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# Dublin North Fringe 220 kV Reinforcement Project Site Selection Report

Potential High Voltage Cable Routes  
Within The Study Area

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PE424-F2013-R00-002-005

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## **Executive Summary**

EirGrid, the Transmission System Operator (TSO), requested ESBI Engineering to identify the optimum site for a future 220 kV transmission substation located within a study area in the Dublin North Fringe Region, as defined in EirGrid's "Functional Parameters Report" in Appendix I of the principal project report PE688-F0154-F00-002-001.

A number of sites were identified as possible locations. Each site was assessed under a number of different criteria. This report assesses the suitability of each station site in relation to possible cable access for future 220 kV and 110 kV circuits.

Having analysed the results of a utility survey and identified possible route options available at present, all sites identified with access from the N32 or the Malahide Road are suitable for development as a 220 kV substation.

Two sites in particular are very favourable from a cable access viewpoint. The IDA site located to the north of the N32 with potential access onto the Clonsaugh Road is the preferred location. This is assuming that a station access road is constructed from the N32 national road and that a cable easement is acquired to the Clonsaugh Road. The cable easement would be up to 8m wide, and most likely located along the northern boundary.

The Teagasc site located to the east of the Malahide road is also a preferred location. This assumes that a suitable access road would be constructed from the Malahide Road to the station compound. The existence of Posey Row is also a distinct advantage to this potential station site location. A third party easement, up to 8m wide, would be required to access Posey Row from the potential substation site.

Overall, the preferred site identified in relation to future cable access is the IDA site.

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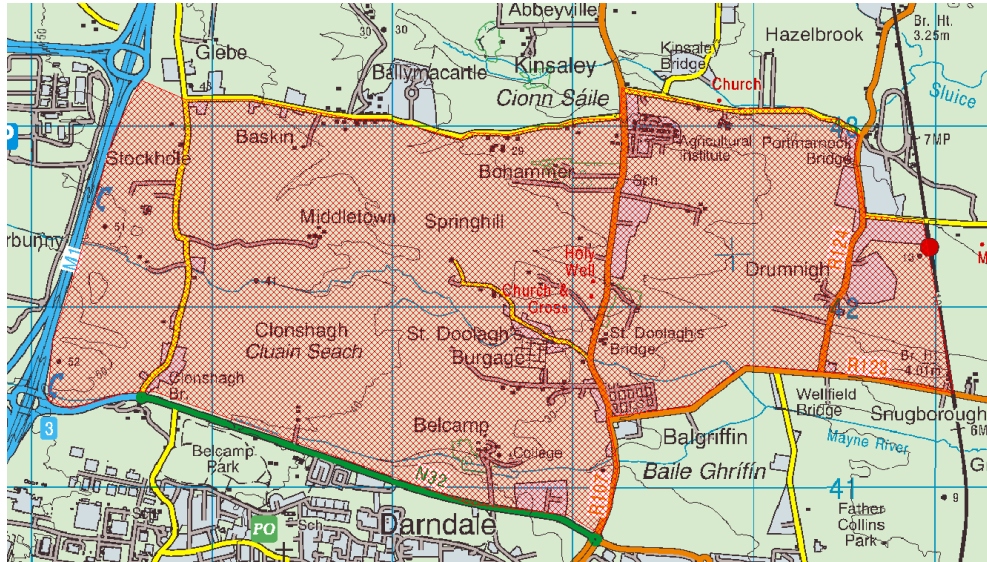
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# 1 Introduction

EirGrid, the Transmission System Operator, has identified a requirement for a new 220 kV substation to be constructed in the Dublin North Fringe Region. The study area within which the station is required is shown in Figure 1. (Highlighted in red hatching)



**Figure 1: Study Area - Highlighted in red hatching**

EirGrid commissioned ESB Engineering to identify a number of possible sites within the study area and to assess each site under a number of criteria. This process would result in the selection of the optimum site location for the proposed 220 kV substation. This is a supplementary report which assesses the potential cable access to any possible station site located within the study area. This report does not give a detailed description of the study area or comment on land zoning, landscape character, potential environmental impact etc. This information is contained within the principle project report **PE688-F0154-R00-002-002**

## 2 Possible Cable Circuits Required

When considering potential high voltage underground cable routes to and from a substation located within a study area, it is necessary to identify what circuits are required and what is the likely direction that they will be routed away from the study area. It should be noted that not all future circuits are known at the time of writing this report and that the assessment is based on those previously advised by EirGrid and ESB Networks. The proposed direction that each circuit will enter or leave the study area is shown on drawing PE424-D3013-010-001-001 in the appendix.

