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Grange Castle West Engineering Overview

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1 Introduction

The proposed Grange Castle West Access Road contains 1.03km of Dual Carriageway with an average corridor width of 34m and 1.15km of Single Carriageway with an average corridor width of 25m. There are a total of 1 No. double lane and 3 No. single lane fully segregated roundabouts proposed for the Grange Castle West Access Road in its entirety. Pedestrian and cyclist crossing facilities are provided at all four proposed roundabouts.

6 No. Bus stops and sustainable transport facilities are proposed within the Grange Castle Access Road development. A three-tiered landscape designed attenuation lake has been successfully constructed to accommodate the Grange Castle west sites surface water drainage requirements (in accordance with Qbar - Greenfield Runoff Calculation) including the Grange Castle West Access Road and surrounding hard standing area infrastructure. The design of the attenuation lake and surrounding lands has incorporated measures to enhance the biodiversity and amenity value of this area that includes the successful construction of the Grange Castle West entrance plaza and the Grange Castle West Integrated Constructed Wetlands.

The landscaped entrance plaza was designed and constructed to aesthetically harmonize with the existing Grange Castle and Grange Castle South Business Park entrances. It is proposed to construct a security building at the Park Entrance to facilitate the parks future security and customer service requirements.

The Grange Castle West Access Road scheme has been constructed to include a fully integrated landscape plan and the installation of all utility services ducting and pipework under its proposed carriageway and reservation footprint. The following services and utilities introduced are as follows.

- Storm Water Drainage
- Foul Sewer Drainage
- Watermain
- Power (HV & MV/LV Ducting Circuits)
- Gas Main
- Telecoms
- Public Lighting
- CCTV

The Grange Castle West Access Road scheme has been designed to current standards including the Design Manual for Urban Roads and Streets (DMURS), TII DMRB, the National Cycle Manual (NCM) and in accordance with smarter travel objectives.

Please note that at the time of writing this report the Grange Castle West Access Road infrastructure and utility services have only been successfully constructed (Phase 1) and installed up to the second Grange Castle West Access Road roundabout located at mainline CH:1+200. The remaining sections of the proposed Grange Castle West Access Road have been designed in accordance with the above referenced design standards and guidelines but to date have not yet been constructed.

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2 Site Characteristics

2.1 Land Ownership & Boundaries

The South Dublin County Council Development Plan 2022-2028 currently identifies the Grange Castle Park lands as having a Zoning Objective of 'EE' (Employment and Enterprise).

All the lands located within Grange Castle, Grange Castle South and Grange Castle West Business Parks are fully owned, maintained, and secured by South Dublin County Council.

2.2 Height restrictions

Located to the southeast of the proposed Grange Castle West site is the Baldonnel Airbase (Casement Air Base). The Department of Defence Inner Zone for Baldonnel (Casement) Aerodrome enforces height restrictions on buildings or structures exceeding 20m in height above ground level in this zone. With respect to Grange Castle West red line boundary, there is a small portion of developable land that falls under this 20m building height restriction zone.

Located approximately 3km to the north of the proposed Grange Castle West site is Dublin Weston Airport. Weston Aerodrome consists of one runway, designated as Code 2B runway by the International Civil Aviation Organisation (ICAO).

The vast majority of the Grange Castle West red line boundary is located under the Horizontal Zone of Casement Aerodrome (131.6m above the runaway level) and the Conical Zone of Weston Aerodrome (93.1m to 146.3m above the runaway level). The remaining sections of the Grange Castle West red line boundary falls outside the above referenced height and conical restriction zones dictated by Weston and Casement Aerodrome facilities.

For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1032 located in **Appendix A** of this report.

2.3 Topography

With regards to the general topography of the Grange Castle Western lands, Peamount reservoir and Hospital is located south and central to the Grange Castle West sites southern boundary and is considered the highest point of the site set at 80m above Malin Head Irish Grid reference system. From this location, the site gradually falls in a northerly, north westerly and north easterly direction towards the Grand Canal with a small portion falling in a south westerly direction.

The overall level difference between the highest (Peamount Reservoir surrounding lands) and lowest point attributed to the furthest north westerly point of the proposed western site is 12m over a length of approximately 1225m. The overall level difference between the highest (Peamount Reservoir surrounding lands) and lowest point attributed to the furthest northern point of the site is 4m over a length of approximately 500m. Finally, the overall level difference between the highest (Peamount Reservoir surrounding lands) and lowest point attributed to the furthest north easterly point of the site is 13m over a length of approximately 1340m.

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A section of the proposed Grange Castle West site, as discussed above, falls in a south westerly direction located within the existing Peamount lands where the overall level difference is 5m over a length of approximately 465m. The current use for the existing Grange Castle Western lands is functioning predominately as both arable and pastoral farming.

A comprehensive 2D and 3D Topographical Survey has been undertaken for the entire Grange Castle West Site. Upon request, South Dublin County Council may be amenable to provide a copy of this 2D and 3D Topographical Survey where genuine interest has been registered at info@sdublincoco.ie

2.4 Ground Conditions

Geological Information obtained from the Geological Survey of Ireland (GSI) are as presented below. The GSI Bedrock 100K Solid Geology for the Grange Castle West Site is recorded to be Lucan Formation (Dark Limestone & Shale - Formation ranges from 300m to 800m in Thickness).

The National Draft Bedrock Aquifer identified within the Grange Castle West Site has been described as a 'Locally Important Aquifer - Bedrock which is moderately productive only in local zones. For further information, please refer to figures 2.4.1. to 2.4.4 presented below.

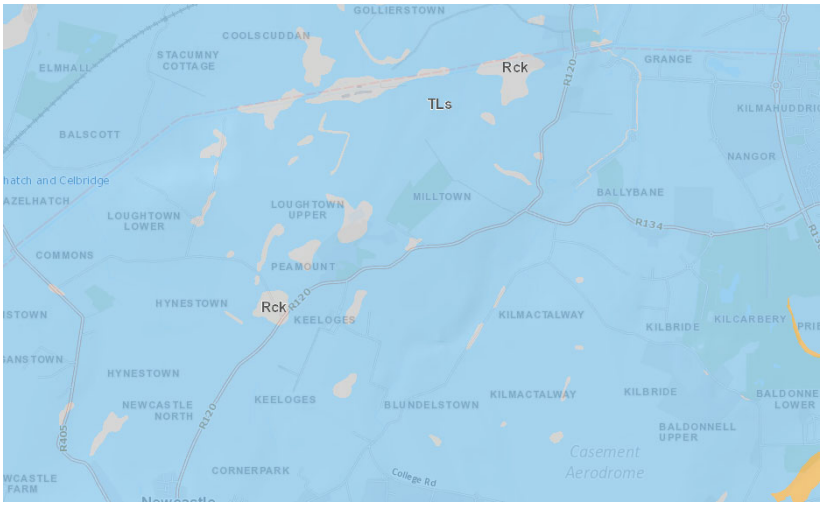

Fig. 2.4.1 - GSI Quaternary Details of the Grange Castle West Site

Legend:

1. Till Derived from Limestone (TLs) & 2. Bedrock Outcrop or Subcrop (Rck)

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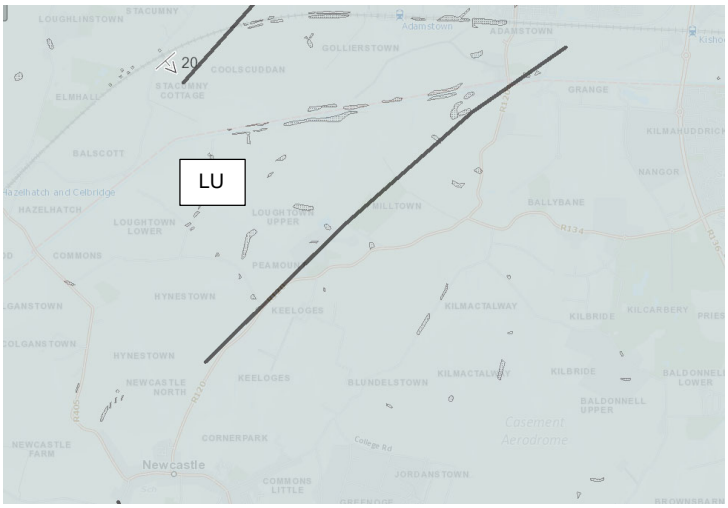

Fig. 2.4.2 - GSI Bedrock Geology 100K Solid Details of the Grange Castle West Site

Legend:

1. Lucan Formation (Dark Limestone & Shale - Formation ranges from 300m to 800m in Thickness) (LU)

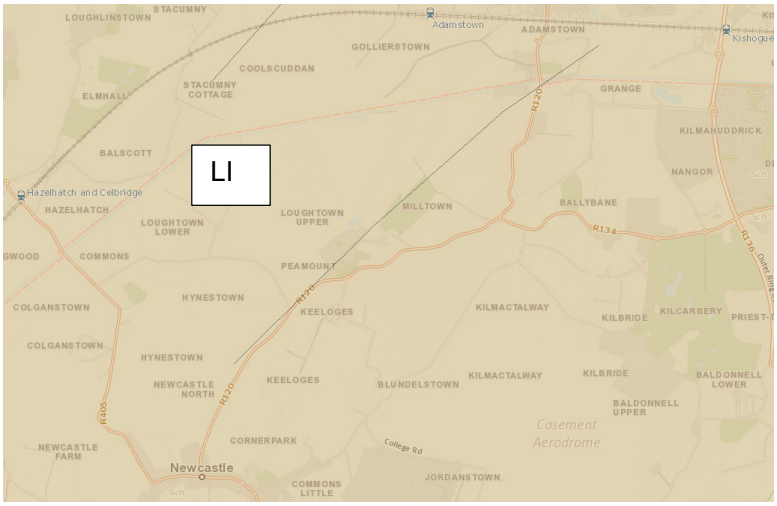

Fig. 2.4.3 - GSI Groundwater Aquifer Details of the Grange Castle West Site

Legend:

1. Locally Important Aquifer - Bedrock which is Moderately Productive only in local zones (LI)

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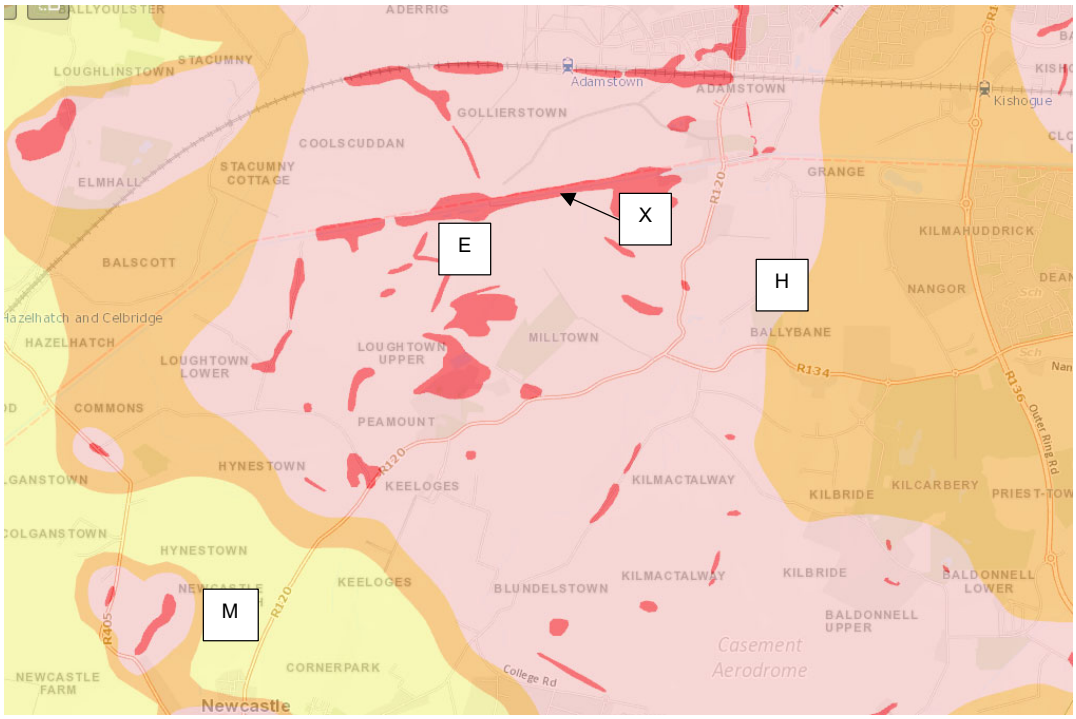

Fig. 2.4.4 - GSI Groundwater Vulnerability Details of the Grange Castle West Site

Legend:

1. Vulnerability Code 'X' - (Description: Rock or Near Surface or Karst)
2. Vulnerability Code 'E' - (Description: Extreme)
3. Vulnerability Code 'H' - (Description: High)
4. Vulnerability Code 'M' - (Description: Moderate)

A ground investigation contract for the entire Grange Castle Access Road footprint was undertaken and completed by Site Investigation Ltd. Q3/Q4 2019. Laboratory tests results classified existing ground as non-hazardous, non-aggressive (pH values between 7.22 and 8.24). CBR test results indicate values of 5.2% or greater. Natural moisture content test show that excavated material is suitable for reuse on site. Bedrock was recovered from depths ranging from 1.1mbgl to 3.2mbgl. The bedrock is very strong light fine grained muddy limestone interbedded with strong dark grey mudstone.

Upon request, South Dublin County Council may be amenable to provide a copy of the Grange Castle West Ground Investigation Report where genuine interest has been registered at info@sdublincoco.ie

2.5 Archaeology

A Geophysical survey was undertaken at the entire Grange Castle West site by Target Q1/Q2 2018. For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1007 located in **Appendix B** of this report.

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The Final Geophysical Survey report for the Grange Castle Western Park Lands was issued to CSEA from ACSU Ltd. in Q4 2018.

From the findings generated upon completion of the Geophysical Survey, an Archaeological Test trenching strategy was devised by CSEA and IAC Archaeology which was executed under three separate phases to cover the Grange Castle West Carriageway and reservation footprints, the sites perimeter haul roads, the entrance plaza and the Attenuation Lake. Three individual sites were required to receive further archaeological investigations, under licence to the DoCHG, by IAC Archaeology. All three sites were preserved by record through full and appropriate archaeological excavations. Three individual and final excavation reports were generated and issued/submitted to the DoCHG in Q3 2019 by IAC Archaeology.

Upon request, South Dublin County Council may be amenable to provide a copy of the three final Archaeological Reports where genuine interest has been registered at info@sdublincoco.ie

2.6 Green Infrastructure

The Grange Castle West Access Road scheme has been designed and constructed in accordance with South Dublin County Council's guidelines regarding green infrastructure. The introduction and use of Sustainable Drainage Systems (SuDS) such as the as constructed attenuation lake feature and the integrated constructed wetlands (ICW) area has enhanced the sites biodiversity and surrounding landscape.

Furthermore, the above referenced SuDS features eliminate the sites dependency to, through sustainable surface water management, discharge its surface water run-off into existing grey drainage systems. The Grange Castle West attenuation lake and integrated constructed wetland area further maintains and enhances the existing riparian corridors that the existing Tobermaclugg stream has ultimately forged through the Grange Castle western lands.

A robust landscape plan has been designed, constructed, and implemented under the sites Biodiversity Management Plan. Green areas and corridors have been enhanced through the creation of a network of earth perimeter berms which have been heavily planted with site specific native trees and plants. This network of earth perimeter berms also provides connectivity to the sites existing tree and hedgerow corridors which play a pivotal role in ensuring that the sites biodiversity is maintained, and in doing so, allowing it to continue to prosper in an ecologically positive manner going forward.

To facilitate the construction phase attributed to the Grange Castle West Access Road scheme, the pre-planned removal of existing hedgerow networks was kept to an absolute minimum which was controlled and supervised by the scheme Ecological and Environmental Consultant Engineers Doherty Environmental. Furthermore, all necessary removal of existing hedgerow networks was mitigated through the planting of several new networks of hedgerows and tree lines to ensure connectivity and continuity to existing hedgerow networks within the site red line boundary had been effectively achieved. This process was captured under the sites landscape design and Biodiversity Management Plan.

Upon request, South Dublin County Council may be amenable to provide a copy of the site Biodiversity Management Plan where genuine interest has been registered at info@sdublincoco.ie

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3 Roads and Access

For further information pertaining the Grange Castle West Access Road Layout Drawing, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1002 located in **Appendix C** of this report.

3.1 Road Cross Section

The Grange Castle West Access Road has been designated with a 50kph speed limit. In accordance with the DMURS and TII DN-GEO-03031 Rural Road Link Design (single and dual carriageway), the lane widths for the dual carriageway (3.0m/lane) and single carriageway (3.75m/lane) were ultimately generated. The road cross section for the 1.03km length of dual carriageway consists of an average corridor width of 34m. The road cross section for the 1.15km single carriageway consists of an average corridor width of 25m.

The road cross section has been designed to encourage and maximise sustainable transport with particular emphasis on creating a modal shift for the future residents of the EE Zoned Lands. The individual cross-section elements of the dual carriageway is made up as follows:

- 2.0m Footpath
- 5.0m Grass Verge
- 2.0m Cycle track
- 6.0m Traffic Carriageway (3m/lane)
- 4.0m Medium Strip
- 6.0m Traffic Carriageway (3m/lane)
- 2.0m Cycle track
- 5.0m Grass Verge
- 2.0m Footpath

The individual cross-section elements of the single carriageway are therefore made up as follows:

- 2.0m Footpath
- 4.75m Grass Verge
- 2.0m Cycle track
- 7.5m Traffic Carriageway (3.75/lane)
- 2.0m Cycle track
- 4.75m Grass Verge
- 2.0m Footpath

For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1005 located in **Appendix D** of this report.

3.2 Horizontal & Vertical Alignment

The horizontal and vertical alignment for the Road has been designed in accordance with TII DN-GEO-03031 Rural Road Link Design and DMURS.

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3.3 Roundabout Layouts

The Grange Castle West Access Road contains 1 No. double lane and 3 No. single lane fully segregated roundabouts, all designed in accordance with TII DN-GEO-03060 Geometric Design of Junctions (priority Junctions, direct accesses, roundabouts, grade separated, and compact grade separated junctions) and in line with the national Cycles Manual guidelines. Controlled pedestrian and cyclist crossing locations are provided at all four proposed roundabouts. There are two proposed uncontrolled crossing locations provided at proposed roundabout No. 4.

3.4 Services Wayleaves

A network of dedicated services wayleaves has been proposed and introduced under the Grange Castle West Access Road and surrounding park lands. It consists of a series of 10m wide wayleave corridors located on both sides of access road for phases 1, 3 and 4 respectively. A 10m wayleave is also proposed along the southern side of access road under phase 2. Similar wayleave depths have been proposed along all boundaries of the Grange Castle West lands where currently applicable.

A number of existing wayleaves are currently in play under the footprint of the Grange Castle Western parkland site which are summarised as follows.

- A 50m IW watermain wayleave is provided at the south western extent of the Grange Castle West site.
- A 20m IW wayleave is required to facilitate the future Shannon to Peamount watermain scheme. This 20m IW wayleave corridor traverses in a west to east direction and is located directly west of the future Shannon to Peamount reservoir footprint. This proposed IW watermain scheme has not been constructed to date but has a 50m construction corridor assigned to this wayleave. The corridor will be removed upon completion of the watermain connection works.
- A 10m IW watermain wayleave traverses the western park lands directly north of existing Peamount reservoir. It consists of 600mm and 700mm existing DIA DI pipes. Future development of the western park lands may necessitate the relocation of these existing pipelines.
- A 5m existing foul pipe wayleave (Peamount Sewer) traverses the western park lands, falling by gravity in a south to north direction away from the existing Peamount reservoir location. Future development of the western park lands, including the decommissioning of the existing Peamount foul sewer macerator, may necessitate the relocation and rerouting of the existing Peamount Foul Sewer which will therefore omit the existing wayleave footprint currently in-situ.

For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1003 located in **Appendix E** of this report.

3.5 Sustainable Transport & Smarter Travel

The continued growth of Grange Castle and Grange Castle South Business Parks, and the predicted growth of Grange Castle West Business Park will substantially increase traffic volumes in the locality of all 3 nr. business park sites. In order to adequately address any future and potential traffic congestion to the locality and maintain the continued success of Grange Castle Business Park, a Smart Travel policy is required in the

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area. It is proposed to work with the National Transport Authority (NTA) in order to develop and achieve a suitable Smart Travel policy for all 3 nr. Grange Castle Business Parks which will encourage and promote a modal shift from private cars to more sustainable modes of transports among all existing and future business park residents.
To achieve a modal shift and create a cleaner safer future, a change of mind-set is required. The introduction of new innovative measures combined with existing successful smart travel methods under the Grange Castle West Access Road scheme would go a long way to facilitating this proposed change.

Introduced to both sides of the proposed Access Road corridor is a 2m wide cycleway and a 2m wide pedestrian walkway which is separated by a 2m landscaped strip. Toucan and zebra crossings provisions are provided on all roundabout approach and departing vehicular traffic lanes to provide safe pedestrian and cyclist crossing routes which in turn increases ease of access throughout the Business Park.

Bringing forward the Grange Castle West cycle and pedestrian facilities and adding/connecting to the proposed Grand Canal Greenway extension scheme (12th Lock to Hazelhatch and due to commence on site Q1 2023), as well as the existing pedestrian / cycling facilities network currently in operation in the vicinity of the 2 nr. existing Grange Castle Business Parks, the cycle and walking offer available to the residents of all 3 nr Business Parks will provide further robustness to the sustainable travel model envisaged for the locality. Furthermore, connectivity between the EE Lands and the main public transport hubs which include Hazelhatch, Kishoge and Adamstown Train Stations with further enhance this offer when all collectively brought into full service.

For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1006 located in **Appendix F** of this report.

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4 Services & Utilities

4.1 Surface Water Drainage

For further information pertaining the Grange Castle West Surface Water Layout Drawing, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1017 located in **Appendix G** of this report.

4.1.1 Network

There are several types of drainage systems which have been incorporated under the Grange Castle West Access Road Surface Water Drainage Design. All surface water drainage has been designed by means of gravity (no pumping required) and utilise the following principles;

- **Sealed Drainage**: This drainage system collects, conveys and discharges carriageway/hardstanding surface runoff to a suitable outfall via sealed (impervious) conduits. A typical example of this type of drainage system is the kerb and gully drain.
- **Positive Drainage**: As sealed drainage is impervious, it does not drain groundwater; therefore its use in cut areas is combined with or accompanied by a filter drain.
- **Sealed Manhole Chambers**: Sealed storm water chambers in accordance with TII Standard Construction Details - Series 500.
- **Flow Restricting Devices**: Hydro-brake flow restricting devices have been used to convey allowable discharge rates in accordance with Qbar. Allowable discharge rates in accordance with Qbar (GDSDS - Typically 2l/s/Ha) has been generated for all catchment surfaces/areas.
- **Bypass Separators:** Petrol/Oil Bypass Interceptors have been installed down stream of hydro brake chambers prior to discharging/connecting into existing storm network/open channel watercourses located in close proximity.
- **Integrated Constructed Wetlands (ICW):** An ICW has been constructed down stream of Grange Castle West Attenuation Lake/Penstock Chamber/Hydro Brake Chamber. Surface water discharges in a controlled matter through the Hydro brake Chamber (in accordance with Qbar) which then enters the ICW. The ICW removes all debris and potential pollutants from the surface water discharge before it joins and re-connects downstream to the existing Lucan (Tobermaclugg) stream.

The design of the closed/sealed drainage system was completed using XP Microdrainage software in accordance with the Modified Rational Method. XP Microdrainage is supported by both FSR and FEH rainfall data in the UK and Ireland. Pipe capacities were calculated by using the Colebrook-White equations. XP Microdrainage employs a full hydrograph method to design, size and test storage/attenuation systems in accordance with BRE 365, Sewers for Adoption, CIRIA guidance and the Building Regulations. The analysis of each storm network, including attenuation/storage, was analysed using automatic storm generation of both FSR and FEH rainfall from 15 minutes (summer/winter) to 7 days duration and return periods of up to 1000 years in the UK and Ireland.

