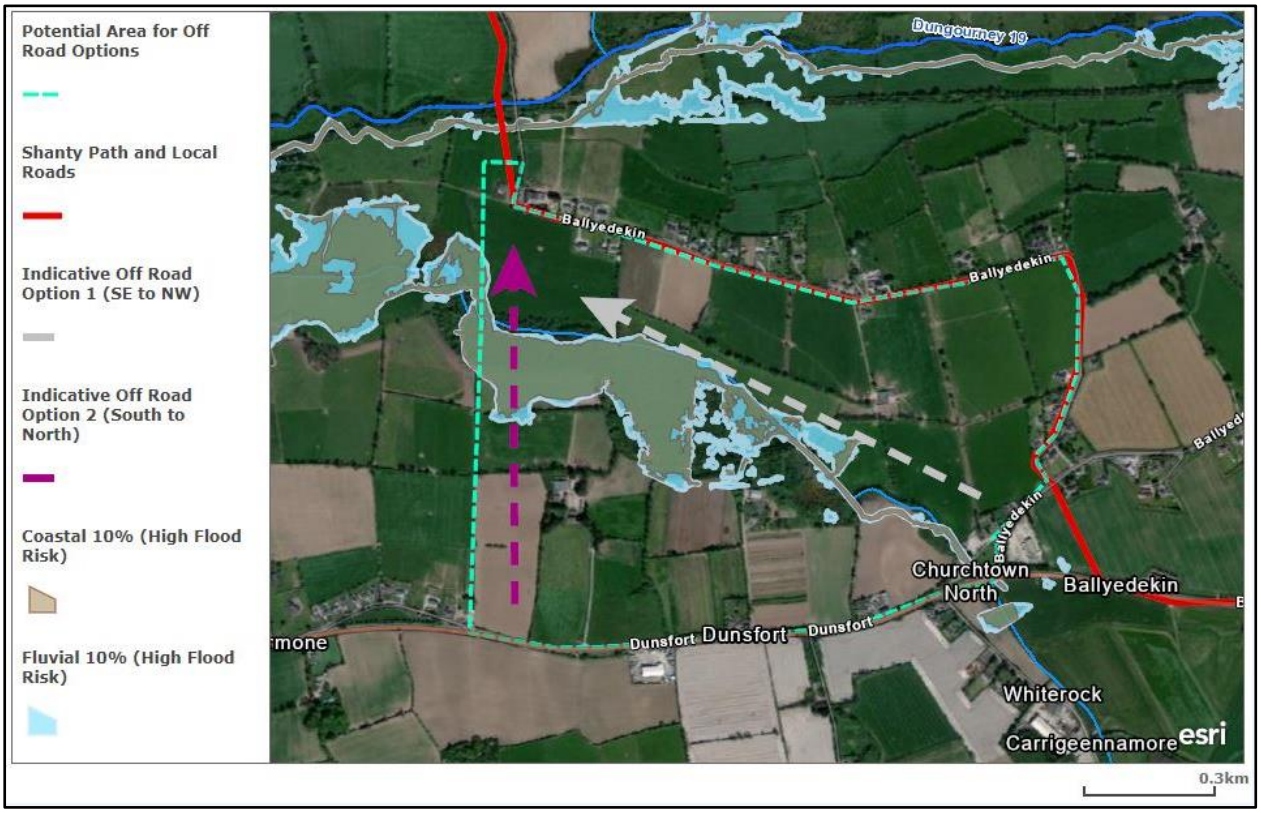

Figure 9.3: CFRAM Flood Risk modelling in the off-road study area at Churchtown (source: EirGrid/ESRI)

Having regard to the above, this option is denoted as **LIGHT BLUE**

Socio-Economic

The typical off-road options cross private agricultural lands. This will place a temporary burden on an approximately 30 metre swathe of those lands during construction, and a permanent burden on a smaller swathe of those lands (approximately 14 metres) in terms of restriction of certain activities thereon.

No tree planting will be permissible within the corridor in the existing woodland plantation. In addition, permanent access will be required along the UGC alignment. Such burden will be subject of compensation payment.

Having regard to the above, this option is denoted as **DARK GREEN.**

Deliverability

The laying of the cable across private agricultural lands places a permanent burden on the title of those lands. This has the potential to be a matter of concern to directly affected landowners, particularly in the context that there are other route options that do not affect private landholdings. This could potentially impact upon deliverability timelines in comparison with a UGC route along a public road.

There is risk that consent might be delayed or not forthcoming from An Bord Pleanála, as decision-making authority, in view of the fact that there are alternatives which would avoid the potential impact arising in respect of flood risk, groundwater vulnerability, impact on the downstream river corridor of the Owenacurra River, the two European sites in Cork Harbour, and other environmental impacts.

Having regard to the above, this option is denoted as **DARK GREEN**

Overall Evaluation: Typical Off-Road Option

Criterion	**Typical Off-Road Option**
Technical	
Economic	
Environmental	
Socio-Economic	
Deliverability	

10. Conclusion – Comparative Evaluation

Having regard to the preceding sections, the performance matrix for the combined evaluation is set out in Figure 10.1 below:-

Criterion	Option A - Local Road Route	Option B - Disused Railway Corridor	Option C - N25 West of Midleton	Option D - Midleton	Option E- Typical Off-Road Option
Technical					
Economic					
Environmental					
Socio-Economic					
Deliverability					

Figure 10.1: Combined evaluation performance matrix

It is concluded that the Local Road Route option via the Shanty Path is the Best Performing Option of the various alternatives, as it achieves the best balance of these various criteria:-

- From a Technical perspective, the option is not unduly complex in comparison with the other options, with avoidance of impact on the existing watermain within the road a standard matter of detailed design and construction methodology;

- From an Economic perspective, the option is of generally greater length in comparison with the other options; however, its relatively straightforward construction relative to the other options is likely to result in equal or lower overall construction costs;

- From an Environmental perspective, the option is laid within the public road, within an area that has no flood risk. Temporary noise, disturbance and disruption is likely to be inevitable for all options– this is mitigated by the linear progression of construction;

- From a Socio-Economic perspective, all options have different issues. Community sentiment, anxiety and concerns regarding the provision of HVDC UGC within the road in the Churchtown area is fully acknowledged. Such concern is primarily articulated in terms of potential health impacts arising from the presence of magnetic fields. However, it is confirmed that levels arising in this area will be many multiples below established international guideline risk levels.

- From a Deliverability perspective, the option is equivalent or lesser than the other options, all of which have different factors arising.