## **2.1 Proposed 220 kV Cable Circuits**

This substation will be energised via two 220 kV underground cable circuits. These cables will both be installed as independent single circuits from Finglas 220 kV substation to the proposed substation site. One of the 220 kV circuits will be routed south of the M50 motorway. The route will then approach any potential site from a southern direction either crossing the N32 road or running north along the Malahide Road (R107)

The second 220 kV cable circuit is already part installed and is currently being operated as a 110 kV cable, providing one leg of a looped supply to Dardistown 110 kV Substation (Dublin Airport). The proposal is to continue this circuit to the proposed 220 kV substation site as the second supply which will complete a secure and reliable feeding arrangement. This circuit will enter the study area from the west; crossing lands currently owned by Dublin Airport Authority and possibly a number of third party private land owners. It was originally envisaged that this circuit would be continued to the proposed substation site along the East West Distributor Road when constructed in the future. Due to the significant down turn in the economic situation of the public finances this project is unlikely to be completed in the short term. This will probably result in the installation of a short section of this proposed 220 kV cable across a section of private land.

## **2.2 Proposed 110 kV Cable Circuits**

The exact number and direction of 110 kV underground cable circuits is not known at this stage. It is envisaged that the following circuits may be required in the near future.

1. Loop in the existing Kilmore – Grange 110 kV Cable. (South of the study area). This will create two 110 kV cable connections to the new substation
2. A new 110 kV Cable to the existing Kilmore 110 kV substation. (South of the study area)
3. A new 110 kV Cable to a future substation in Swords. (North of the study area)

Note: There may also be a requirement for another 110 kV cable in the general direction of Malahide (to the north) and a 110 kV cable in the general direction of Grange 110 kV Substation (Clongriffin to the east).

This will result in a requirement for at least two 110 kV circuits to the north of the study area and at least three 110 kV circuits to the south of the study area.

## **2.3 Assumptions**

- 220 kV circuits required are similar to existing 220 kV circuits currently in operation on the transmission system in Ireland under the control of the TSO.
- 110 kV circuits required are similar to existing 110 kV circuits currently in operation on the distribution system in Ireland under the control of the DSO.

Note: All information is correct at the time of writing the report. Where sufficient space exists in the various roads at the time of writing the report this space may be utilised for other services over a period of time.

## **2.4 Consultation**

No direct consultation with any third parties, stake holders, Local Authorities or Statutory Bodies was carried out as part of this feasibility study.

# **3 Cable Installation in Public Roads**

## **3.1 Cable Routes Installed in Public Roads/Lands versus Private Cross Country**

The majority of cable routes, where technically feasible, are installed along existing roadways and public land rather than across private land in accordance with the long established practice of both ESB Networks and EirGrid for high voltage underground cable circuits in Ireland for the following reasons:

- Cables crossing private land require numerous legal easements with private landowners. There are no requirements for private cable easements when an underground cable is installed in public roads.
- The logistics of getting heavy drums (up to 30 tonnes) to joint bay locations may require the construction of haul roads across private land. This requirement does not arise when cables are installed in public roads.
- There is a negative short term disruption to farm practice as a result of the construction activities associated with a cable being installed on private land. There is also the issue of the long term disruption to farm practice due to the conditions of the cable easement. This issue does not arise when routing cables in the public road.
- A cable route has to be patrolled regularly after installation to ensure it is not being put at risk due to other works taking place nearby. Private landowners

would not look favourably on cable maintenance personnel regularly accessing their property to inspect the cable.

- Road works on public roads are carried out in a controlled manner, with all documentation required under current health and safety legislation and under licence from the local authority. This is not the case when excavations are undertaken on private land. As a result of this there is increased risk of third party damage and associated risks to the public with cross country cable routes.