All the above was designed in parallel and in accordance with the Greater Dublin Strategic Drainage Study (GDSDS), the 2010 Building Regulation - Technical Guidance Document H, the SuDS Manual, the TII Design

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of 'earthworks drainage, network drainage, attenuation and pollution control' DN-DNG-03066 and all other relevant drainage standards and guidance documents available at the time of design.

4.1.2 Attenuation

The vast majority of storm water runoff generated from the Grange Castle West Access Road scheme footprint discharges into an attenuation lake prior to discharging downstream, in a controlled manner, into the existing Lucan (Tobermaclugg) stream which flows in a south to north direction prior to discharging into the River Liffey. In order to maintain the ecology of the stream, the existing flow rates of the stream are being maintained through the attenuation lake using flow control devices.

There is a generous section of hardstanding area (includes carriageway, footway/cycleway and entrance plaza area) that is drained and attenuated through the introduction of an underground Stormtech Arch Type Attenuation system that has been constructed north west of the northern Grange Castle West Access Road Entrance Plaza area. This attenuation system is designed to temporarily store surface water run off which is slowly released, in a controlled manner through a flow restricting device (in accordance with Qbar), before traversing through a by-pass separator prior to final discharge into an existing surface water network currently in service along the R120.

It should be noted that each of the proposed developable land plots in Grange Castle West will be required to attenuate surface water runoff in accordance with QBar (Greenfield run off). This allowable discharge rate has been catered for through the surface water network and attenuation system. Any exceedance of this limit will require further onsite attenuation within the boundary of each respective site.

4.2 Foul Drainage

The proposed foul drainage design for Grange Castle West was carried out in accordance with the Building Regulations 2010 Technical Guidance Document 'H' and the Environmental Protection Agency's (EPA) "Wastewater Treatment Manuals: Treatment Systems for Small Communities, Businesses, Leisure Centres and Hotels". In areas where the above documents do not provide specific guidance, or where the guidance provided is ambiguous, reference will be made to the EPA's "Code of Practice: Wastewater Treatment and Disposal Systems Serving Single Houses".

The Grange Castle West foul sewer design takes cognisance of Irish Waters Code of Practice for Wastewater Infrastructure document IW-CDS-5030-03. The design software used for the foul drainage design was XP Micro-Drainage. The foul drainage exiting the existing Grange Castle Foul Pump Station ultimately discharges into the existing 9B Foul Sewer System.

The Grange Castle West foul sewer system was designed as a gravity sewer which will ultimately discharge into the existing Grange Castle Foul Pump Station located within Grange Castle Business Park. It is recommended that a mixture of heavy, intense light, open light and warehousing industry is introduced throughout the areas of Grange Castle West and no one industry type should be allowed to dominate the park, in particular heavy industry, as this has huge water usage associated with its overall operations.

Although the existing Grange Castle pumping station will comfortably service all the lands located within Grange Castle Campus catchment area and depending on the type of industries that will be potentially introduced, phase 3 & 4 of the pump station would need to be reviewed regarding respective discharge rates.

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The Grange Castle Pump station is currently operating under Phase 2 which has a max pumping output of 55l/s (Phase 3 = 270l/s and Phase 4 = 420l/s).

The existing Tobermaclugg pumping station is in operation north of the Grange Castle Campus lands and could potentially provide a possible discharge point for part of Grange Castle West lands if required. It is recommended that this alternative discharge solution be further investigated to establish and determine if it could be a viable option.

It is noted that some areas along the western boundary of Grange Castle West may require pumping across respective sites to discharge into the main foul sewer due to its challenging terrain. This will be site specific and dependant on the proposed site layout.

The existing Peamount foul sewer pipe infrastructure traverses the Grange Castle Western lands, falling south to north, and services the Peamount Hospital site. The pipeline is equipped with a macerator which assists the flow northwards. Future development of the lands impacted by this pipeline may need to relocate the existing foul pipework and macerator (both can be decommissioned and rerouted to suit potential/future site layouts). The existing Peamount sewer pipework and associated macerator can only be decommissioned and rerouted by agreement with Irish Water and SDCC Water Services Dept.

Upon request, South Dublin County Council may be amenable to provide a copy of the Peamount Foul Sewer Survey Report and Drawings where genuine interest has been registered at info@sdublincoco.ie

For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1014 located in **Appendix H** of this report.

4.3 Water

A 400mm diameter watermain connection has been taken off the existing 400mm diameter R120/R134 watermain. The Grange Castle West 400mm diameter watermain traverses in a westerly direction along the southern extent of the Grange Castle West carriageway. A 200mm diameter watermain is connected to this 400mm diameter watermain and extends along the northern extent of the Grange Castle West carriageway. The 400mm and 200mm diameter distribution watermains provide water provisions to the Grange Castle Western lands under the zoning objective EE (Employment and Enterprise). These watermains have been sized to cater for general Business Park and Industrial Park requirements. Each new development in the park will require an Irish Water application for connectivity.

Water meters to measure water usage shall be installed at every service connection supplying both domestic and commercial premises that may take up residency with the Grange Castle West Business Park lands. Bulk flow meters, measuring the total development water use, shall be provided at the connection point of the works to the main distribution watermain in cases where the development exceeds 20m^3 per day.

The proposed watermain design has been carried out in accordance with Irish Waters Code of Practice for Water Infrastructure document IW-CDS-5020-03 and Irish Waters Water Infrastructure Standard Details IW-CDS-5020-01. The design is such that a minimum design life is achieved of 60 years for pipework and structures, 25 years for mechanical and electrical plant and 15 years for information, communication and telemetry (ICT) plant.

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The existing Peamount Reservoir is located directly southeast (outside Grange Castle Wests red Line boundary) off the 4th Grange Castle West Access Road roundabout which is the current termination point for the Access Road scheme. IW and SDCC's Water Services Department commissioned upgrade works to the existing Peamount Reservoir facility that included the construction of a new pumping station which can now facilitate future expansion from the initial delivery of 40ML per day up to 100ML per day. Furthermore, a total of 6.8km of 1200mm diameter ductile iron trunk watermain was successfully installed to provide linkage between Peamount Reservoir and Saggart Reservoir.

This is a strategic reservoir site that feeds into the wider Dublin area, increases strategic connectivity and ultimately improves the resilience of the water network supply in County Dublin.

For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1013 located in **Appendix I** of this report.

4.4 Power

The Grange Castle West Business Park has been equipped with the ability to be serviced with both High Voltage (HV) and Medium and Low Voltage (MV/LV) power.

4.4.1 High Voltage Power

The Castlebaggot 220kV Substation was successfully constructed within the footprint of the existing site located under the Grange Castle South Business Park lands. This 220kV Substation is currently proposed to provide the required power provisions that will be required to energise the Grange Castle western lands. HV duct provision has been made from Grange Castle West to the 220kV Castlebaggot substation. Power connectivity from the 220kV Castlebaggot Substation is provided through the construction and introduction of 2 no. 110kV Double Power Circuits. The as constructed HV circuits were installed along the northern extents of the Grange Castle South Business Park Access Road heading in a westerly direct before traversing in a northerly direction on the western side of the recently upgraded Baldonell Road. The 2 nr. HV circuits then traverse in a westerly direction along the northern extent of the Old Nangor Road before passing under the existing R120 carriageway where they enter the Grange Castle West Park lands at the southern corner of the Grange Castle West eastern red line boundary.

For protection, the 110kV ducts are generally located under the surface of the Grange Castle West Access Road carriageway. Design provisions have been made for future jointing pits along the as built 110kV ducting route in Grange Castle West Business Park. To date the required jointing pits have not been installed as the final location for the future 110/220kV substation for the Grange Castle Western lands has not yet been determined by ESB. ESB are currently reviewing the preferred location for the future 110/220kV substation in Grange Castle West.

Depending on the type of industry that lands its respective operation in Grange Castle West, there is potential that additional 110kV Substations may be required to be constructed within the surrounding western park lands. The number and location of any future 110kV substations will be based on demand and the size and function of the development proposed for that particular client which are privately developed within their sites. The design of the proposed 110kV Double ESB Circuits is in accordance with all relevant ESB specification and guidelines and takes cognisance of Eirgrids double/single separation requirements.

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For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1011 located in **Appendix J** of this report.

4.4.2 Medium/Low Voltage Power

For the distribution of MV/LV power through the western park lands, a series of 8 nr. 160mm diameter power ducts have been installed on both the northern and southern extents of the Grange Castle Access Road. For ease of access these 160mm dia. Telecom ducts are generally located under the grass verges attributed to the access road scheme footprint.

Duct spurs and road crossings have also been provided at each of the roundabouts along the carriageway. The MV/LV ducting is connected to the greater ESB Power Network at the R120 (Park Entrance) and via a 20kV circuit traversing the site in a north-south direction.

It is intended that all MV/LV ducting will connect to a future ESBN 110kV substation therefore reinforcing the distribution of power in the western park lands.

For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1012 located in **Appendix K** of this report.

4.5 Gas

The Grange Castle Western Park lands has been equipped with the ability to be serviced with both Transmission High Pressure (HP) and Distribution Low Pressure (LP) gas mains.

4.5.1 High Pressure Transmission Gas

A transmission gasmain has not been installed through the park at this stage, however a 10m wide services wayleave has been retained for future installation. At present, to bring HP gas into the western park lands, a high-pressure gas main would need to be installed and connection to be taken off the existing 70bar interconnector transmission gas main currently in service under the existing R136 Outer Ring Road.

For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1016 located in **Appendix L** of this report.

4.5.2 Low Pressure Distribution Gas

To service the Grange Castle Western lands, a connection off the existing 315PE-100 4Bar Gas Main located under the existing R120 carriageway at the main Grange Castle West entrance plaza has been successfully completed by Gas Network Ireland (GNI). A 315PE-100 4Bar Gas Main has been successfully installed and commissioned by GNI's main contractor and is generally located under the 2m wide cycle track located within the Grange Castle West carriageway footprint. 180PE-100 4bar Gas Main spurs have been installed at strategic locations along the Grange Castle West Road, these are generally located at roundabout locations. For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1015 located in **Appendix M** of this report.

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4.6 Telecom

It has been determined that fibre connectivity to service the future Grange Castle Western lands has been deemed as extremely viable.

The existing T50 infrastructure comprises of an 18-way duct system which is currently owned and operated by Zayo. The existing T50 fibre network runs in close proximity to the Grange Castle western lands and currently services the existing Grange Castle and Grange Castle South Business Parks from a section of the T50 network that traverses under the exist Nangor Road (R134) that loops in a south to south eastern direction traversing under the footprint of the existing L2901 local Road. Please see Figure 4.6.1 below for further details with regards to the existing T50 infrastructure network.

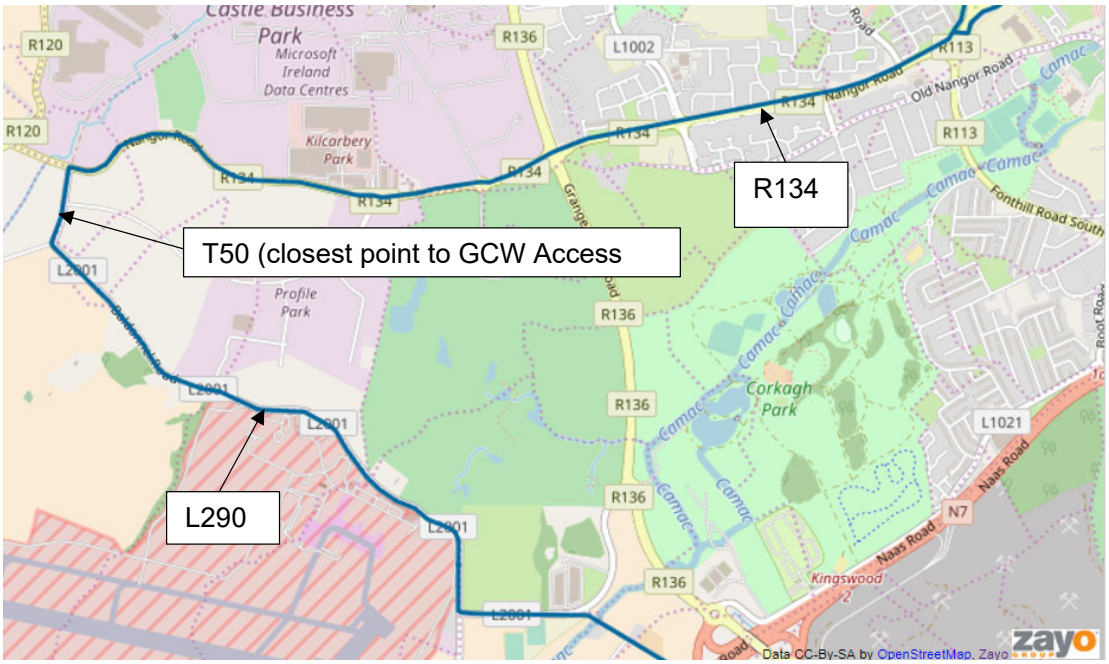

Figure 4.6.1 - Existing T50 Fibre Network

An existing 16-way 110mm diameter telecom ducting network is in service at the Grange Castle West Park entrance, this existing telecom duct network is connected into the Grange Castle and Grange Castle South Business Parks as well as the T50 Network. A 16-way 150mm diameter telecom ducting network has been connected into the network at the Grange Castle West Park entrance. Two banks of 16-way 150mm diameter ducts have been successfully introduced through the western park lands predominately under the 2m wide footways which are located on both sides of the Grange Castle Access Road scheme footprint.

For resilience of the telecom network, the ducting system is linked throughout the park and at strategic intervals, road crossings have successfully been installed. The 16-way ducting has been divided into 8 separate networks each serviced by its own dedicated access/maintenance chamber. Therefore, there are 8 individual networks each with their own access chamber and serviced by 2-way 150mm diameter telecom ducts.

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All telecom ducting and chamber construction has been designed in accordance with TII's Standard Construction details (series 500) and TII's Specification for Road Works Series 500 - Drainage and Service Ducts.

For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1010 located in **Appendix M** of this report.

4.7 Public Lighting

For the safety and convenience of vehicular road users, pedestrians, and cyclists; an LED public lighting system has been successfully introduced along the Grange Castle West Access Road scheme. The public lighting has been designed in accordance with ISEN 13201-1:2015 and ETCI 101:2008 (cable calculations). The lighting is also designed in accordance with South Dublin County Councils Public Lighting Specification.

Each public lighting column contains two LED lantern heads which are secured to the pole at different heights so that both the parks footways/cycle track and carriageway surfaces are illuminated simultaneously. The public lighting system is also cognisant of it surrounding environs where baffles have been strategically installed to ensure existing bat foraging corridors are maintained.

4.8 District Heating System

A district heating distribution network has not been installed through the park at this juncture of the access road project. However, a 10m wide services wayleave has been retained for future installation. At present, a district heating system is been assessed and considered in Grange Castle and Grange Castle South Business Parks with a network extension to Grange Castle West Business Park envisaged for the future depending on outcome of an SDCCC feasibility study.

For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1020 located in **Appendix O** of this report.

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5 Grange Castle West Energy Hub

Located west of the existing Peamount Hospital campus and north off the existing R120 Regional Road is a proposal for a 4.5 acre size site specifically dedicated for the production, storage, and distribution of energy for the Grange Castle West Park lands. Where surplus energy materialises, it is proposed that this surplus energy is connected back onto the existing power grid.

Please see drawings located in **Appendix J (**17_129A-CSE-GEN-XX-DR-C 1011) and **K** (17_129A-CSE-GEN-XX-DR-C 1012) for proposed Energy Hub location details.

5.1 Grid Connection

A new 220kV substation will be considered to take up operations at the proposed Grange Castle West Energy Hub site, which in parallel with the existing Castlebaggot 220kV substation located in Grange Castle South Business Park, will provide the majority of the Grange Castle West parks future power requirements. In response to the Grange Castle West Energy Hub site proposal, ESBN have produced a site selection report to identify a potential site in Grange Castle West for a new 250MVA 220/110kV Substation. Furthermore, ESBN produced and delivered a Geotechnical Desk Study and Site Walkover report that supplemented the above referenced site selection report. Both reports can be reviewed under **Appendix P** (PE688-F0416-R00-001-00 & PE688-F0416-R00-002-00) of this report.

The ESBN site selection report identified three (3) potential sites in Grange Castle West. The site selection process for each site looked at the following criteria which included previous planning history, possible environmental, archaeological, and geotechnical concerns, local road network and the ability to load and off load the proposed 220/110kV substation. The three (3) potential sites that were interrogated are as conveyed in figure 5.1.0 below.

- Site A – Located to the north-west of Peamount Hospital.
- Site B – Located on the north – western corner of a proposed extension to the new Business Park.
- Site C – Located to the south-west of Peamount Hospital.

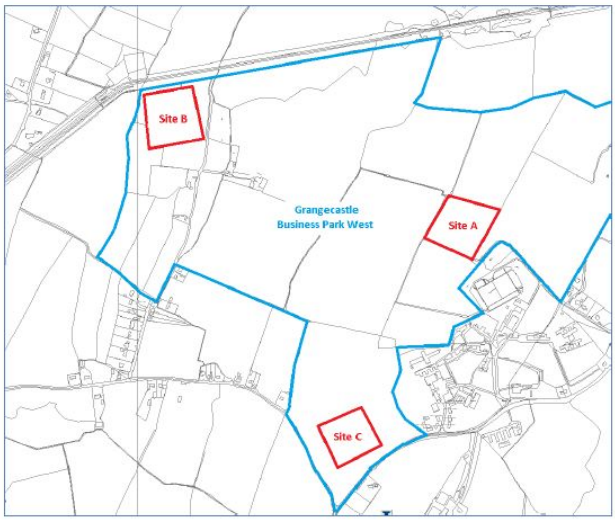

Figure 5.1.0 – ESBN Potential Substation Sites in GCW

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ESBN's site selection report concluded that Site A and Site C would appear suitable to house the proposed 220/110kV substation based on the outcome of the assessment process. Site Option B was discounted and omitted from the assessment process at the request of South Dublin County Council. Following an assessment by ESBN's Engineering and Major Projects department, Site A was deemed the most suitable out of the three (3) sites assessed as it met all the assessment criteria set out in ESBN's site selection report. Site C was also deemed by ESBN as appropriate as it also met the criteria set out under ESBN's site selection process. However, and according to ESBN, the only negative associated with Site C was that the location of Site C was considered to be further away from Grange Castle West's internal road network when comparisons were drawn against Site A.

It is important to note that Site C would be South Dublin County Councils preferred site option to develop Grange Castle West's Energy Hub which would include the proposed 220/110kV Substation. The proposal and plan to extend and provide connectivity to the already Part 8 approved Grange Castle West Access Road infrastructure is in motion and is duly reflected in the Grange Castle West Masterplan drawings and imagery. Therefore, South Dublin County Council do not foresee any issues with proceeding with Site Option C as an option for the proposed and future Grange Castle West 220/110kV Substation as access and connectivity issues have been satisfactorily addressed under the proposals set out under the Grange Castle West Masterplan. The above is to be confirmed pending engagement with and meeting the requirements of ESBN.

5.2 Geothermal Energy

Grange Castle West lands are considered highly suitable for a vertical close loop geothermal system (Fig. 5.2.1). Similar systems of geothermal energy have also been considered under a current and ongoing feasibility study for this type of green energy where the heat source yielded from this technique will assist in the future operation of the parks potential district heating network. Geothermal facilities could also be utilised for its hydrogen production capabilities as well as energy production.

For further information, please refer to drawing 17_129A-CSE-GEN-XX-DR-C 1020 located in **Appendix O** of this report.

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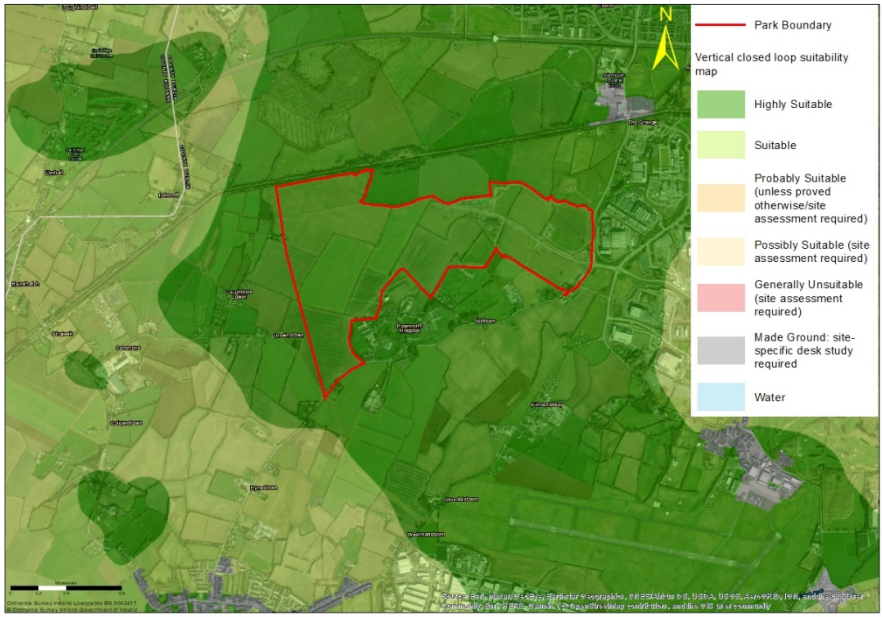

Figure 5.2.1 – Geothermal Vertical Closed Loop suitability classification

A Specialist desk stop study was conducted to further support potential Geothermal site work for the Grange Castle West Energy Hub complex which aims to identify the Geothermal gradient that exists below the proposed Grange Castle Western lands.

Geothermal Energy is one of the cleanest, 100% available, forms of renewable energy on the planet, with the smallest physical footprint. The overall process requires a five (5) phase workflow, where Phase 1 would entail a Desktop Survey and analysis of all existing geological and geophysical data. Unlike solar power which is very reliant on the intensity and/or illumination provided by the sun or wind power, which is about 45% efficient onshore and 65% efficient offshore, Geothermal is 100% or whatever percentage the proposed plant is effectively designed to yield.

With the assistance of site investigations to determine how deep the heat is, a closed loop system can ultimately be designed which can potentially provide district heating for up to 30,000 dwellings. Depending on the geology determined under the Grange Castle West site, 15MW of heat and between 3-8MW of energy can also be potentially provided.

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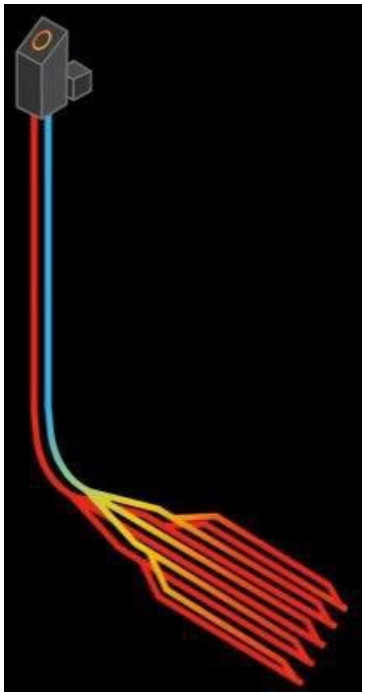
The Radiator

Closed-loop geothermal technology consists of several Patent Pending innovations. The Loop is a closed-loop geothermal system within which a proprietary working fluid is contained and circulated. The working fluid is not fluid from a reservoir flowing into our wells, it is a fluid added to the closed- loop system to create an efficient radiator, much like a vehicle radiator circulates fluid in a closed loop to remove heat from a gasoline engine.



Energy Generation

The Loop harvests heat from deep in the earth to be used for commercial heating applications (ex: greenhouses or district heating) or to be used to generate electricity using conventional heat to power engines. The closed loop system is an industrial scale geothermal system that mitigates many of the issues with traditional geothermal systems, which rely upon using wells to produce brine from a subsurface aquifer.

Advanced Geothermal

The main difference between traditional geothermal and the closed loop system is scalability. Traditional geothermal has never been globally scalable as the conditions required are very rare. There are only a few places in the world where you can find a hot underground aquifer to extract hot liquid in order to generate usable energy. The difference between Enhanced Geothermal Systems (EGS) and the closed loop system is again scalability. While EGS is more scalable than traditional geothermal, fracking its own aquifer and injecting liquid is also reliant on very specific conditions which are also rare to find in the world.

Figure 5.2.2 – Indicative Closed Loop System

Energy Produced

The working fluid naturally circulates without requiring an external pump due to the thermosiphon effect of a hot fluid rising in the outlet well and a cool fluid falling in the inlet well. The working fluid contained in the closed-loop pipe system brings thermal energy to the surface where it is harvested for use in a commercial direct heat application or converted to electricity with a power generation module (heat engine). Unlike heat pumps (or “geo-exchange”), which convert electricity to heat using very shallow wells, the closed loop system generates industrial-scale electricity or produces enough heat for the equivalent of 30,000 dwellings with a single installation.

Geothermal Source

Heat from the ground can be used as an energy source and it can be found in many regions of the world, especially at tectonic plate boundaries or at places where the crust is thin enough to let the heat through. The most common way of capturing energy from geothermal resources is to tap into naturally occurring

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hydrothermal convection systems, where cooler water seeps into earth's crust and is heated up within a reservoir.

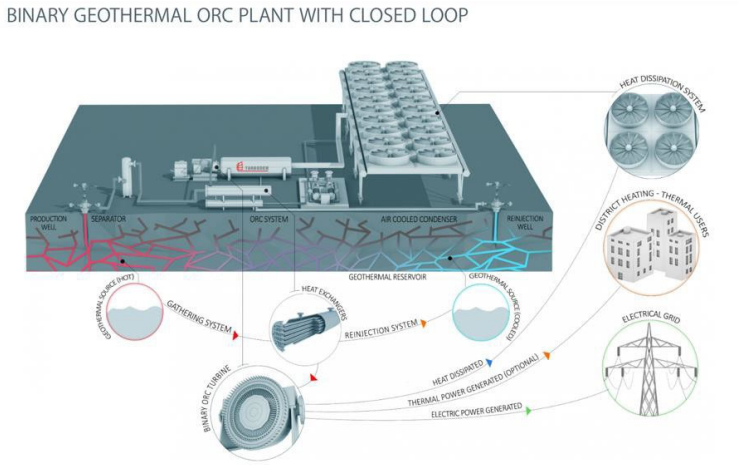

Figure 5.2.3 – Indicative Geothermal Orc Plant with Closed Loop

Binary Orc Technology

Binary ORC plants use heat exchange to exploit geothermal fluid to heat up and vaporize a secondary organic fluid that drives a turbine and produces electric power. In this way, the geothermal fluid remains within a closed loop of piping (from the reservoir to the reinjection) without passing through the turbine, with no harmful emissions into the atmosphere. The heat that is not converted into electricity can be delivered to a thermal user or dissipated through a suitable cooling system. ORC is very effective for exploiting resources with high steam fractions at locations where it is not convenient to collect and deliver all the fluids to a centralized station, but preferable to employ modular well-head units. Existing single- flash power plants can be improved by adding an ORC system on the separated brine stream before reinjection. This makes it possible to produce more power from the same geothermal resource.

5.2.1 Next Steps (Technical/Project Approach)

The next steps proposed in the continued effort to explore the viability of Thermal Energy in Grange Castle West would be to identify any local geological maps which would be harvested through online research and reaching out to local and national academia. Furthermore, the identification and collection of data from all pre-drilled wells that may have been executed within a certain radius of the future Grange Castle West Energy Hub site would also assist in providing the necessary temperature versus depth information to support in building a local temperature gradient.

South Dublin County Council granted planning for two further wells (identified with red star symbols) at a depth of 4,000 in Newcastle which are as identified in Figure 5.2.4 below. Unfortunately, the two additional Newcastle wells commenced on site but abruptly ceased drilling for non-technical reasons. Since then, only

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academic research has taken place to improve the understanding of local geology and geothermal prospects at both drill locations.

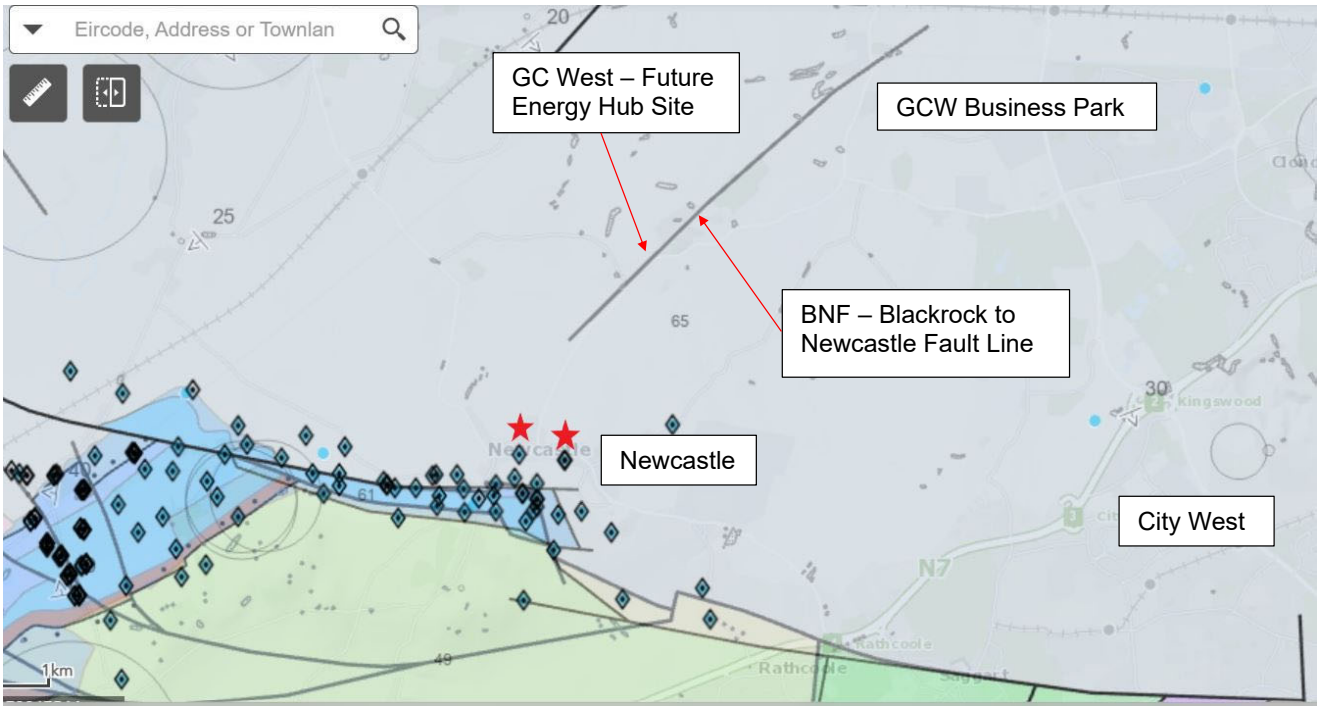

Figure 5.2.4 – GSI – Existing Well Locations

As conveyed in Figure 5.2.4 above, the proposed Grange Castle West Energy Hub site is conveniently located and close to the existing Blackrock to Newcastle (BNF) Fault line.

Taking all the above into consideration, the data yielded will assist in the creation of a Regional Thermal Model which will be analysed and assessed to ultimately determine if Thermal Energy can be affectively utilised and introduced under the future and proposed Grange Castle West Energy Hub. A report will then be produced which will capture and outline all the findings from the research activities undertaken and outputs generated through the simulation of the Thermal Model. Conclusions from said report will also be brought forward for discussion and to advise and inform South Dublin County Council on the viability and potential of what can be theoretically yielded from the Grange Castle West Energy Hub site with respect to Thermal Energy.

5.3 Battery Energy Storage System (BESS)

The potential through the introduction of Battery Energy Storage System development within the Grange Castle West Energy Hub may allow for increased renewable energy generation connection onto the electricity grid. These systems will provide response capabilities to support the network. Power will be imported, effectively ‘charging the battery’, during periods of excess capacity. The power will be stored for future use and discharged onto the grid during periods of excess customer demand.

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Figure 5.3.1 – Typical Battery Energy Storage System Equipment arrangement

5.4 Combined Heat & Power Plant (CHP)

CHP also known as "Co-generation", is the simultaneous production of electricity and heat usually in the form of hot water or steam from a primary fuel such as natural gas. Electricity is generated on site by using natural gas to drive an alternator connected to a turbine or engine. The heat from the exhaust gases generated by the turbine or engine is harvested to provide steam or hot water for the production processes. CHP combining heat and power production reduces carbon footprint and is more efficient than both services separately.

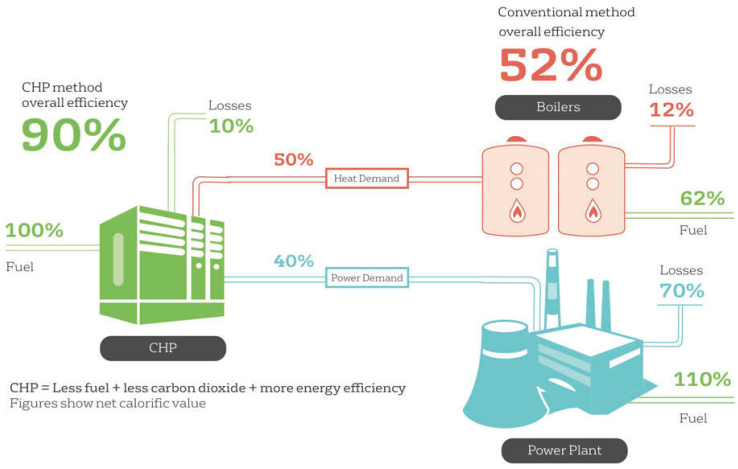

Figure 5.4.1 – CHP efficiency

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5.5 Solar Power

Solar panels for large power generation were not considered for the Grange Castle West Park lands due to the space necessary to generate significant amount of power. Micro generation is considered with future development of the western lands.

5.6 Wind Power

Wind turbines were not considered for energy production in Grange Castle West Business Park due to height restrictions from the neighbouring Baldonnel Aerodrome and Weston Airport. Micro generation is considered with further development of the park.

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Appendix A – Height Restrictions

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GRANGE CASTLE WEST BUSINESS PARK
HEIGHT RESTRICTIONS
APPENDIX A

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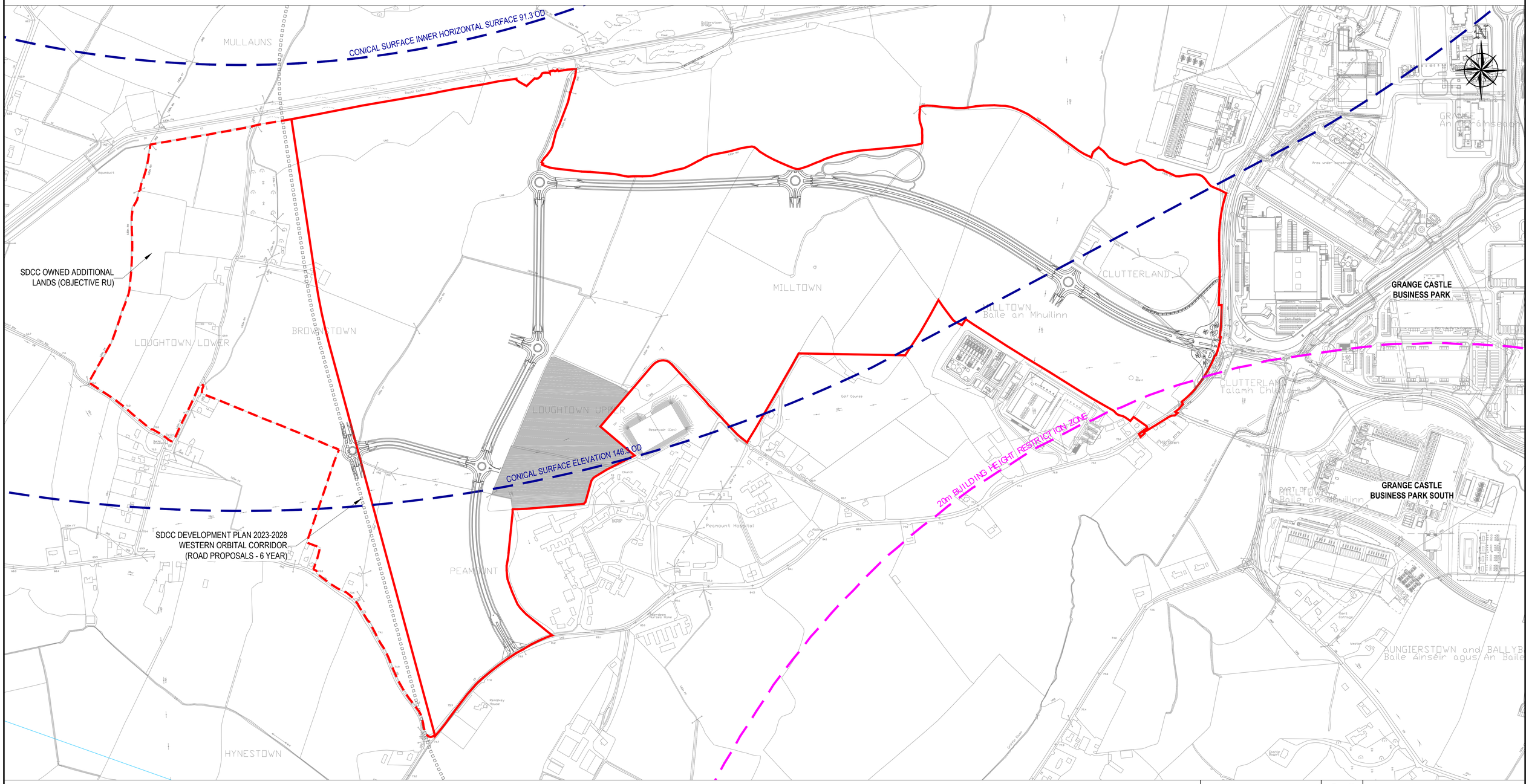

GCBP WEST BOUNDARY
FUTURE SHANNON TO DUBLIN WATER SCHEME RESERVOIR
BUILDING HEIGHT RESTRICTIONS
WESTON AIRPORT CONICAL SURFACE

Scale Bar: 0 — 0.5 — 1 Kilometre

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Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
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Status Code: S2	Suitability Description: FOR INFORMATION
Revision: P01	Project Status: PRELIMINARY

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Appendix B – Geophysical Survey Map

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GRANGE CASTLE WEST BUSINESS PARK
GEOPHYSICAL SURVEY
APPENDIX B

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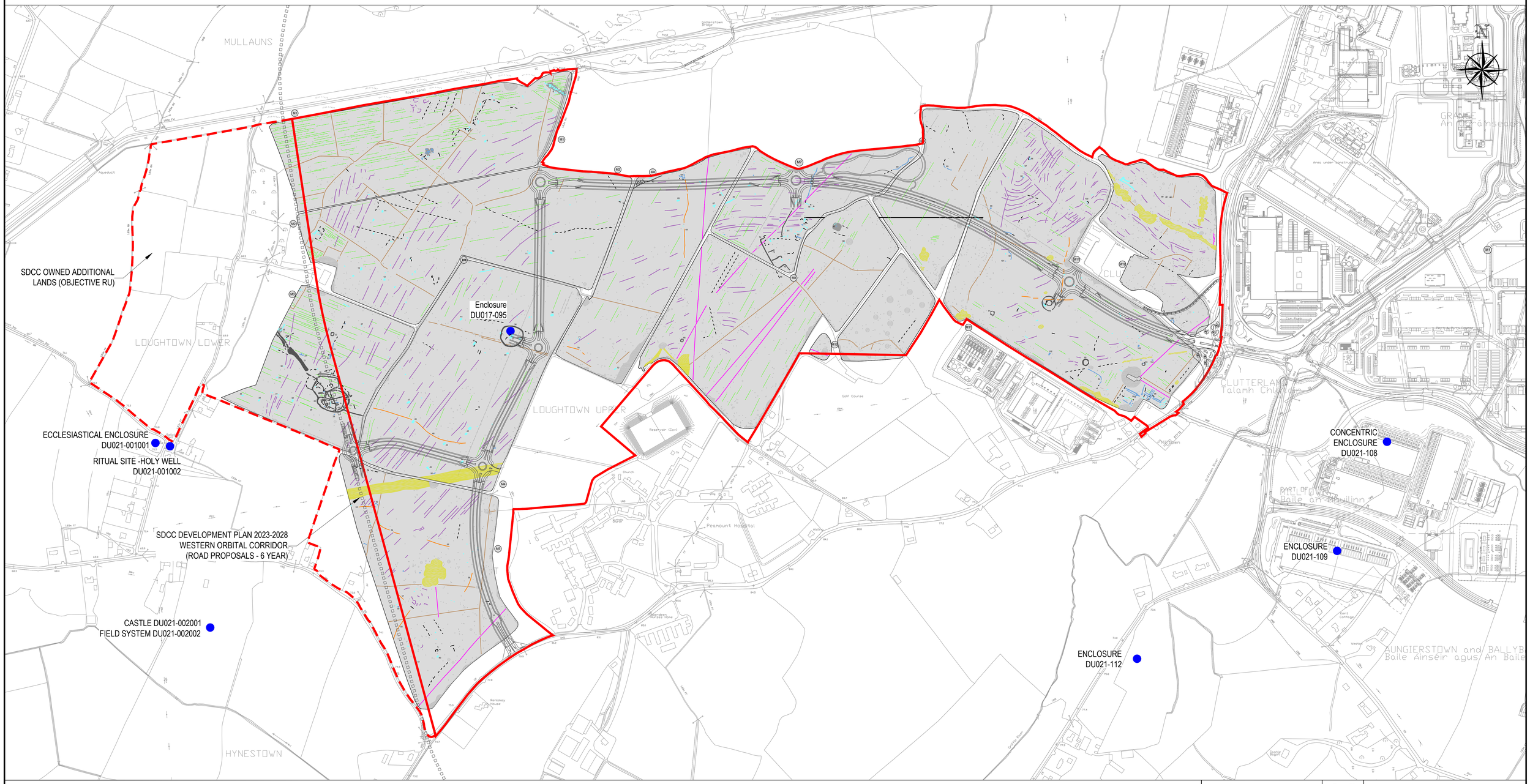

GCBP WEST BOUNDARY
ARCHAEOLOGY
? ARCHAEOLOGY
?? ARCHAEOLOGY
INCREASED RESPONSE
TREND
? EARLY FIELD SYSTEM
FORMER BOUNDARY
BURIED SERVICE
CULTIVATION
NATURAL
MAGNETIC DISTURBANCE
FERROUS
SYSTEM ISSUE -WATER INGRESS

Scale Bar 0 0.5 1 Kilometre

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Appendix C – Roads and Connectivity

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GRANGE CASTLE WEST BUSINESS PARK
ROADS AND CONNECTIVITY
APPENDIX C

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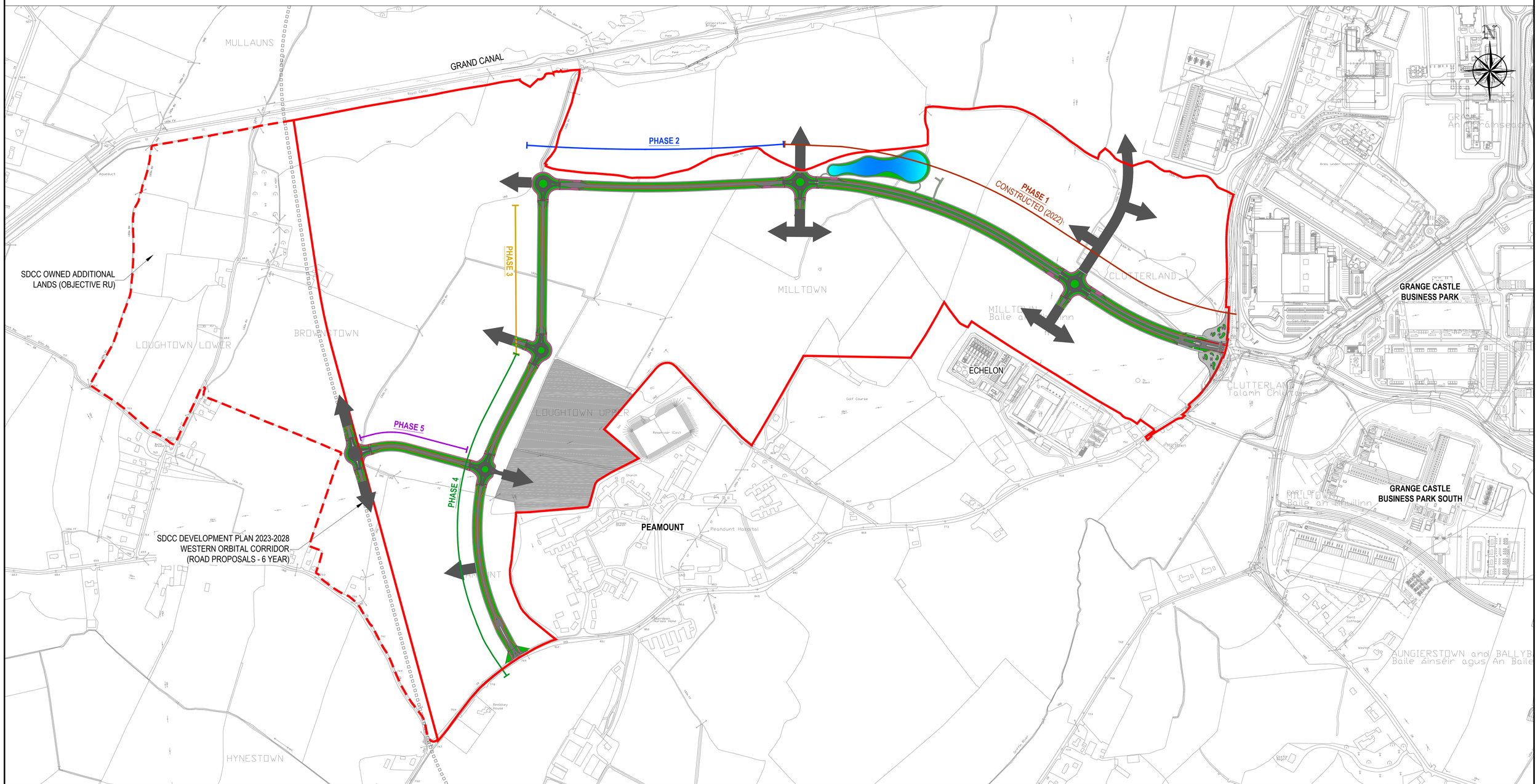

GCBP WEST BOUNDARY

FUTURE SHANNON TO DUBLIN WATER SCHEME RESERVOIR

POSSIBLE CONECTIVITY

Scale Bar 0 — 0.5 — 1 Kilometre

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Appendix D – Road Cross Sections

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GRANGE CASTLE WEST BUSINESS PARK
ACCESS ROAD CROSS SECTIONS
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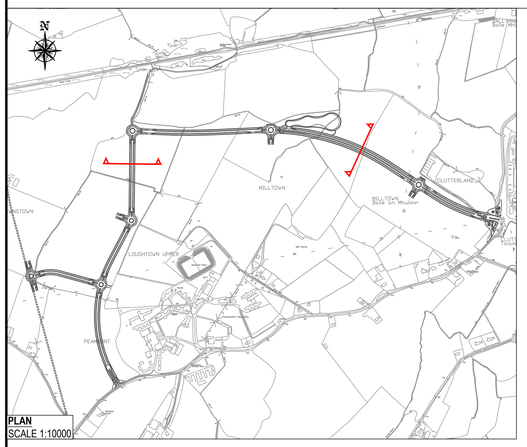

PLAN
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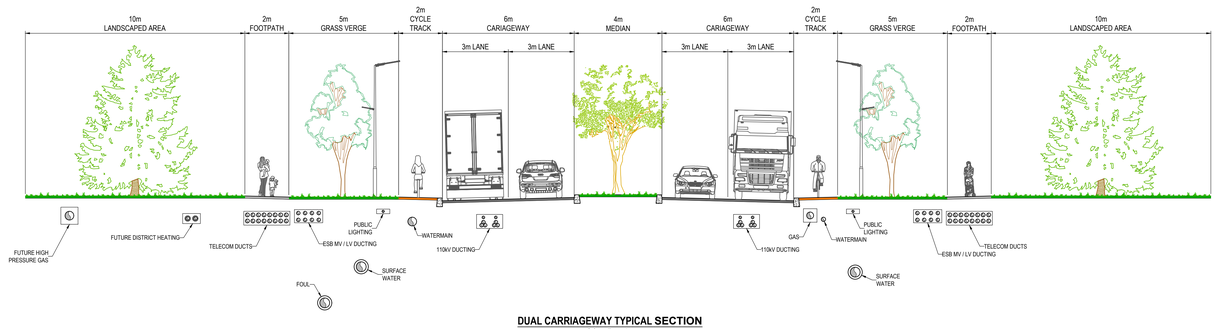