## **4 Site Study Area- Cable Summary**

The study area is situated in Dublin North Fringe Region. In considering potential cable routes to and from potential substation sites, it is important to examine the existing road network within the study area. There are four main roads that traverse the study area in a general 'box' shape. These roads are the N32 National Primary route along the south of the study area. The Malahide Road (R107) on the eastern side of the study area. Finally the Clonsaugh Road and Baskin Lane complete the box shape on the west and northern sides respectively.

### **4.1 N32 National Primary Route**

The N32 is a national primary route connecting the M50 to the Malahide Cross junction. It runs in an east west direction along the southern boundary of the study area. The road consists of two traffic lanes in each direction, one lane for private vehicle and another for public transport. There is also a grass verge on either side of the road for much of its length. See Fig 4.1 below

Experience has shown that the grass verges on either side of this road are congested with existing services including some MV and LV electricity services. It is probable that any future transmission or distribution high voltage cables installed along this road will be located in the existing carriageway. This would require the consent of the local authority and possibly the National Roads Authority. The overall width of the carriageway from kerb to kerb is approximately 18m. The service record information obtained indicates that there is sufficient space to install the required new circuits along this road. This route carries a high volume of traffic from private motor cars to large HGV's. Tailbacks are common during rush hours both mornings and evenings.

A number of the possible substation sites are located on the north side of this road.





**Fig 4.1: N32 National Route Looking West**

## **4.2 The Malahide Road – R107 Secondary Route**

The road runs in a north south direction on the eastern side of the study area. The road is the main artery for traffic from Malahide, Portmarnock and their hinterlands to and from the main city roads. Again this road is subject to high volumes of traffic particularly at peak times.

The road width varies greatly from a maximum of 18m near the Malahide Cross interchange to a typical 8m/9m wide along the majority of sections. (See Figures 4.21 & 4.22 below). Based on some non invasive survey techniques it appears that the majority of the services are located within the footpaths and that the carriageway of the road is relatively clear from existing services.

A number of possible substation site options are located either side of this road. Based on the information received to date it appears that it is probable that this road could accommodate two 110 kV circuits and a 220 kV circuit, with 3m separation in a northerly direction from a possible substation site. It could also accommodate another two 110 kV circuits, and a 220 kV circuit in a southerly direction from any substation site entrance. These circuits would also have a 3m separation.



**Fig 4.21: Malahide Road – Wide Section**



**Fig 4.22: Malahide Road – Narrow Section**

There may also be a possibility of installing a third 110 kV circuit either north or south along this road. In order to confirm this, a specific study would be required where the cable rating for each circuit would be known in advance. Knowledge of the standard cable in use at the time of the cable installation and the amount of road space that may be utilised by third party services between the writing of this report and the installation of some or all of the circuits outlined would be crucial.

### 4.3 Baskin Lane – Local Road

Baskin Lane is a local road that runs in an east west direction across the northern extents of the study area. One of the possible substation locations is situated on the southern side of Baskin Lane. The road is narrow in places and varies in width from 5 to 6 metres. As is the case with all roads in the study area this road is heavily trafficked particularly at peak times. The results of the utility survey indicate the presence of telecoms, drainage, water and gas along sections of the route. Fig 4.3 below shows a section of Baskin Lane looking west.



**Fig 4.3: Looking West along Baskin Lane**

It may be possible to install either a single circuit 220 kV circuit along this road or a double circuit 110 kV circuit. As a result of the presence of the third party services, in particular the gas main, it is unlikely that both the 220 kV circuit and the double circuit 110 kV circuit could be installed in this road without a significant de-rating of either circuits. To achieve complete thermal independence in order to maximise the rating of each circuit, up to 4m separation between circuits could be required. It is standard practice that Bord Gais require high voltage cables to be located a minimum of 2.0m from the centre line of a gas main. If the gas main is distribution, they may reduce the clearance but this may not be sufficient to enable all three circuits to be installed along this section of road. This is a significant impediment to developing a 220 kV substation with the substation access onto this road.

Note:

Single circuit 220 kV cable refers to three 220 kV cables laid in flat format, with 300mm separation in a one trench.