DUAL CARRIAGEWAY TYPICAL SECTION
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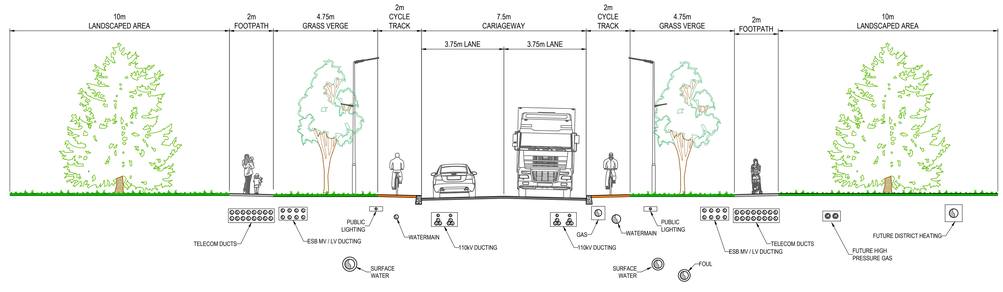

SINGLE CARRIAGEWAY TYPICAL SECTION
SCALE 1:100

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Appendix E – Wayleaves and Right of Way

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GRANGE CASTLE WEST BUSINESS PARK
SERVICES WAYLEAVES AND RIGHT OF WAY
APPENDIX E

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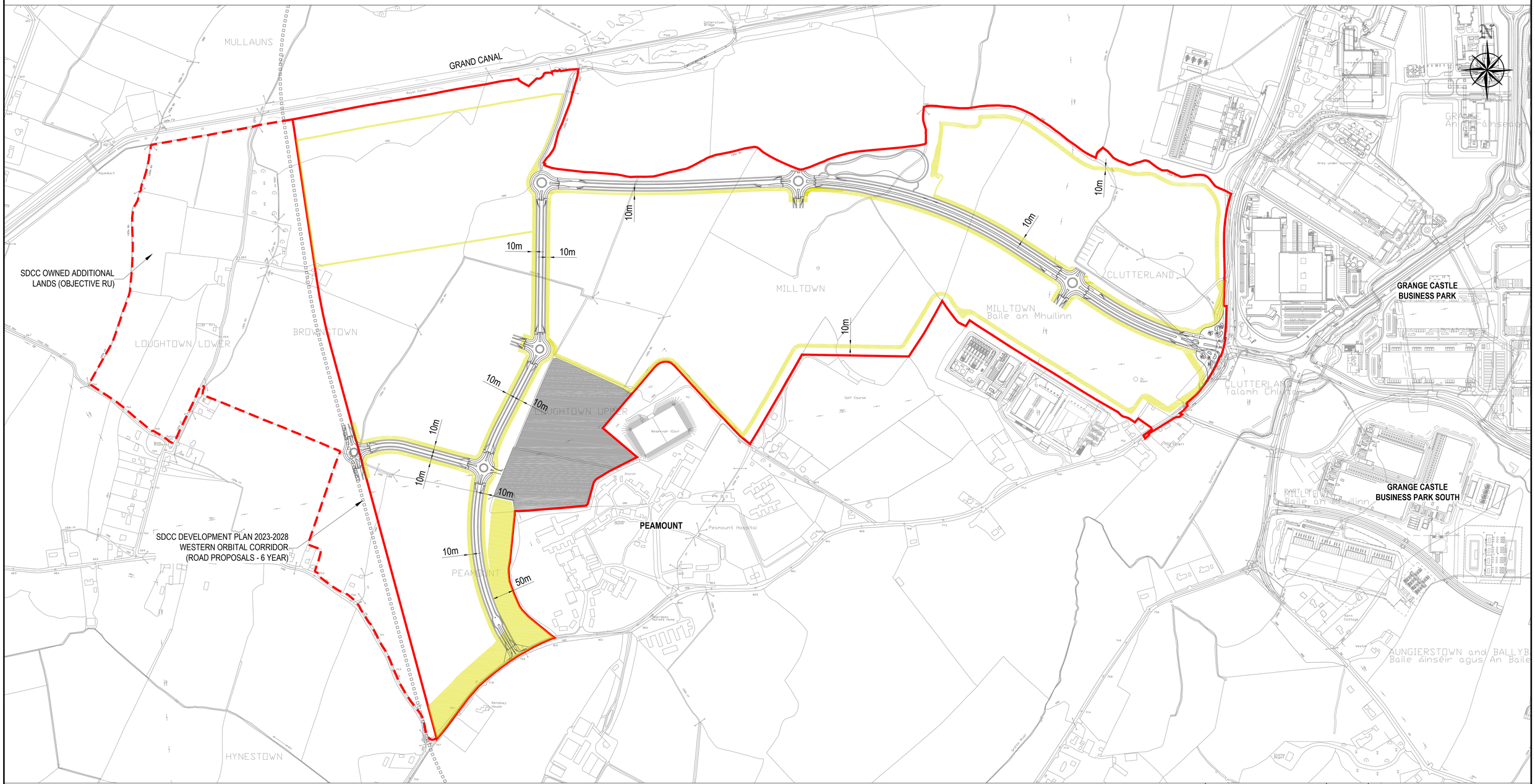

GCBP WEST BOUNDARY
FUTURE SHANNON TO DUBLIN WATER SCHEME RESERVOIR
SERVICES WAYLEAVE / RIGHT OF WAY

Scale Bar 0 0.5 1 Kilometre

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Appendix F – Non-Motorised User (NMU) Connectivity

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GRANGE CASTLE WEST BUSINESS PARK
NON-MOTORISED USERS CONNECTIVITY
APPENDIX F

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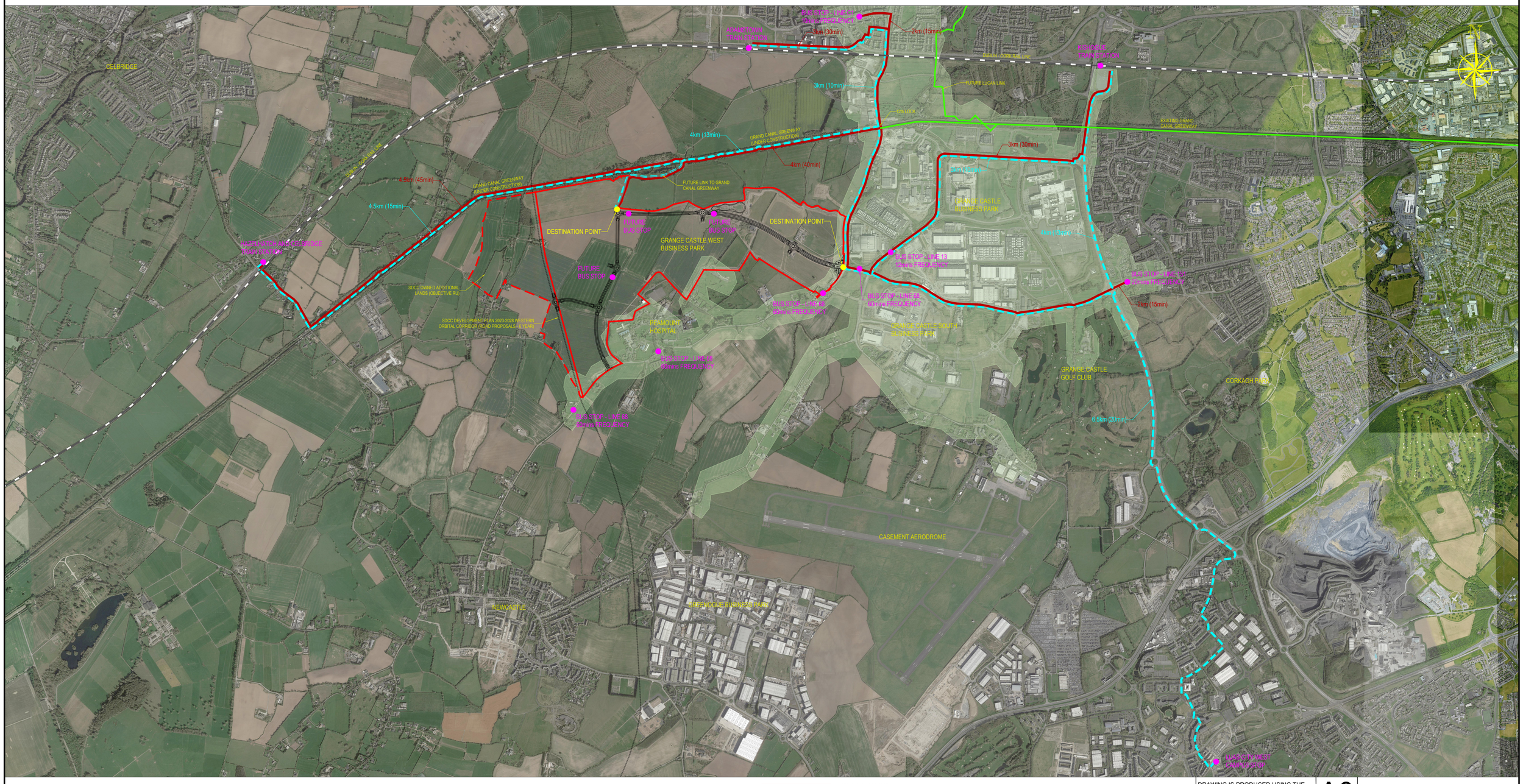

GCBP WEST BOUNDARY
DUBLIN - CORK RAIL LINE
CYCLING ROUTE
WALKING ROUTE
PUBLIC TRANSPORT
30mIN WALKING DISTANCE

Scale Bar 0 0.5 1 Kilometre

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DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A0

Drawn By: KT	Date: NOV. 2022	17_129A
Checked By: RG	Scale: NTS @ A1	CSEA Job No.

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
17_129A	CSE	GEN	XX	DR	C	1006

Full: 17_129A - CSE - GEN - XX - DR - C - 1006

S2 — Status Code — FOR INFORMATION — Suitability Description

P01 — Revision — PRELIMINARY — Project Status

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www.grangecastle.ie

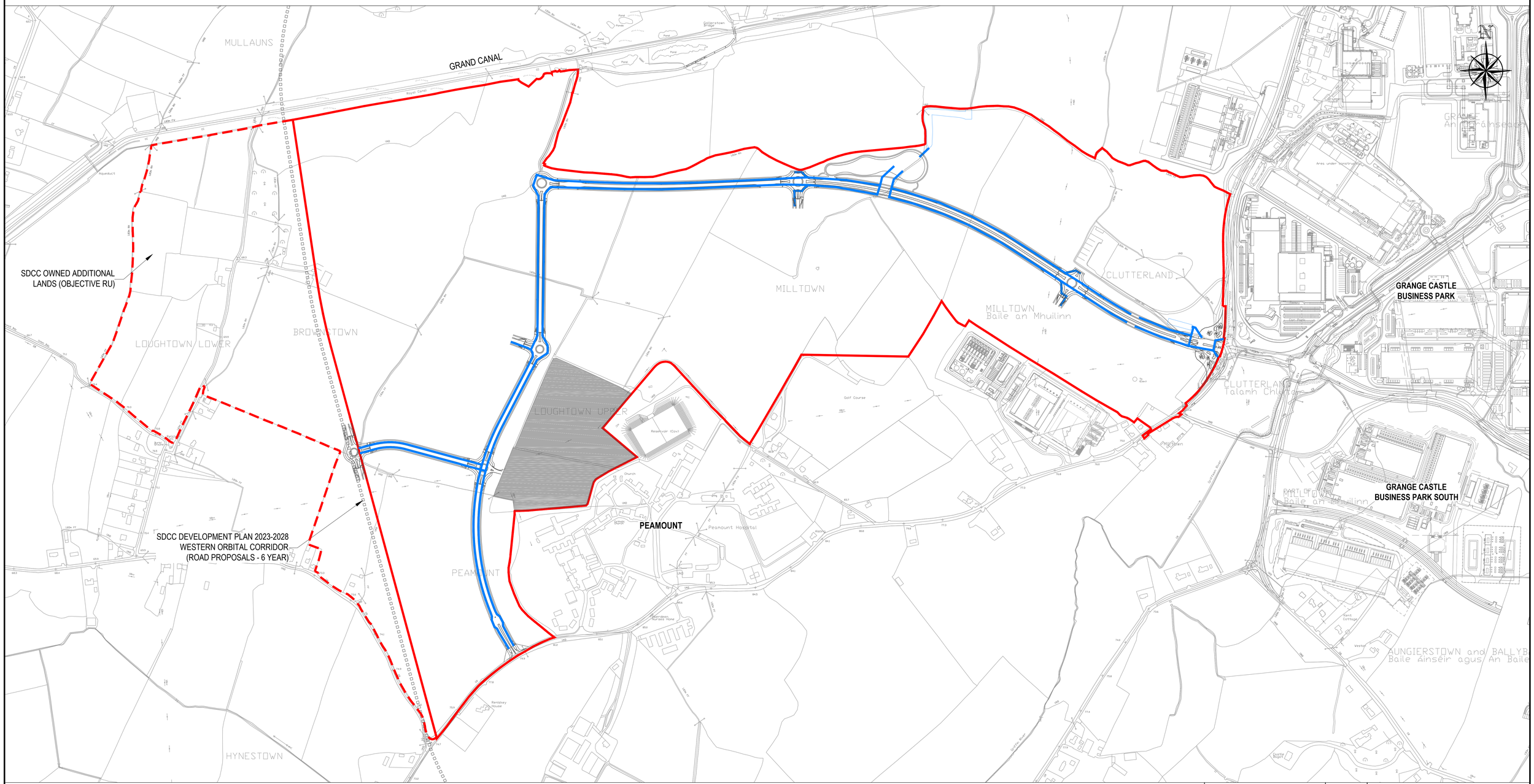
Appendix G – Surface Water Drainage Layout

Comhairle Contae Átha Cliath Theas
South Dublin County Council

GRANGE CASTLE

GRANGE CASTLE WEST BUSINESS PARK
SURFACE WATER NETWORK
APPENDIX G

Clifton Scannell Emerson Associates



GCBP WEST BOUNDARY
FUTURE SHANNON TO DUBLIN WATER SCHEME RESERVOIR
SURFACE WATER NETWORK

0 0.5 1 Kilometre
Scale Bar

DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A0

Drawn By: KT	Date: DEC. 2022		
Checked By: DRL	Scale: NTS @ A1	CSEA Job No.: 17_129A	

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
17_129A - CSE - GEN - XX - DR - C - 1017						

Status Code	Suitability Description
S2	FOR INFORMATION
P01 (Revision)	PRELIMINARY (Project Status)

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Appendix H – Foul Drainage Layout

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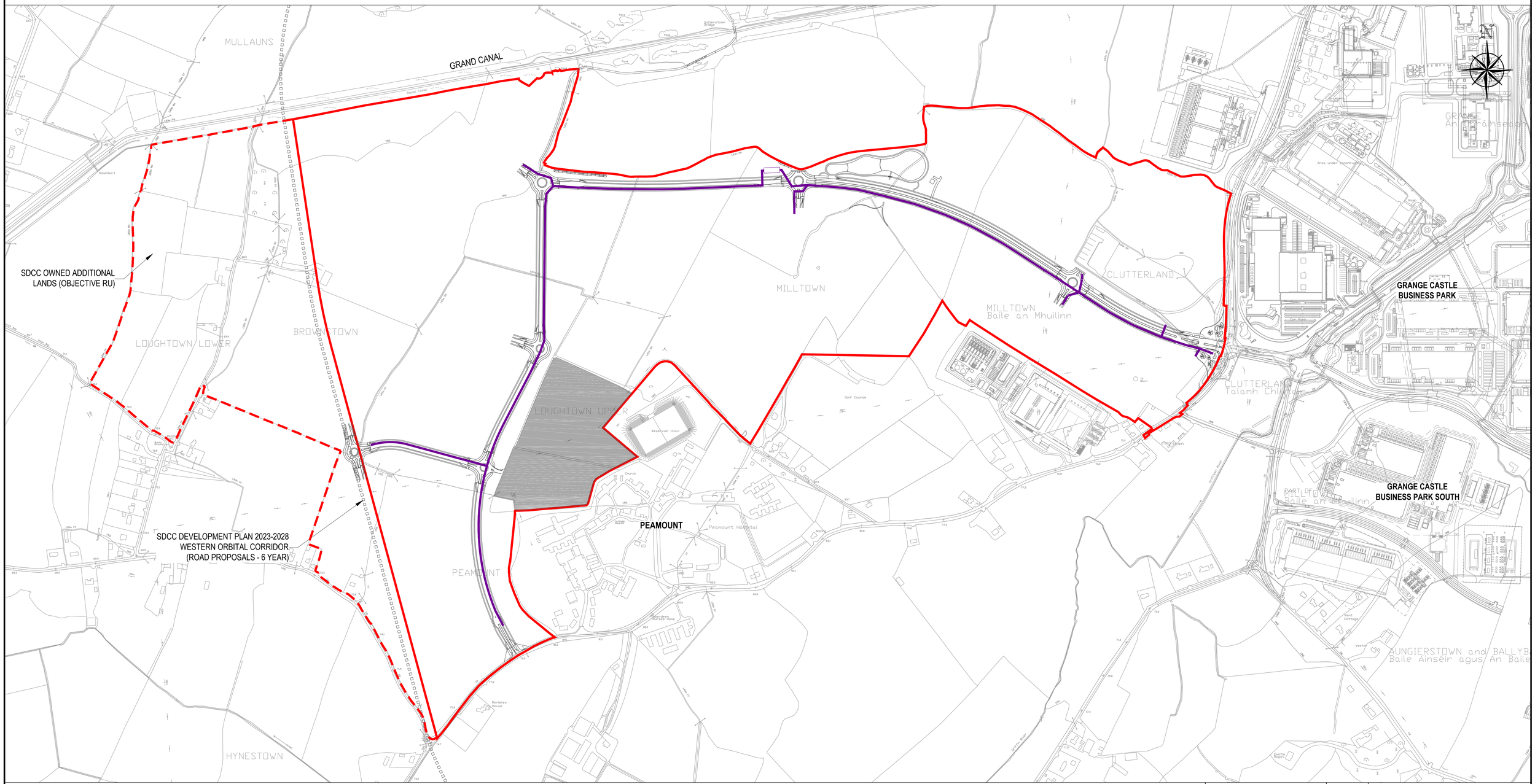
South Dublin County Council

GRANGE CASTLE

GRANGE CASTLE WEST BUSINESS PARK
FOUL NETWORK
APPENDIX H

Clifton Scannell Emerson Associates



GCBP WEST BOUNDARY
FUTURE SHANNON TO DUBLIN WATER SCHEME RESERVOIR
FOUL NETWORK

0 0.5 1 Kilometre
Scale Bar

DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A0

Drawn By: KT	Date: DEC. 2022		
Checked By: DRL	Scale: NTS @ A1	CSEA Job No.: 17_129A	

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
17_129A	CSE	GEN	XX	DR	C	1014

S2 — Status Code — FOR INFORMATION (Suitability Description)

P01 — Revision — PRELIMINARY (Project Status)

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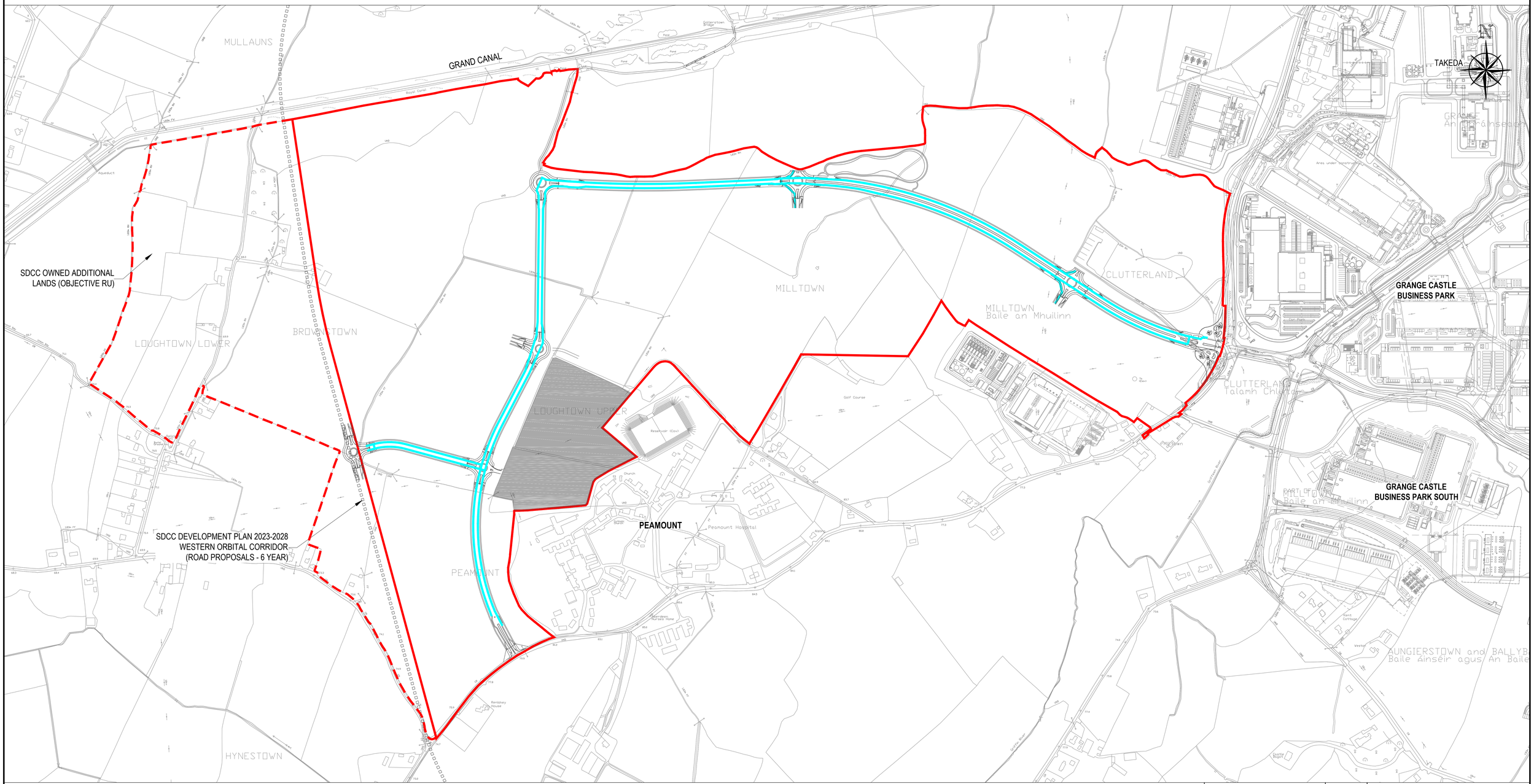
Appendix I – Watermain Layout

GRANGE CASTLE WEST BUSINESS PARK
WATERMAIN
APPENDIX I

Comhairle Contae Átha Cliath Theas
South Dublin County Council

GRANGE CASTLE

Clifton Scannell Emerson Associates



GCBP WEST BOUNDARY
FUTURE SHANNON TO DUBLIN WATER SCHEME RESERVOIR
WATERMAIN NETWORK

0 0.5 1 Kilometre
Scale Bar

DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A0

Drawn By: KT	Date: DEC. 2022		
Checked By: DRL	Scale: NTS @ A1	CSEA Job No.: 17_129A	

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
17_129A - CSE - GEN - XX - DR - C - 1013						

Status Code	Suitability Description
S2	FOR INFORMATION
P01	PRELIMINARY

Revision / Project Status

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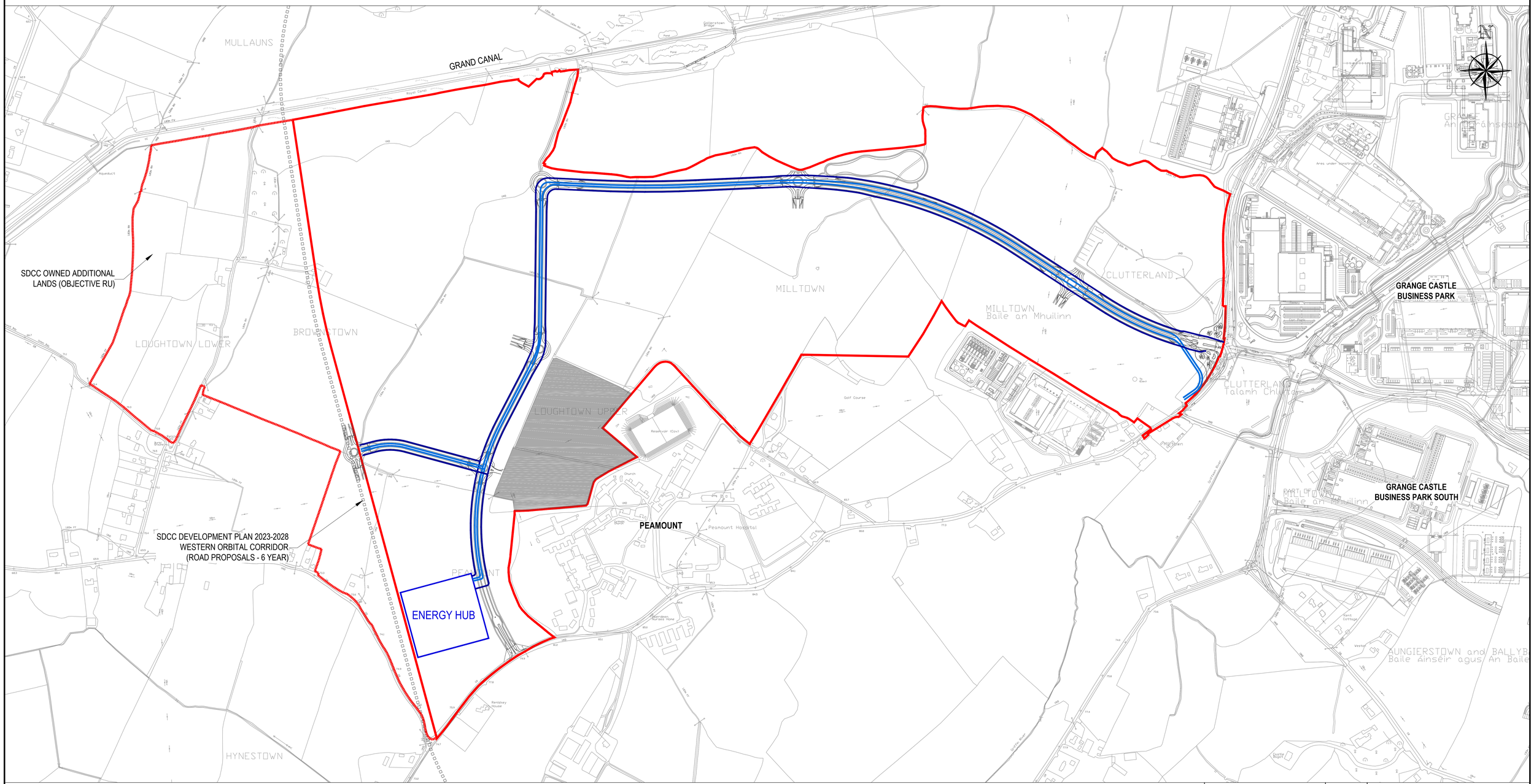
Appendix J – High Voltage Power Layout

Comhairle Contae Átha Cliath Theas
South Dublin County Council

GRANGE CASTLE

GRANGE CASTLE WEST BUSINESS PARK
HIGH VOLTAGE POWER
APPENDIX J

Clifton Scannell Emerson Associates



GCBP WEST BOUNDARY
FUTURE SHANNON TO DUBLIN WATER SCHEME RESERVOIR
110kV NETWORK
220kV NETWORK

Scale Bar: 0 — 0.5 — 1 Kilometre

DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A0

Drawn By: KT	Date: DEC. 2022		
Checked By: DRL	Scale: NTS @ A1	CSEA Job No.: 17_129A	

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
17_129A	CSE	GEN	XX	DR	C	1011

Status Code: S2 — Suitability Description: FOR INFORMATION

Revision: P01 — Project Status: PRELIMINARY

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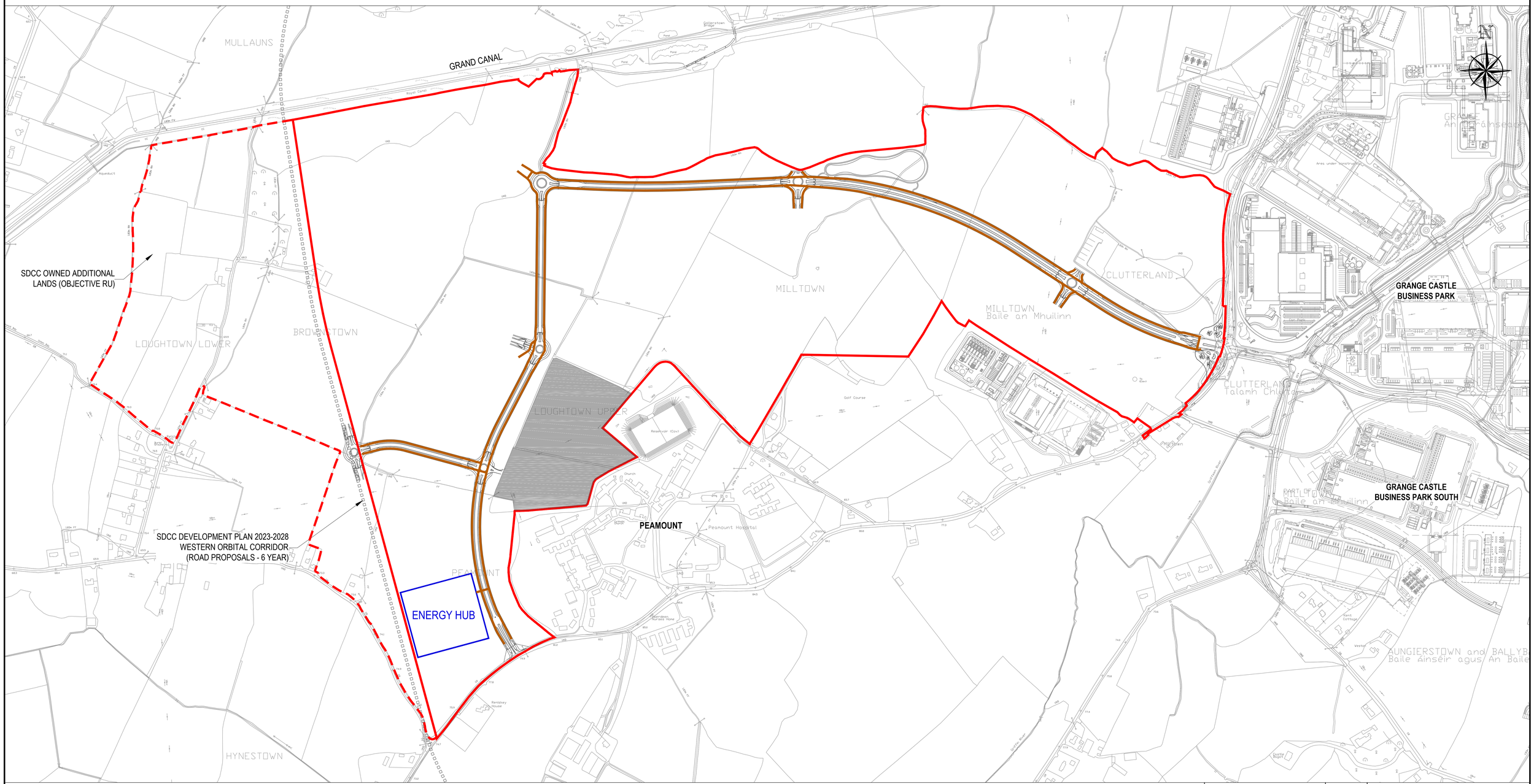
Appendix K – Low / Medium Voltage Power Layout

GRANGE CASTLE WEST BUSINESS PARK
MEDIUM VOLTAGE POWER
APPENDIX K

Comhairle Contae Átha Cliath Theas
South Dublin County Council

GRANGE CASTLE

Clifton Scannell Emerson Associates



GCBP WEST BOUNDARY
FUTURE SHANNON TO DUBLIN WATER SCHEME RESERVOIR
LOW / MEDIUM VOLTAGE NETWORK

Scale Bar 0 0.5 1 Kilometre

DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A0

Drawn By: KT	Date: DEC. 2022		
Checked By: DRL	Scale: NTS @ A1	CSEA Job No.: 17_129A	

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
17_129A	CSE	GEN	XX	DR	C	1012

Status Code: S2 — Suitability Description: FOR INFORMATION

Revision: P01 — Project Status: PRELIMINARY

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Appendix L – High Pressure Gas Layout

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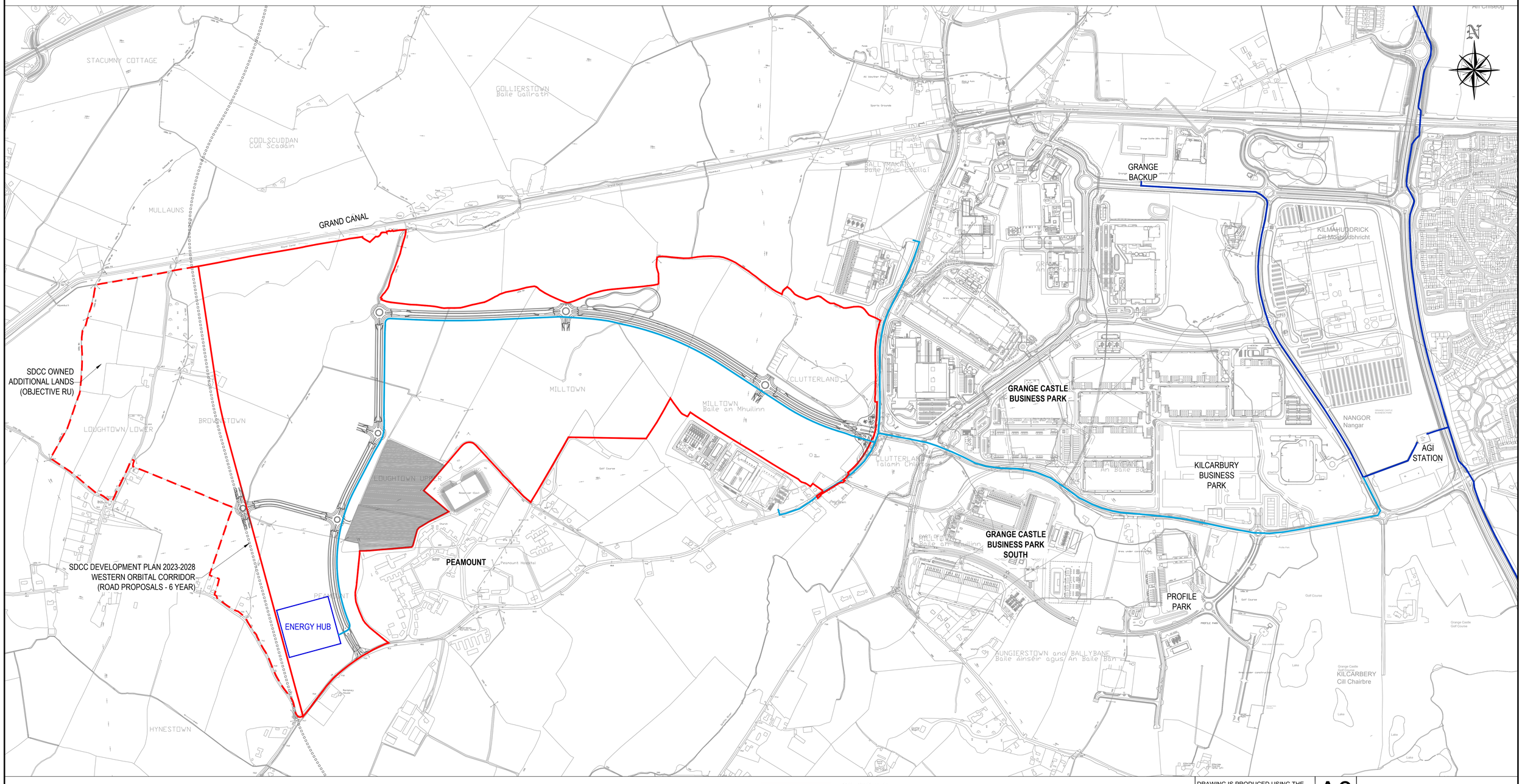
South Dublin County Council

GRANGE CASTLE

GRANGE CASTLE WEST BUSINESS PARK
GAS TRANSMISSION NETWORK
APPENDIX L

Clifton Scannell Emerson Associates



GCBP WEST BOUNDARY
FUTURE SHANNON TO DUBLIN WATER SCHEME RESERVOIR
FUTURE GAS TRANSMISSION NETWORK
EXISTING GAS TRANSMISSION NETWORK

Scale Bar 0 0.5 1 Kilometre

DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A0

Drawn By: KT	Date: OCT. 2022	17_129A
Checked By: RG	Scale: NTS @ A1	CSEA Job No.

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
17_129A - CSE - GEN - XX - DR - C - 1016						

S2 (Status Code)	FOR INFORMATION (Suitability Description)
P01 (Revision)	PRELIMINARY (Project Status)

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Appendix M – Distribution Gas Layout

Comhairle Contae Átha Cliath Theas
South Dublin County Council

GRANGE CASTLE

GRANGE CASTLE WEST BUSINESS PARK
GAS DISTRIBUTION NETWORK
APPENDIX M

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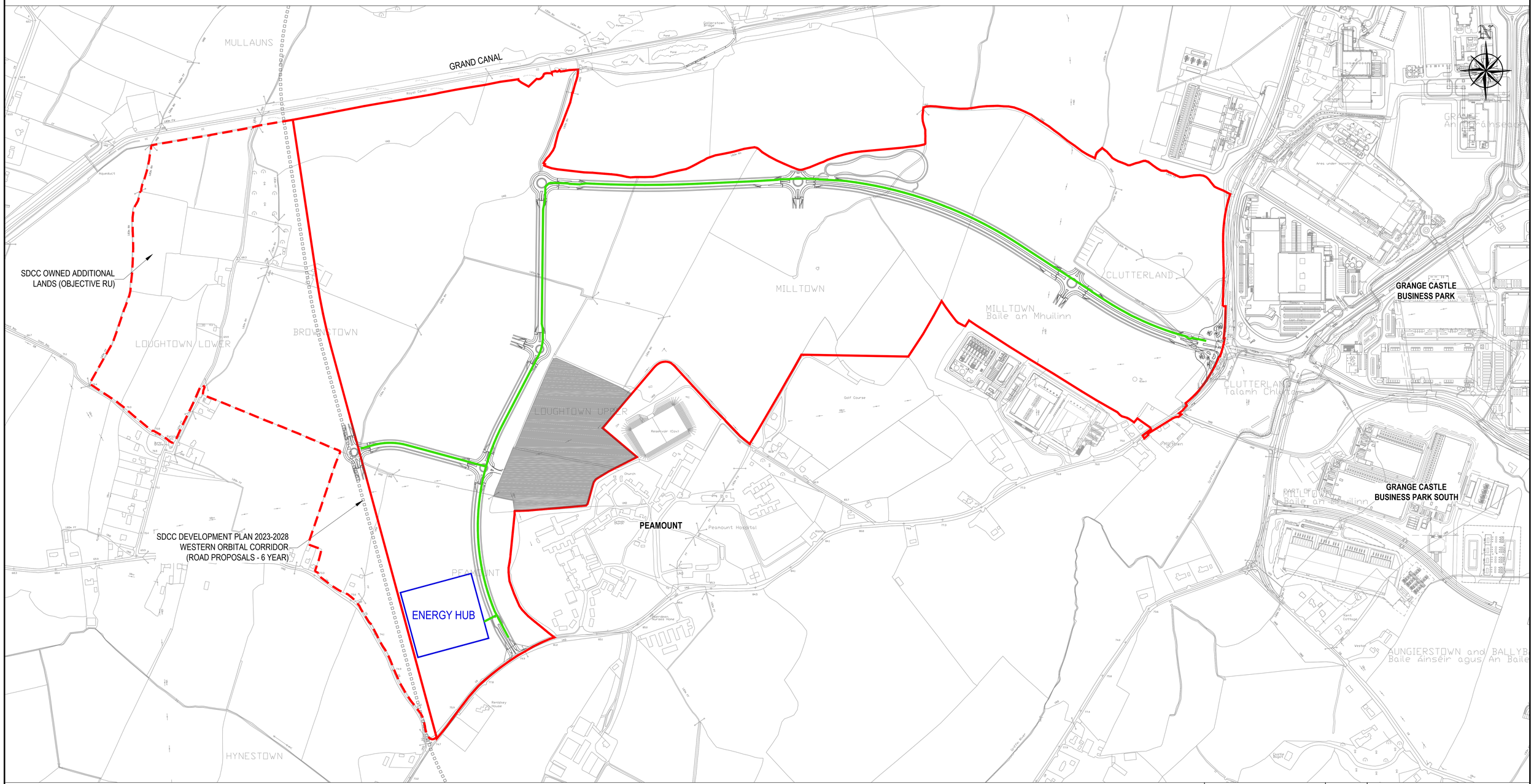

GCBP WEST BOUNDARY
FUTURE SHANNON TO DUBLIN WATER SCHEME RESERVOIR
GAS DISTRIBUTION NETWORK

Scale Bar 0 0.5 1 Kilometre

DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A0

Drawn By: KT	Date: DEC. 2022		
Checked By: DRL	Scale: NTS @ A1	CSEA Job No.: 17_129A	

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
17_129A - CSE - GEN - XX - DR - C - 1015						

Status Code	Suitability Description
S2	FOR INFORMATION
P01 (Revision)	PRELIMINARY (Project Status)

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Appendix N – Telecom Layout

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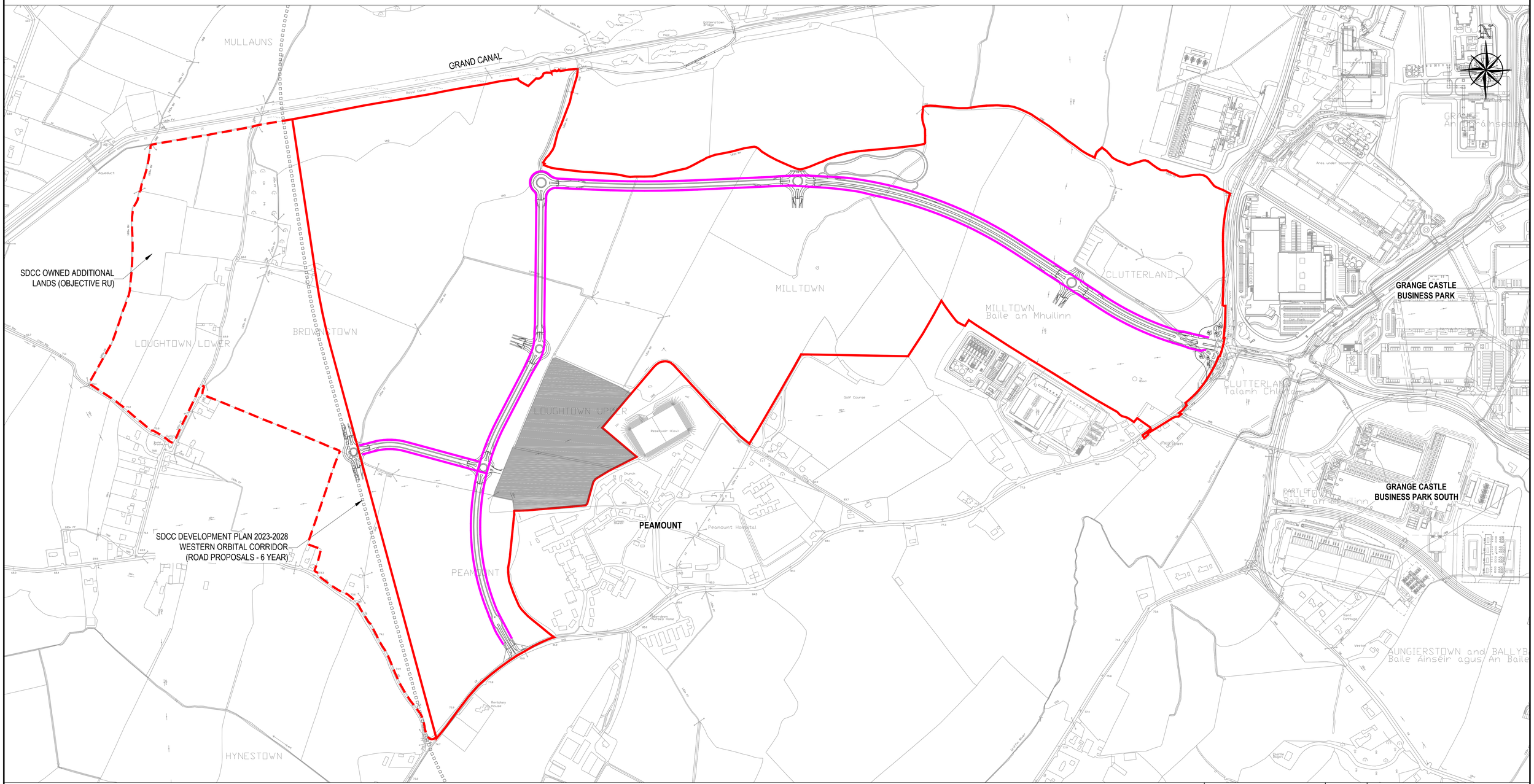
Átha Cliath Theas
South Dublin County Council

GRANGE CASTLE

GRANGE CASTLE WEST BUSINESS PARK
TELECOM
APPENDIX N

Clifton Scannell Emerson Associates



GCBP WEST BOUNDARY
FUTURE SHANNON TO DUBLIN WATER SCHEME RESERVOIR
TELECOM NETWORK

Scale Bar 0 0.5 1 Kilometre

DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A0

Drawn By: KT	Date: DEC. 2022		
Checked By: DRL	Scale: NTS @ A1	CSEA Job No.: 17_129A	
Project Code	Originator	Zone/Phase	Level	Type	Role	Dwg. No.
17_129A - CSE - GEN - XX - DR - C - 1010						
Status Code: S2	Suitability Description: FOR INFORMATION					
Revision: P01	Project Status: PRELIMINARY					

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Appendix O – District Heating

GRANGE CASTLE WEST BUSINESS PARK
DISTRICT HEATING
APPENDIX O

Comhairle Contae Átha Cliath Theas
South Dublin County Council

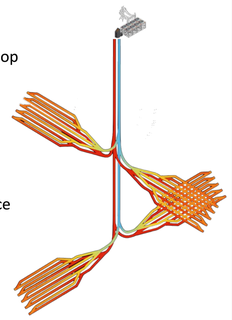
GRANGE CASTLE

Clifton Scannell Emerson Associates

Geothermal from the Earth:
- Geothermal **Anywhere** – closed loop
- Constant 24/7
- Clean renewable power and heat

Geothermal Anywhere is:
- Clean / Carbon Neutral
- No Aquifer required
- Natural / Sustainable energy source
- Small surface footprint

Geothermal Anywhere provides:
- Heating
- Power Generation



GRAND CANAL
LENS MEDIA
SDCC OWNED ADDITIONAL LANDS (OBJECTIVE RU)
SDCC DEVELOPMENT PLAN 2023-2028 WESTERN ORBITAL CORRIDOR (ROAD PROPOSALS - 6 YEAR)
ENERGY HUB
PEAMOUNT
GRANGE CASTLE BUSINESS PARK
GRANGE CASTLE BUSINESS PARK SOUTH
KILCARBURY BUSINESS PARK
PROFILE PARK
NANGOR ROAD
GRANGE CASTLE ROAD
KILCARBERY
GRANGE CASTLE GOLF COURSE
TO CASEMENT AERODROME
KISHOGE
NANGOR
KILMAHUDDRICK
GOLLIERSTOWN
BALLYMAKAILY
CLUTTERLAND
MILLTOWN
LOUGHTOWN LOWER
LOUGHTOWN UPPER
BROWNSTOWN
HYNESTOWN
AUNGIERSTOWN and BALLYBANE

GCBP WEST BOUNDARY
FUTURE SHANNON TO DUBLIN WATER SCHEME RESERVOIR
DISTRICT HEATING NETWORK
POSSIBLE WASTE HEAT PRODUCERS

Scale Bar 0 0.5 1 Kilometre

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DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A0

Drawn By: KT	Date: OCT. 2022	17_129A
Checked By: RG	Scale: NTS @ A1	CSEA Job No.