Double circuit 110 kV circuit refers to six 110 kV cables laid in two trefoil formations separated by 500mm.

#### **4.4 Clonshaugh Road – Local Road**

Clonshaugh Road is a local road that runs in a north south direction along the western extreme of the study area. The road width ranges from 5m to 6.5m with one significant bend. This road is also heavily trafficked particularly at peak times. There is a bus route along this road, serving Bewley's Hotel and the AUL sports complex. It is also used as an alternative route to Dublin Airport.

The utility survey has indicated the presence of telecoms, drainage and water services within the carriageway of the road. Depending on consultations with the local authority and the clearances upon which they will require it is possible that one 220 kV circuit and two 110 kV circuits could be installed along a section of this route. The 220 kV circuit would only be installed along the section of this road from the north of the IDA property to the south of the AUL property. This section would only be approximately 300m in length.



Fig 4.4: Looking South along Clonshaugh Road

## **5 Preferred Station Site Locations for Underground Cables Access**

A number of sites are identified and discussed in detail in the main site selection report. (see PE688-F0154-R00-002-002). The majority of these substation sites would have a substation access off either the Malahide Road or the N32 road.

Assuming that a sufficiently wide access road or easement is procured with the site acquisition, all of these sites could be considered suitable. However, two sites in particular are preferred from a cable access view point. The first site is land north of the N32 in the ownership of the IDA. The second is land east of the Malahide Road currently owned by Teagasc.

## **5.1 The IDA Site**

The IDA site is located on the northern side of the N32 primary route and the east side of the Clonshaugh Road. This site appears to be the most favourable site of those identified. It is well positioned to minimise the overall route of both 220 kV underground cable circuit routes. This will result in reduced installation costs, reduced disruption to the community and reduced conflict with third party services. It also has the benefit of minimising the extent to which the 220 kV cable, which currently feeds Dardistown substation, will be installed on private ground.

This substation site is ideally positioned to facilitate the 110 kV circuits that are required to the south of the study area. It would be envisaged that a minimum of an 8m entrance road or cable wayleave from the N32 would be provided to facilitate the 220 kV cable and the three 110 kV cables to the south.

The 110 kV circuits required to the north may be routed west across the IDA land to the Clonshaugh Road where they can then be installed in a northerly direction. Any future circuits to the east may be installed along the N32, with agreement from the local authority or alternatively the zoned land to the east of the IDA lands may be developed as the potential load demand is realised.

## **5.2 The Teagasc Site**

The identified site on the Teagasc lands located to the east of the Malahide Road could also be considered favourable in terms of future cable access. While it does not have all the benefits of the IDA site, the fact that there may be an alternative cable access route along Posey Row is an advantage (see fig 5.2 below). This would help in off-loading the substation and would reduce the problem of cable congestion along the substation access road.

While the Malahide Road appears capable of accommodating the number of cable circuits required, the congestion of circuits on Baskin Lane would result in a reduction in the possible route options for the 110 kV circuits to Malahide and Swords.





**Fig 5.2: Looking west along Posey Row – Alternative cable access to Teagasc site**

## **6 Cost Comparison between Preferred Sites**

### **6.1 220 kV Underground Cable Routes**

The planned 220 kV substation will be energised via two 220 kV underground cables from Finglas 220 kV substation. This substation is situated due west of the study area. The first connection is likely to be installed along a route running east west on the south side of the M50 motorway and N32 national primary route. The cable would then be installed due north to the preferred substation site. On this basis the 220 kV underground cable feed to the IDA site location would be approximately 3km less than a route to the Teagasc site.

The second 220 kV underground cable is currently installed from Finglas substation to a point close to Collinstown cross near Dublin Airport. It is intended that this circuit would be continued due east to the planned substation site. Again the IDA site is considered an advantageous location as any cable route to the Teagasc site would be approximately 2.5km longer.

Based on the Transmission capital cost units published by the Commission for Energy Regulation this could result in a cost difference of up to €11 million between the two preferred sites.

### **6.2 110 kV Underground Cable Routes**

As the number and direction of the proposed 110 kV underground cable routes are located equal radial distances from the study area, there is no significant cost difference between the identified substation sites.

# Appendices