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
17_129A - CSE - GEN - XX - DR - C - 1020						

Status Code: S2 — Suitability Description: FOR INFORMATION

Revision: P01 — Project Status: PRELIMINARY

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Appendix P – ESBN 220kV Substation - Site Suitability/Selection Report

Site Selection Report to identify possible sites for a new four x 250 MVA 220/110 kV Substation, in Grangecastle West Business Park, Dublin

Document No.: PE688-F0416-R00-001-000

Date: 18/01/2023

Engineering and Major Projects, One Dublin Airport Central, Dublin Airport, Cloghran, Co. Dublin,
K67 XF72, Ireland.
Phone +353 (0)1 703 8000
www.esb.ie

File Reference:	PE688-F0416	
Client / Recipient:	ESB Networks	
Project Title:	New 220 kV Substation Site Acquisition	
Report Title:	Site Selection Report to identify possible sites for a new 220/110 kV BSP or a 110 kV DSO junction substation, at Grangecastle West Business Park, Dublin	
Report No.:	PE688-F0416-R00-001-000	
Revision No.:	000	
Prepared by:	Farrell_N	Date: 12/01/2023
Verified by:	OSull_Bri	Date: 12/01/2023
Approved by:	N.Holmes	Date: 18/01/2023

Template Used: T-020-017-Engineering and Major Projects Report Template

Change History of Report

Date	New Revision	Author	Summary of Change

Executive Summary

This report has been prepared by Engineering and Major Projects (EMP), ESB to identify sites for a new 220 kV BSP substation or if not suitable a 110 kV junction substation in the new Grangecastle Business Park West in west county Dublin. The substation will consist of a 220 kV GIS indoor substation, a 110 kV GIS substation building and a combined 38 kV and MV building. It should also accommodate four 220 kV / 110 kV 250 MVA transformers, two 110 kV / 38 kV 63 MVA transformers and two 110 kV / MV 31.5 MVA transformers.

Three sites were offered to ESB Networks (ESBN) by South Dublin County Council with the best suited options detailed in the following report.

The site selection process looked at the following criteria; previous planning history, possible environmental, archaeological and geotechnical concerns, local road network and ability to load and off load the substation.

Contents

1 Introduction

1.1 Scope and Purpose of this Report

This report has been prepared by Engineering and Major Projects, ESB to identify possible sites for a proposed new 220 kV BSP substation in the new Grangecastle Business Park West. If the sites are not adequate for a 220 kV BSP, suitability for a 110 kV junction substation will be assessed.

South Dublin County Council has offered three potential sites in the new Grangecastle Business Park West. Each one is 180 m^2 or larger as requested by the TSO to be able to contain the 220 kV BSP substation.

2 Planning and Environmental

2.1 Study Area Location and Boundary

The study area is in west county Dublin near Peamount Hospital and the existing Grangecastle Business Park. The new 220 kV substation will be located within the new Grangecastle Business Park West.

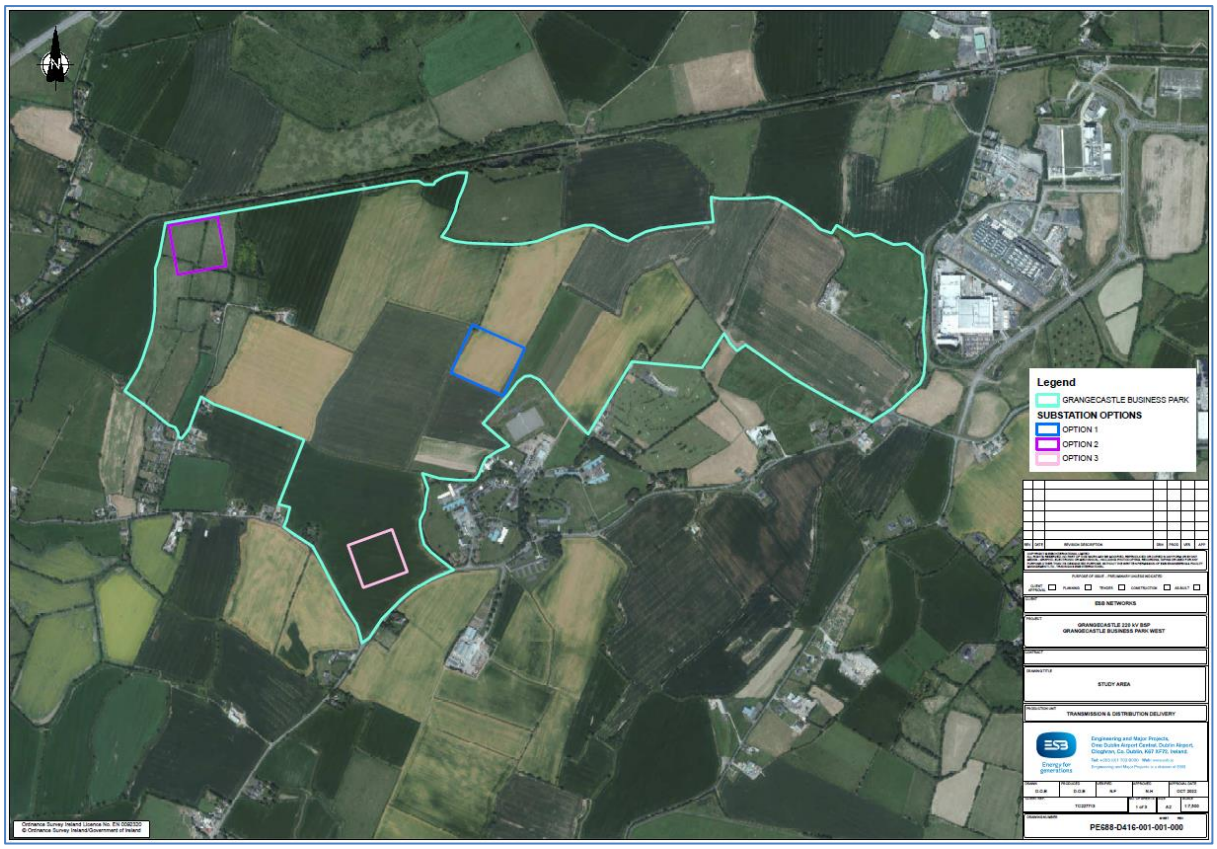

Figure 1: Aerial view of study area

2.2 Land Use and Zoning

The study area currently has Rural Zoning by South Dublin County Council. This is to protect and promote in a balanced way, the development of agriculture, forestry and rural related biodiversity, landscape and culture.

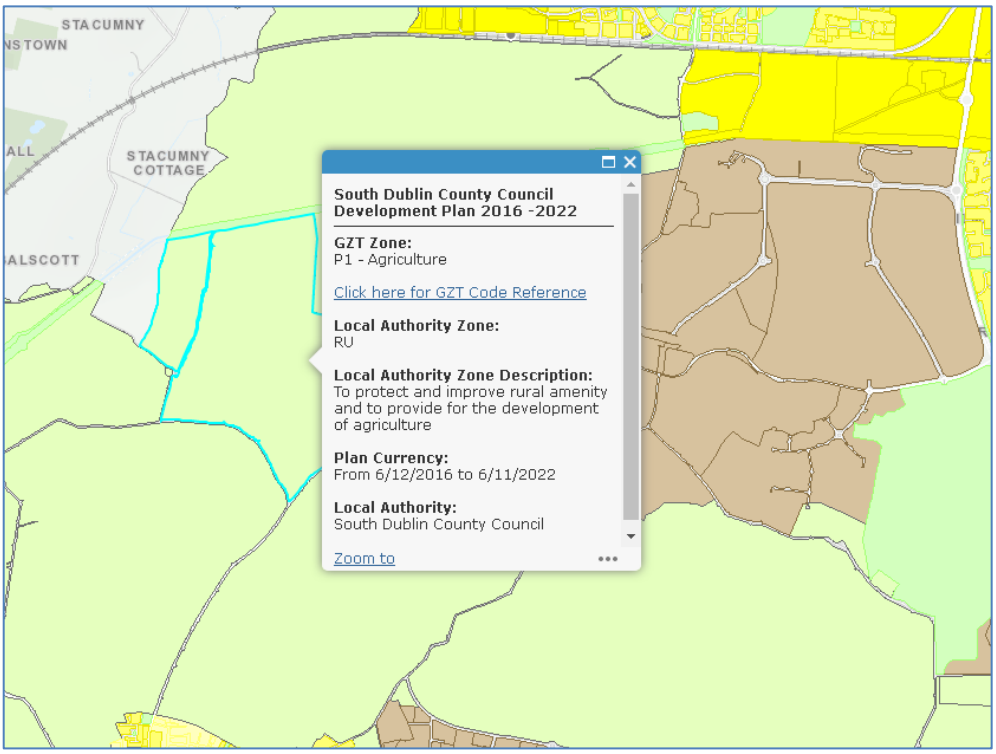

Figure 2: Zoning Map for study area (Source: South Dublin County Council)

2.3 Environmental

2.3.1 SEA

Strategic Environmental Assessment (SEA) is the formal systematic evaluation of the likely significant environmental effects of implementing a plan or programme before a decision is made to adopt the plan or programme,

The four main steps of the SEA are as follows:

1 – Screening

2 – Scoping

3 – Environmental Assessment and Environmental Report

4 – SEA Statement

2.3.2 Appropriate Assessment

An Appropriate Assessment is an assessment taken under the EU Habitat's Directive (92/43/EEC). Under the EU Habitat's Directive, any plan or project not directly connected with or necessary to the management of a Natura 2000 site (e.g. SAC or SPA), but likely to have a significant effect thereon,

either individually or in combination with other plans or projects, shall be subjected to an Appropriate Assessment of its implications for the site in view of the site's conservations objectives.

***In relation to 'Open Space' Objectives**: It is therefore recommended that potential conflicts are avoided by directing people away from sensitive areas and that the Commitments for protected areas and Appropriate Assessment in Chapter 5 of the Development Plan are taken into account.*

NHA – Natural Heritage Area

pNHA – Proposed Natural Heritage Area

SAC – Special Areas of Conservation (Natura 2000 sites)

SPA – Special Protection Areas

Objective NH15 - *Strictly protect areas designated or proposed to be designated as Natura 2000 sites (i.e. Special Areas of Conservation (SACs) and Special Protection Areas (SPAs); also known as European sites) including any areas that may be proposed for designation or designated during the period of the Plan.*

Figure 3: Ecological constraints map of study area

2.4 Cultural and Archaeological Heritage

Objective CH04 - *Ensure archaeological remains are identified and fully considered at the very earliest stages of the development process, that schemes are designed to avoid impacting on the archaeological heritage.*

Objective DMS152 – *A site assessment should be carried out prior to starting any design work to help inform and direct the layout, form and architectural treatment of the proposed development and identify issues that may need to be avoided, mitigated, or require sensitive design and professional expertise. The site assessment should evaluate:*

- *Character of the site in its setting (including existing buildings),*
- *Access to the site,*
- *Services,*
- *Protected Designations,*
- *Rare and protected species (such as bats)*

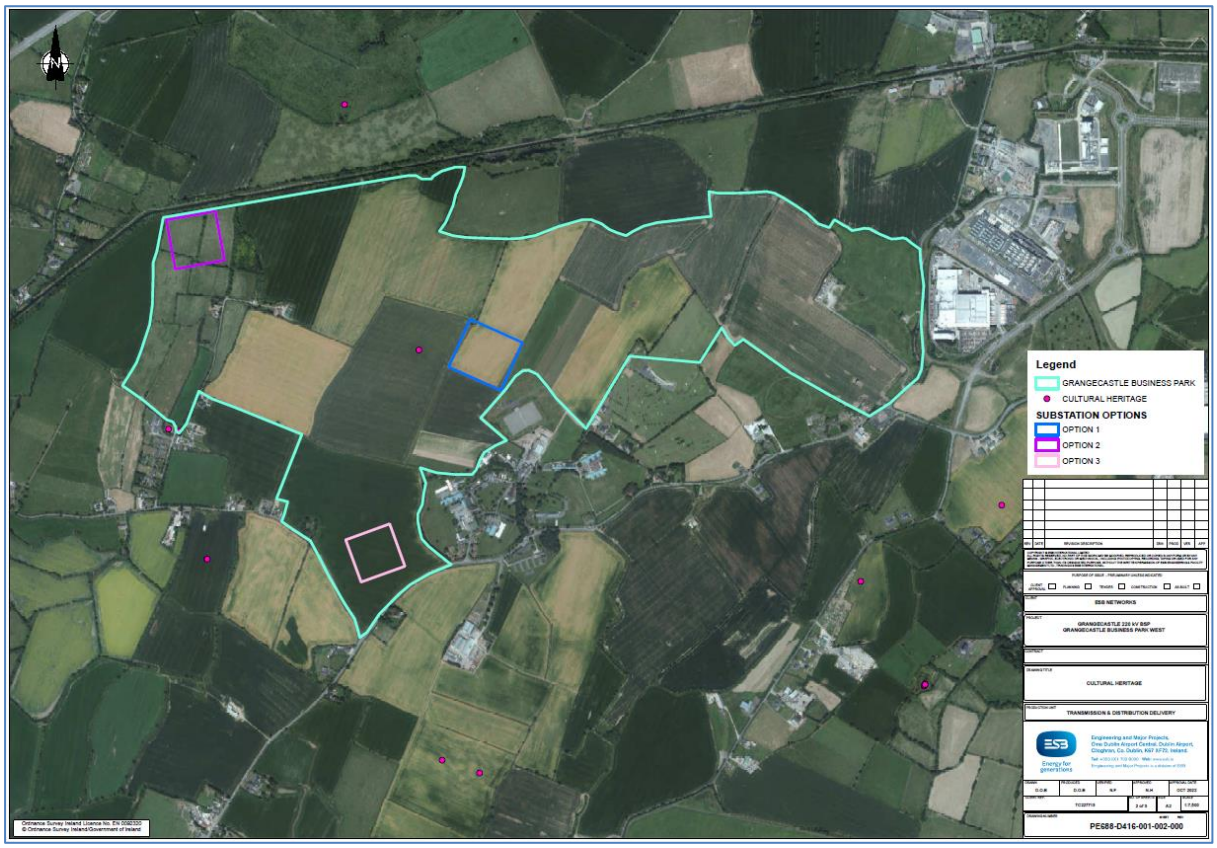

Figure 4: Areas of cultural & archaeological heritage

There are no cultural or archaeological heritage sites within 100 m of the sites selected for the study.

2.5 Flooding History and Probability

The search area has very little history of flooding. The map below shows the nearest expected area of fluvial (river) flooding with a 1-in-100 chance of a flood in any given year. The nearest river is on the southwest corner of the search area. Source: **floodinfo.ie**

Figure 5: 1-in-100 probability of flooding events

3 Site Requirements

Two substation site options are proposed, if the site is not suitable for a 220 kV BSP it would also be a good location for a 110 kV DSO junction substation.

220 kV/110 kV BSP Substation Arrangement:

- Connections to the 220 kV transmission networks, route is not known at this time, just allow for 220 kV ducts in site footprint.
- 220 kV GIS Enhanced Ring type indoor station:
  - Three busbar sections
  - 8 line bays
  - 4 220 kV/110 kV 250 MVA transformer bays
  - 2 wing couplers
  - 2 sectionaliser bays
- Four 220 kV/110 kV 250 MVA transformers
- 110 kV GIS Double Busbar should contain (at a minimum):
  - 4 220 kV / 110 kV transformer bays
  - 2 110 kV / 38 kV transformer bays
  - 2 110 kV / MV transformer bays
  - 8 110 kV Line bays
  - 3 sectionaliser bays
  - 2 wing couplers
- Two 110 kV / 38 kV 63 MVA transformers
- Two 110 kV / MV 31.5 MVA transformers
- 38 kV GIS Standard Indoor Double Busbar should contain (at a minimum):
  - 2 transformer bays
  - 8 line bays
- MV GIS Standard Indoor BB
  - 2 transformer bays
  - 16 line bays
- 110 kV and 38 kV Ducting - again routes do not need to be determined just allow for access in site footprint

Or 110 kV Junction Substation Arrangement:

- 110 kV GIS Double Busbar should initially contain 8 line/transformer bays and be extendable up to 12 line/ transformer bays. Initial 8 bay (2 sections) double busbar should contain:
  - 2 110 / MV transformer bays
  - 6 110 kV line bays
  - 2 sectionaliser bay
  - 1 wing couplers
- Two 110 kV / MV 31.5 MVA transformers
- MV GIS Standard Indoor Busbar
  - 2 transformer bays
  - 16 Line bays
- 110 kV and MV Ducting - routes do not need to be determined just allow for access in site footprint

The 110 kV Building should be expandable to 12 line/transformer bays (3 DB sections) ultimately:

  - 2 110 kV / MV transformer bays
  - 10 110 kV line bays
  - 2 sectionaliser bays
  - 2 wing couplers
- Two 110 kV / MV 31.5 MVA transformers
- MV GIS Standard Indoor Busbar
  - 2 transformer bays
  - 16 line bays
- 110 kV and MV Ducting-routes do not need to be determined just allow for access in site footprint

The overall substation dimensions required will be a footprint of 180 m x 165 m in the worst case. This measurement is from the TSO and does not take the DSO requirements into consideration. The TSO have indicated that they want a site with a much bigger footprint than Castlebaggot 220 kV substation as there was cable derating due to the tight footprint.

4 Site Options

Three potential sites within the new Grangecastle Business Park West have been offered to ESB for consideration for a new 220 kV BSP substation or 110 kV junction substation.

- **Site A** – Located to the north-west of Peamount Hospital.
- **Site B** – Located on the north – western corner of a proposed extension to the new Business Park.
- **Site C** – Located to the south-west of Peamount Hospital.

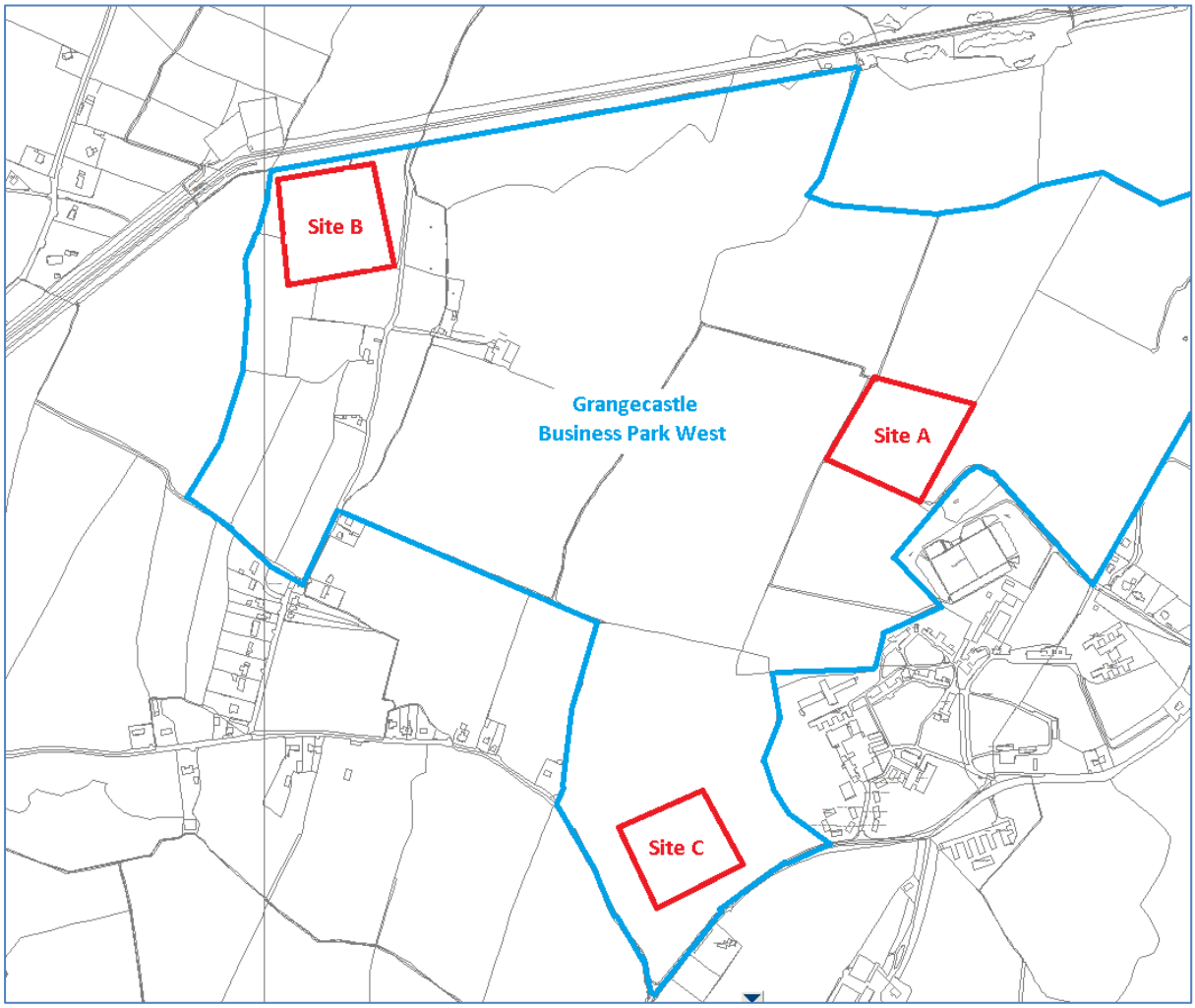

Figure 6: Sites chosen for investigation

4.1 Ownership

South Dublin County Council owns all the land that will make up the new business park. *Source:* ***landdirect.ie***

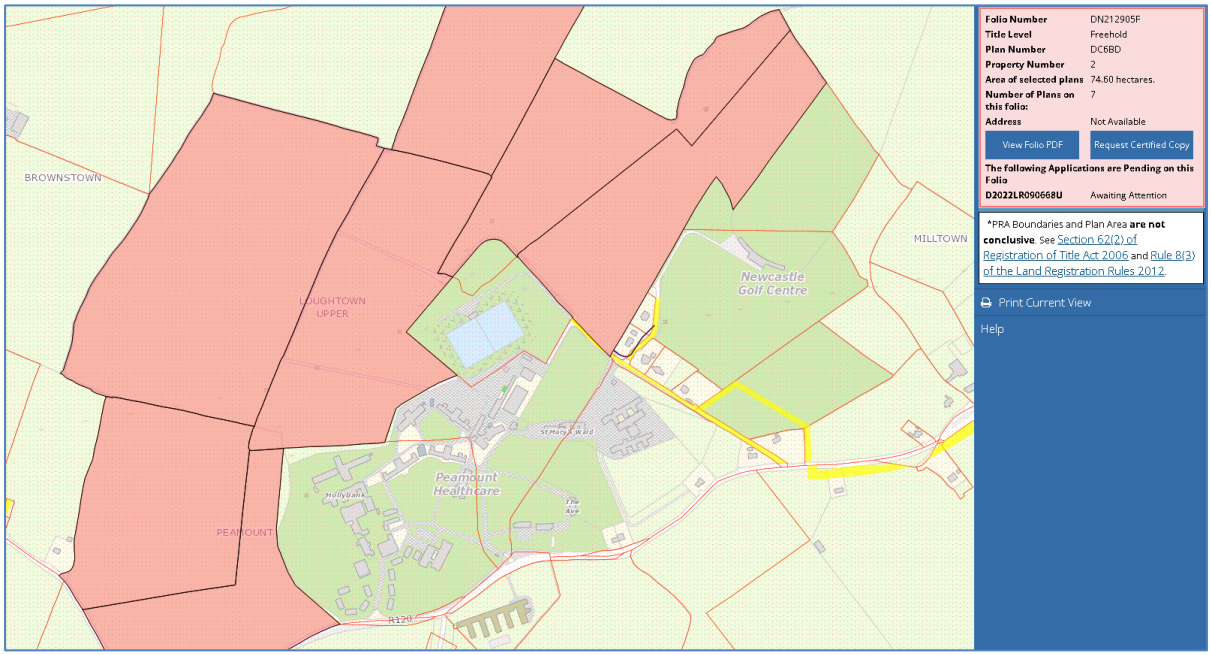

Figure 7: Site A – Freehold

4.2 Connection Options

There is a spare underground cable that was installed from the Maynooth – Inchicore 220 kV OHL to Castlebaggot 220 kV substation. The route of the spare cable runs next to the proposed entrance to the new Grangecastle Business Park West where new internal roads will be constructed and could contain the 220 kV cables. Infrastructure information from GNet.

Connecting directly from Maynooth – Inchicore 220 kV Double Circuit OHL would require the construction of a Line / Cable interface mast and compound and a substantial outage. The 220 kV underground cable connecting to the substation would have to travel across open countryside and require a bore under the Grand Canal.

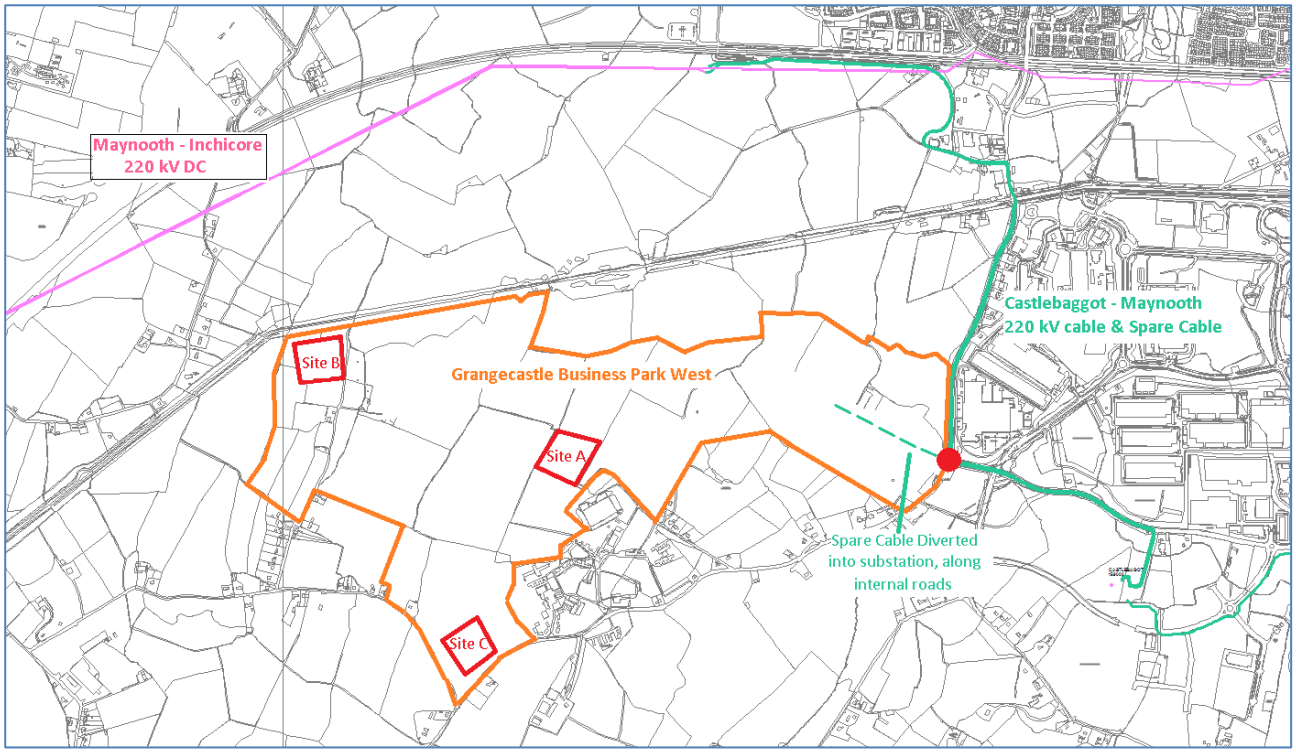

Figure 8: Connection Options

4.3 Site Planning History

There is currently planning for the internal road network and none near the 3 sites available to ESBN.

Source: South Dublin County Council Planning website.

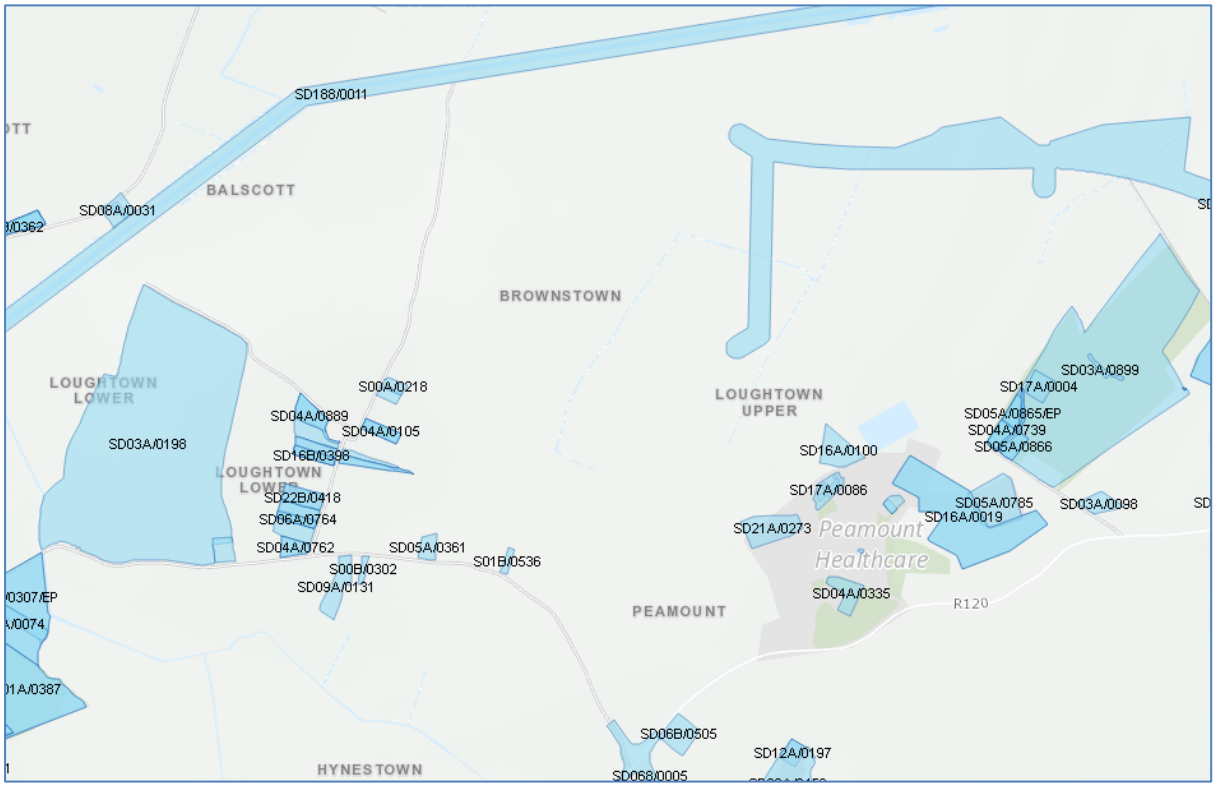

Figure 9: Previous planning applications

4.4 Site A

Located to the north-west of Peamount Hospital. The site will be accessible through a new internal road network built for the Business Park for both construction and operation purposes. These roads can be used for cables feeding and off-loading the substation. The site can be up to 190 m x 180 m, depending on the final substation design. Of the three sites, it is the closest to the spare Castlebaggot – Maynooth 220 kV cable. There are already hedgerows on the site boundary, but landscaping can be planted if required by planning. There are no houses within 850 m and the hospital buildings nearest the site look to be industrial / support buildings.

Figure 10: Site A Overview

4.5 Site B

Located to the north-west of the business park, the site is adjacent to the Grand Canal. The nearest public road access is 750 m away with local farm access nearer. This area of the business park is only for future expansion so currently there are no plans to build internal roads to this site. This site is not suitable for the substation.

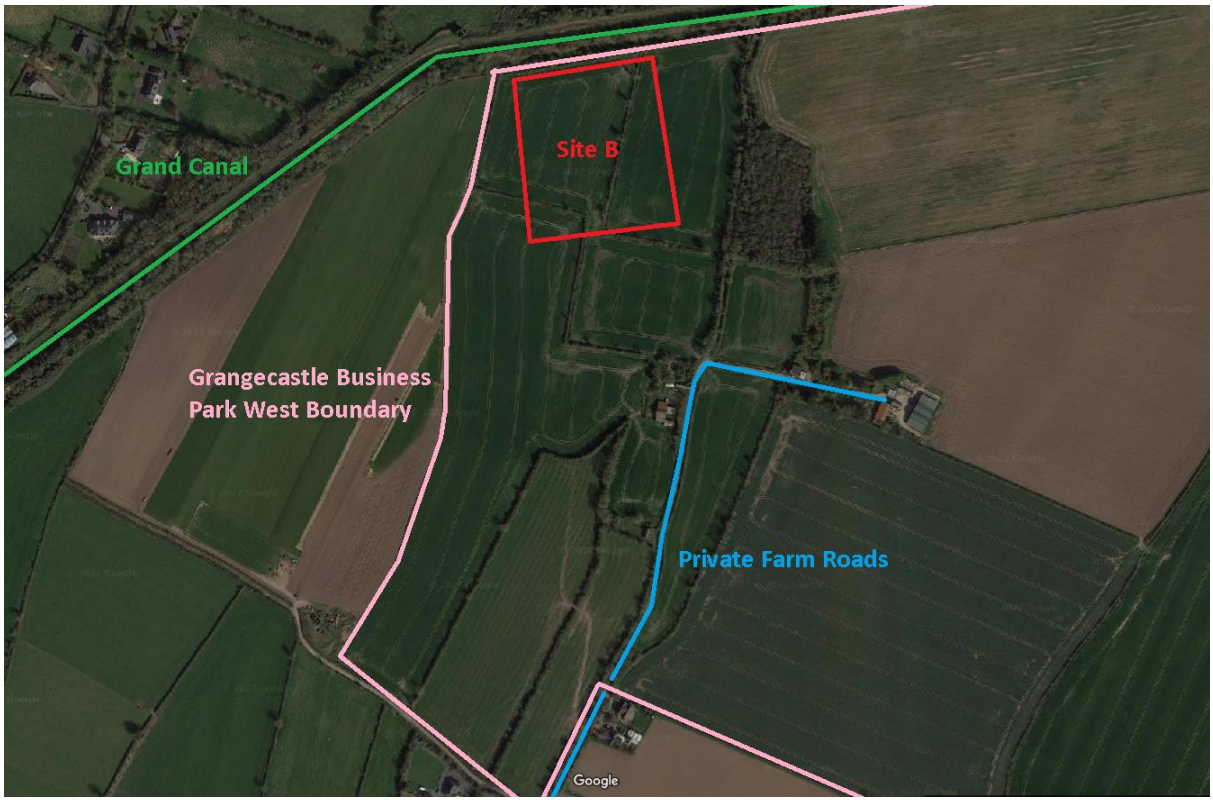

Figure 11: Site B Overview

4.6 Site C

Located to the south-west of Peamount Hospital. The site can be accessible through new internal roads built for the Business Park and / or the local road network. The local network consists of 2 roads on adjacent sides of the site. These can be used for cables offloading the substation. The site can be up to 180 m x 180 m, depending on the final substation design. The nearest houses are within 150 m of the site and landscaping can be used to shield the substation from their view.

Figure 12: Site C Overview

5 Technical Considerations

5.1 Complexity of Construction and Feeding

- Work has already commenced on the internal road network which will need cable ducting and cable joint bays installed to feed both sites A and C.
- A study will have to be completed to determine if the local roads can accommodate the cable offloading of the 110 kV and 38 kV circuits, from sites A and C.
- Due to noise constraints for patients at Peamount Hospital construction at Site A may have to be carried out during certain hours of the day.

5.2 Geotechnical Desktop Study

ESB EMP have been instructed to undertake a geotechnical desk study to inform site selection for a 220 kV Substation, at the new Grangecastle West Business Park in South West Dublin.

The study references the following publicly available resources, accessed from the Geological Survey of Ireland, Geotechnical and Groundwater Data Viewers:

- 1:100k Bedrock Geology of Ireland
- 1:50k Quaternary Sediments
- Landslide Events and Susceptibility Classification
- Site topography: OPW Lidar Survey data
- Karst Data
- Historical Mapping: First Edition 6-inch black and white (1829-1841) and earliest available aerial photography, 1995.

5.2.1 Summary of Findings and Assessment of Risk

Table 1 provides a summary of preliminary ground risk classification definitions and examples. It shall be noted that this classification is based on a brief desktop study, which may refer to low resolution or low confidence data provided by others.

The site appraisal is presented in Table 2. All assigned classifications should be seen as preliminary and subject to change, pending the receipt of new information, a site walkover and ground investigation.

Classification	Description of Risk
1	No findings which would suggest elevated geotechnical risk during construction or over the operational life of the project. A site is unlikely to be allocated this classification following an exclusively desk-based study.
2	Findings which would suggest a minor geotechnical risk, applicable during construction only. Risk can be fully mitigated by routine geotechnical investigation and design. Example: Superficial soft soils or peat
3	Findings which would suggest a moderate geotechnical risk, applicable during construction only. Risk can be fully mitigated by routine geotechnical investigation and design at modest additional expense. Example: Moderately deep deposits of soft ground or peat.
4	Findings which would suggest a high geotechnical risk, mitigated by complex and expensive engineering solutions. Further risk during the operational life of the project is possible but unlikely. Example: Very steep topography, very deep peat.
5	Findings which would suggest a high geotechnical risk, partially mitigated by complex and expensive engineering solutions. Further risk during the operational life of the project is difficult to mitigate. Example: Karst area prone to sinkhole formation.

Table 1: Preliminary risk classification, definitions

Site	Classification	Description of Risk
'Grangecastle, option 1 and Option 2'	3	Available mapping, historical boreholes and on-site observations indicate rockhead close to, or at, ground level within the site boundary. Both sites are free from historical development. Both sites present minimal risk relating to soft ground conditions. Conversely conditions are likely to be highly favourable for ground stability. Faulting close to the site may indicate variable rock quality. Neither of the sites present significant technical short or long-term risk; however, the presence of shallow rock presents risk in terms of cost and programme, dependent on the nature and exact depth of rockhead, requirements for basements within the structure, and trenching for cables. The assigned Risk Classification may be reconsidered following the execution of a robust ground investigation.

Table 2: Preliminary Site Appraisal: Grangecastle West

5.2.2 Recommendations

Should greater confidence be sought in rock levels throughout each site, a series of Trial Pits and/or boreholes, targeted at structure and trench locations may be beneficial.

6 Conclusions

Three potential sites were offered to ESBN for consideration. The main criteria used in selecting a suitable site for the substation were as follows.

- Area of site (Completed substation, construction, access, etc.)
- Access to site from road network for construction and operation
- Proximity of local 220 kV network for feeding
- Surroundings and suitability (zoning, proximity to housing, etc.)

Only Site A and Site C would appear suitable for the 220 kV substation based on the above criteria. Following an assessment by Engineering and Major Projects, **Site A** is the most suitable of the three sites as it meets all criteria set out in the request from ESBN.

- There is sufficient room on the site for the substation for construction and operation.
- Proximity to the new internal road network for operation, construction, feeding and offloading of the substation.
- Closest of the three sites to the spare Castlebaggot – Maynooth 220 kV cable.
- The nearest housing to the substation is 850 m.

Site C also meets the criteria for the substation, but it is further away from both the business parks new internal road network and would be the second choice.

Appendix One – Constraints and Other Mapping

1. PE688-D416-001-001-000 – *Grangecastle Business Park West Study Area*
2. PE688-D416-001-002-000 – *Grangecastle Business Park West Cultural Heritage*
3. PE688-D416-001-003-000 – *Grangecastle Business Park West Study Ecological Constraints*

Appendix Two – Reference Reports & Drawings

1. PE688-F0416-R00-002-000 – *Grangecastle Substation Site Selection, Co. Dublin Geotechnical Desk Study and Site Walkover*

Grangecastle Substation Site Selection, Co. Dublin

Geotechnical Desk Study and Site Walkover

Document No.: PE688-F0416-R00-002-000

Date: November 2022

Engineering and Major Projects, One Dublin Airport Central, Dublin Airport, Cloghran, Co. Dublin, K67 XF72, Ireland.

Phone +353 (0)1 703 8000

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File Reference:	PE688-F0416	
Client / Recipient:	ESB Networks	
Project Title:	Grangecastle Substation, Co. Dublin	
Report Title:	Site Selection, Geotechnical Desk Study and Site Walkover	
Report No.:	PE688-F0416-R00-002-000	
Revision No.:	000	
Prepared by:	Noel Kelly	Date: November 2022
Title:	Senior Geotechnical Engineer	
Verified by:	Carl Brangan	Date: November 2022
Title:	Senior Geotechnical Engineer	
Approved by:	Niamh Holmes	Date: November 2022
Title:	Team Lead	

Template Used: T-020-017-Engineering and Major Projects Report Template

Change History of Report

Date	New Revision	Author	Summary of Change
11/2022	First Issue	NJK	

Contents

Table of figures

1 Introduction

ESB EMP have been instructed to undertake a geotechnical desk study and site walkover to assess Geotechnical risk for a 220 kV Substation at Grangecastle in Co. Dublin.

The desk study examines two sites, the outline of which are detailed in the attached Appendices.

The study references the following publicly available resources, accessed from the Geological Survey of Ireland, Geotechnical and Groundwater Data Viewers:

- 1:100k Bedrock Geology of Ireland,
- GeoUrban bedrock depth mapping,
- 1:50k Quaternary Sediments,
- Landslide Events and Susceptibility Classification,
- Site topography: OPW Lidar Survey data, where available,
- Karst Data,
- Historical Mapping: First Edition 6-inch black and white (1829-1841) and aerial photography, 1995, 2005 and latest available.

Findings are discussed in the following sections. Associated figures are presented in Appendix A and site walkover photographs presented in Appendix B. Note that site boundary lines presented on all figures are approximate and indicative only.

2 Superficial and Solid Geology

Referring to Figure 1, Figure 2 and Figure 3, Appendix A, mapping indicates:

- The site is underlain by “Till Derived from Limestone”.
- There are several rock outcrops mapped within the vicinity of both sites, and within the boundary of both sites.
- Solid geology (bedrock) is mapped as “Dark Limestone and shale of the Lucan Formation”. A northeast – southwest trending fault is mapped approximately 150 - 300 m to the southeast of both sites.
- GeoUrban rockhead mapping indicated bedrock is present between 0 and 1 metres below ground level (mbgl) and 1 to 3mbgl (mbgl).
- No peat is mapped within a 1.5 km radius of the site.

Referring to Figure 4, a number publicly available borehole records are mapped within a 1.5 km radius of the site. For clarity, the following summary is limited to eight borehole records, undertaken adjacent to the eastern boundary of the site.

Table 1: Summary of relevant historical borehole records

Stratum	Saggart to Leixlip Watermain (1985)					'Cuisine de France' (2006)	'Well at Peamount' (1921)
	75376	75394	75377	75378	75379	B139576	B63580
	Depth to base of stratum (mbgl)						
Brown Dublin Boulder Clay: Firm or Firm to stiff brown silty CLAY with boulders SPT N = 14 – 32 where recorded	3.0	1.4[1]	0.65	1.5	1.0	-	-
Black Dublin Boulder Clay: Very stiff black gravelly sandy CLAY with occasional cobbles and boulders. SPT N = 24 where recorded	-	-	-	-	-	2.7	-
Bedrock: Limestone. Grey thinly bedded fine grained bioclastic limestone. "Very broken core" and poor recovery TCR = 17 – 77 RQD = 0 - 59	3.4 (Ref[2])	5.2 (EOH[3])	0.85 (Ref[2])	1.9 (Ref[2])	-	-	1.5
Bedrock: Limestone. Dark grey to black, fresh, strong to moderately strong, commonly argillaceous and fine grained. TCR = 100 RQD = 41 - 68	-	-	-	-	-	8.0 (EOH[3])	-
Groundwater Depth of Strike (Rising to)	-	-	-	-	-	2.5 (2.2)	-

Notes:
1. Inferred. Depth of commencement of rotary coring.
2. Ref = Borehole Refusal. Bedrock not proven.
3. EOH = End of Hole, Borehole terminated on instruction.

Encountered geology typically comprised firm brown Dublin Boulder Clay overlying stiff to very stiff black Dublin Boulder Clay or Limestone. Bedrock depth, as indicated by borehole refusal ranged from 1.4 – 3.0 mbgl, average 1.67 mbgl.

3 Geohazards

Referencing the GSI Geotechnical Viewer and Open Topography Data Viewer:

- No Karst features are present within a 1.5 km radius of the study area
- No landslide events have been recorded within a 1.5 km radius of the study area

- Landslide susceptibility classification for the sites and wider study area is *Low* or *Low – inferred.*
- The site appears to be relatively flat, with low topographical relief indicated by OSI Lidar Data. 10 m topographical contours indicate a shallow (approx. 1:8) northwest facing slope

4 Surface water and drainage

Referencing the GSI Groundwater Viewer:

- Three watercourses are identified within the vicinity of the site:
  - Lucan Stream, approximately 0.6 km to the northeast of Option 1.
  - Grifeen, approximately 1.2 – 1.5 km to the east of both sites.
  - Milltown, approximately 1.4 km to the east of the Option 1.
- Unnamed 'Lake Segments' approximately 0.6 km to the north of Option 1.
- Grand Canal, not identified on the viewer, is present approximately 0.6 – 1.2 km north of both sites.
- The prevalence of cohesive Glacial Till would indicate poor surface water drainage potential within this stratum.
- GSI Synthetic Aperture Radar (SAR) Seasonal Flood Maps, 2015 – 2021, indicate low confidence flood observations adjacent to the eastern boundary of Option 1. Comment on the significance of this data regarding flooding and surface water management of the sites is outside the scope of this report.

5 Historical Development

Referencing Figure 6, Figure 7, Figure 8 and Figure 9, Appendix A, both sites appear to have been in agricultural use since First Edition 6 in. black and white mapping of the area (1829-1841). Site Option 2 appears to have contained an old field boundary which has since been removed, the outline of this feature can possibly be made out from aerial photographs (Figure 13).

Both local roads adjacent to the sites appear along their current alignment since earliest mapping.

Several small-scale quarries appear on the earliest historical mapping. 'Peamount Quarry' is roughly coincident with the existing Peamount Hospital Grounds. A small surface depression, labelled 'Quarry', is shown close to the western boundary of Option 2.

Last edition black and white mapping shows the current Peamount Hospital Grounds labelled as a 'Sanitorium' and adjacent 'School'. A 10 kV overhead line is shown running east-west over site Option 1.

1995 aerial imagery shows no obvious change or development within, or adjacent to, either site.

2005 – 2012 mapping shows the constructed (covered) Peamount Reservoir, immediately adjacent to the south-eastern boundary of the site.

6 Summary of findings and assessment of risk

Table 2 provides a summary of preliminary ground risk classification definitions and examples. It shall be noted that this classification is based on a brief desktop study, which may refer to low resolution or low confidence data provided by others.

The site appraisal is presented in Table 3. All assigned classifications should be seen as preliminary and subject to change, pending the receipt of new information, a site walkover and ground investigation.

Table 2: Preliminary risk classification, definitions

Classification	Description of Risk
1	No findings which would suggest elevated geotechnical risk during construction or over the operational life of the project. A site is unlikely to be allocated this classification following an exclusively desk-based study.
2	Findings which would suggest a minor geotechnical risk, applicable during construction only. Risk can be fully mitigated by routine geotechnical investigation and design. Example: Superficial soft soils or peat
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5	Findings which would suggest a high geotechnical risk, partially mitigated by complex and expensive engineering solutions. Further risk during the operational life of the project is difficult to mitigate. Example: Karst area prone to sinkhole formation.

Table 3: Preliminary Site Appraisal: Blakes Cross

Site	Classification	Description of Risk
'Grangecastle, Option 1 and Option 2'	3	Available mapping, historical boreholes and on-site observations indicate rockhead close to, or at, ground level within the site boundary. Both sites are free from historical development. Both sites present minimal risk relating to soft ground conditions. Conversely conditions are likely to be highly favourable for ground stability. Faulting close to the site may indicate variable rock quality. Neither of the sites present significant technical short or long-term risk; however, the presence of shallow rock presents risk in terms of cost and programme, dependent on the nature and exact depth of rockhead, requirements for basements within the structure, and trenching for cables. The assigned Risk Classification may be reconsidered following the execution of a robust ground investigation.

7 Recommendations

Should greater confidence be sought in rock levels throughout each site, a series of Trial Pits and/or boreholes, targeted at structure and trench locations may be beneficial.

Appendix 1: Figures

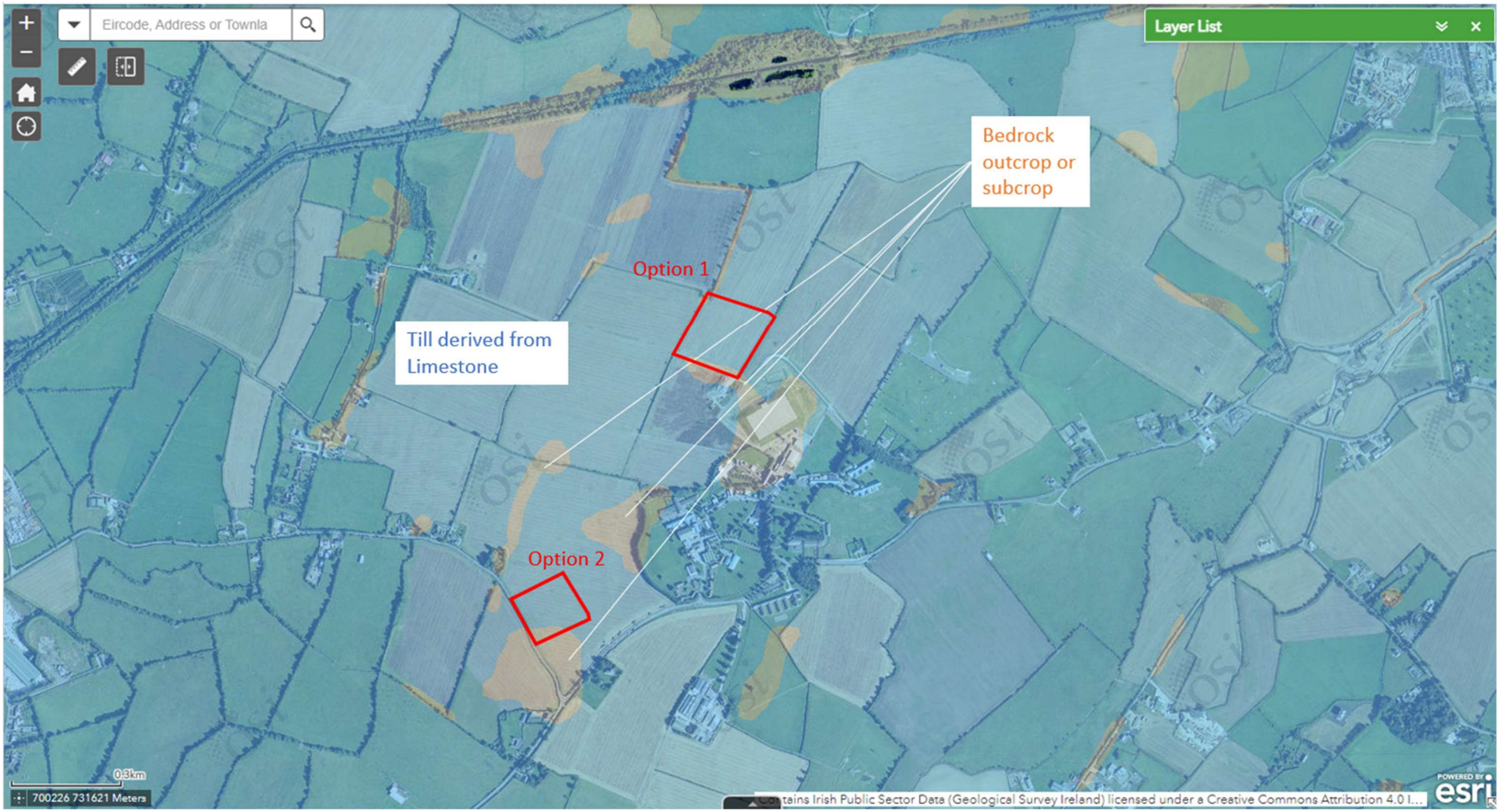


Figure 1: Quaternary sediments, GSI 1:50k mapping, GSI

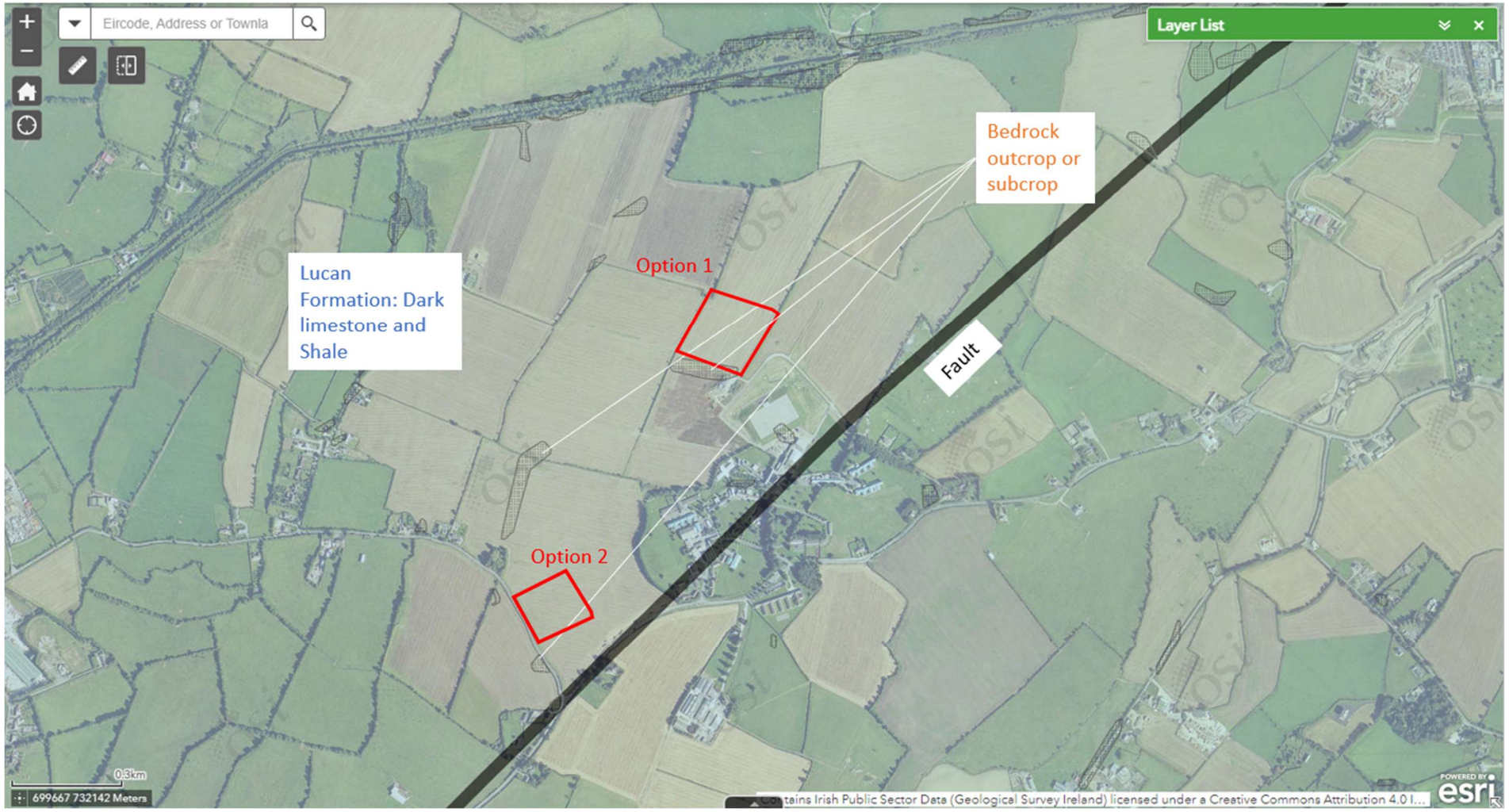


Figure 2: Solid Geology, 1:100k mapping, GSI

Figure 3: Inferred depth to bedrock, GeoUrban Project, GSI

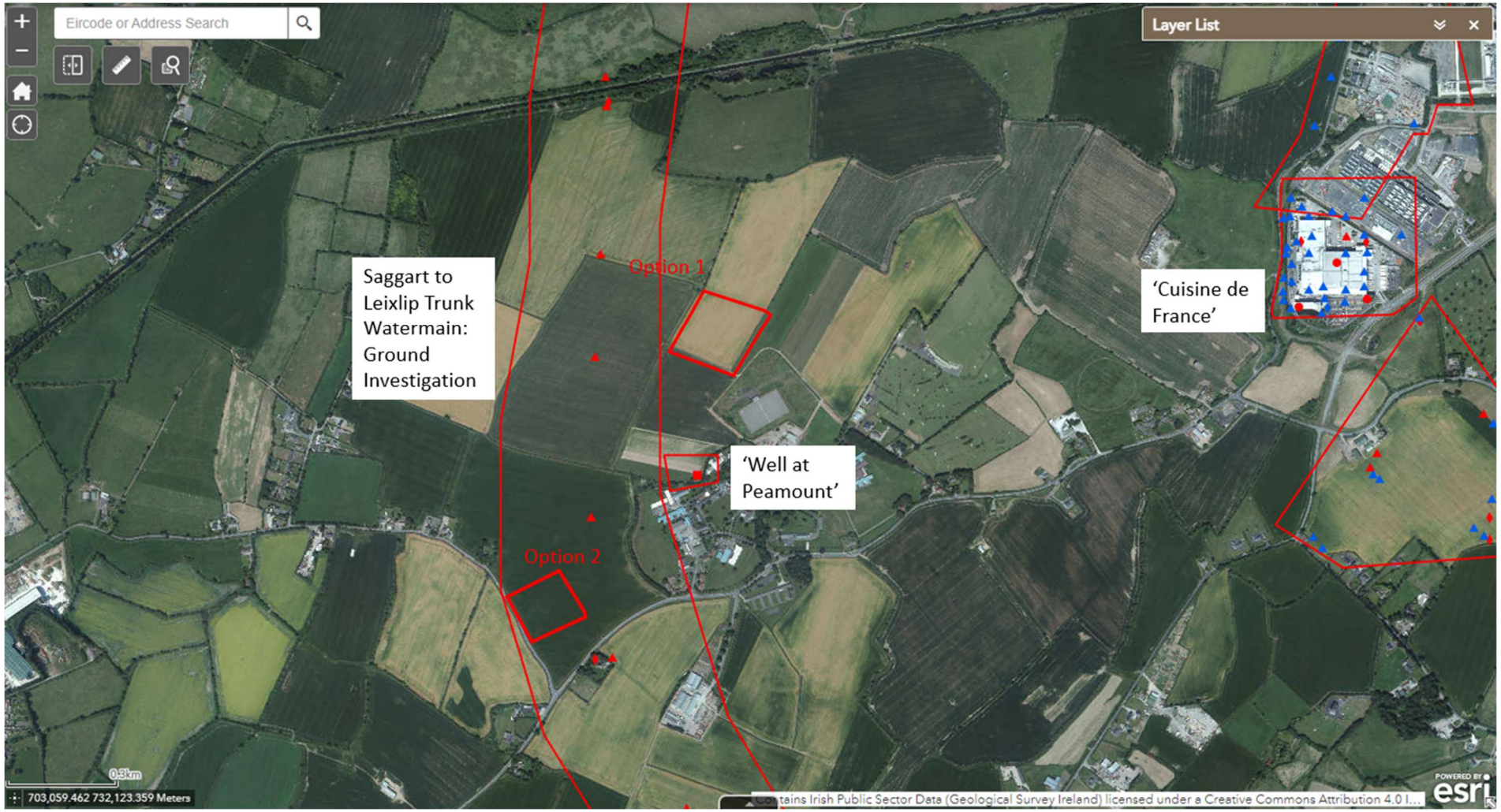


Figure 4: Borehole records, GSI

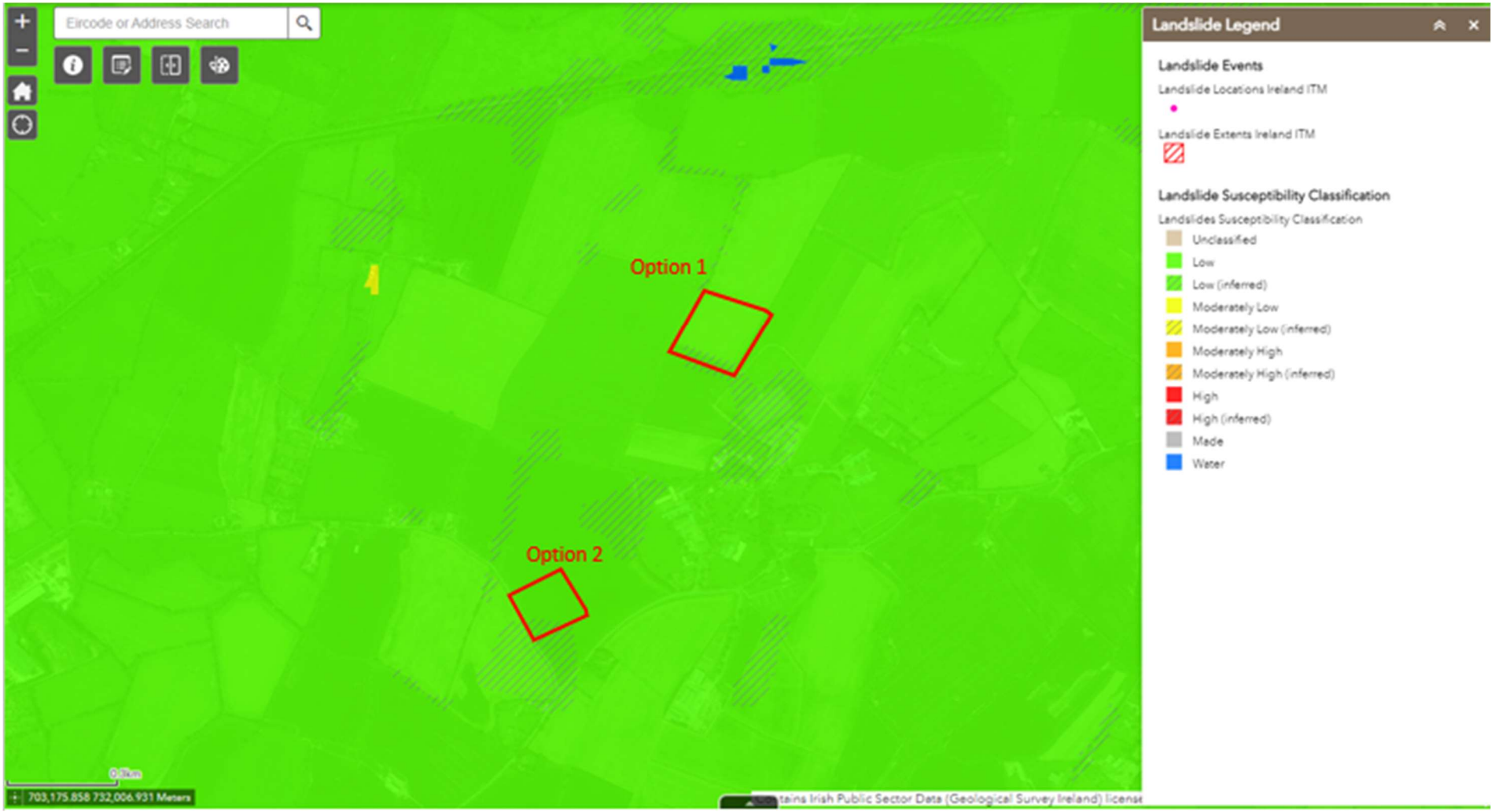


Figure 5: Landslide susceptibility mapping, GSI

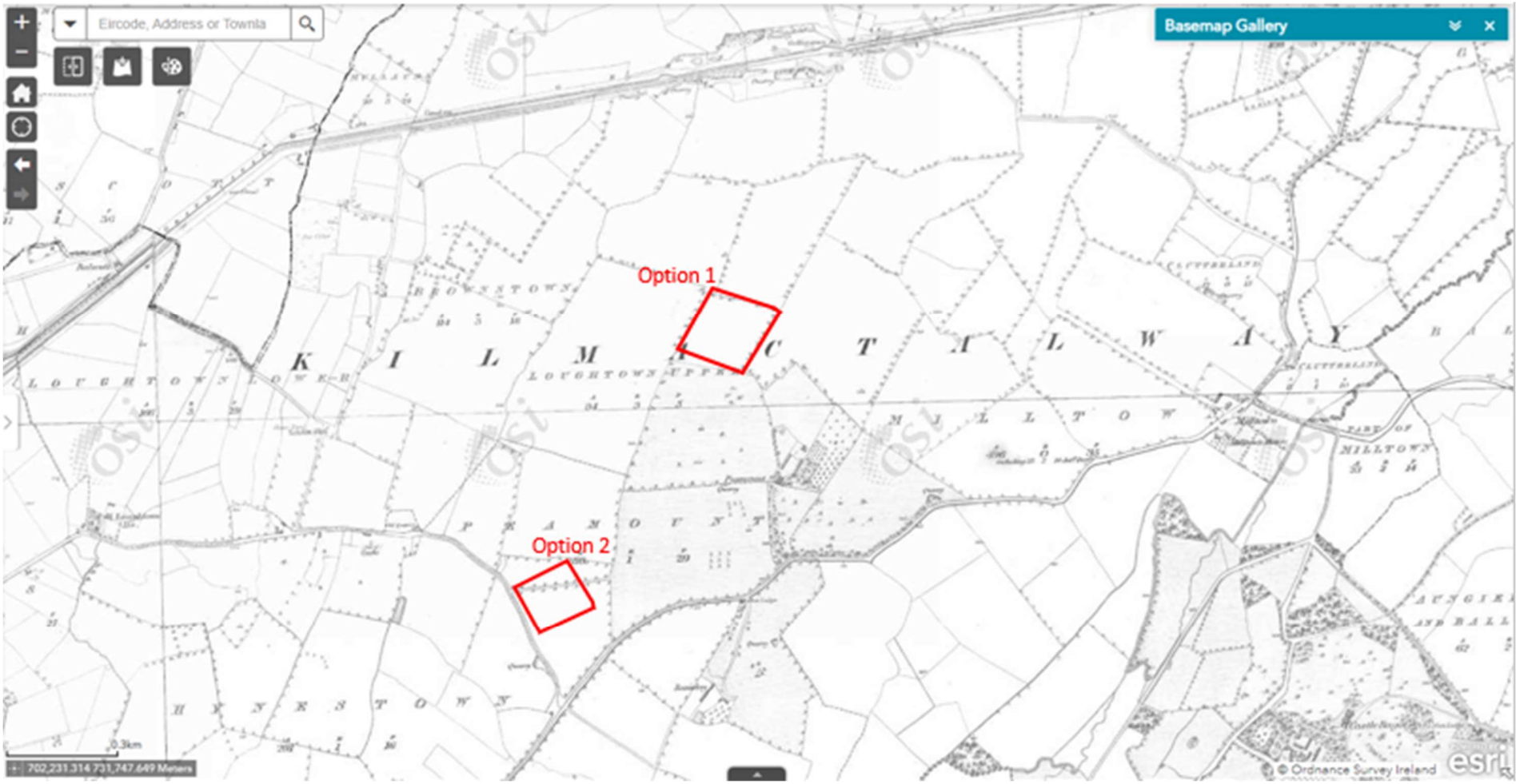


Figure 6: 6 in. Historical mapping, 1829-1841, OSI

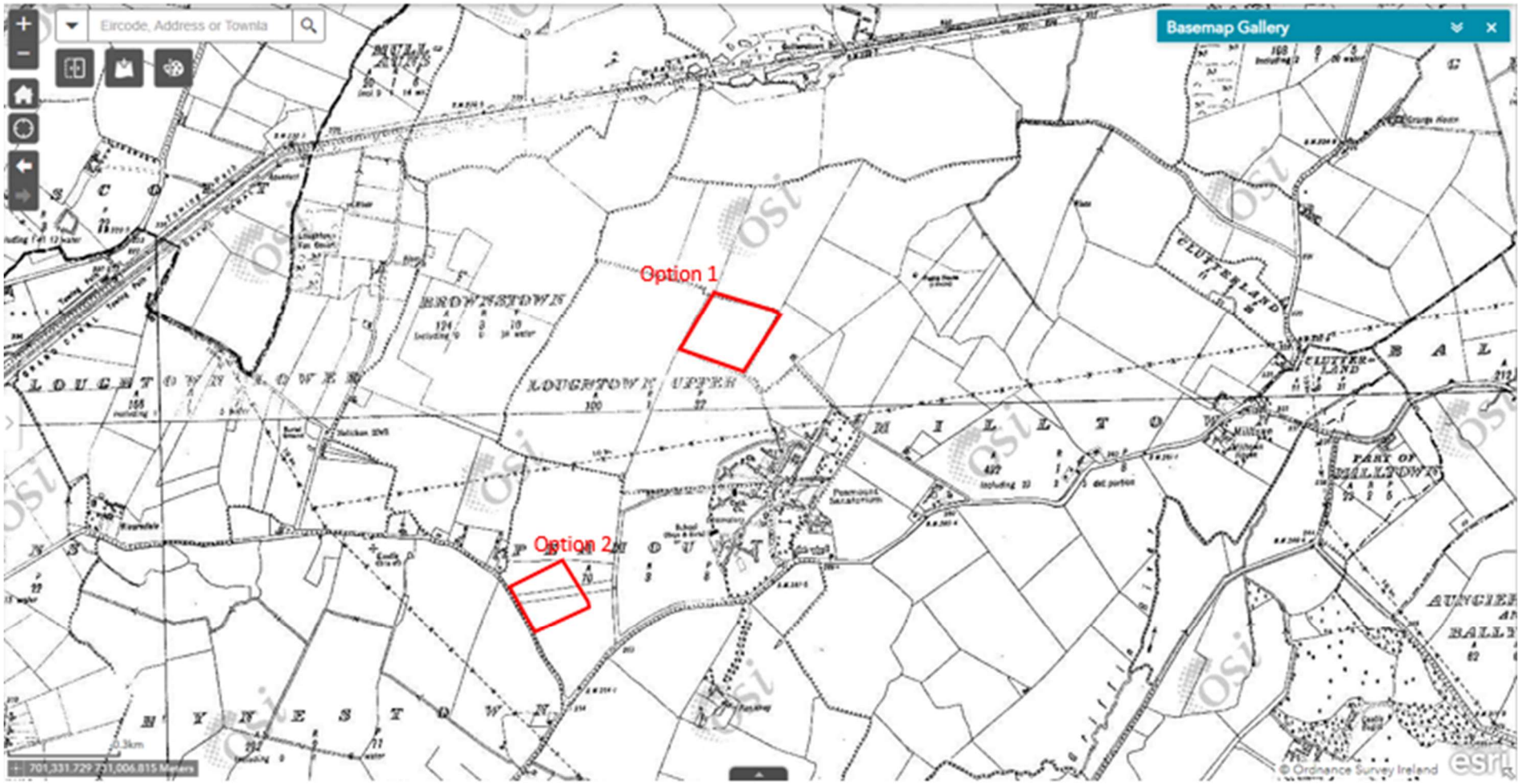


Figure 7: 6 in. Historical mapping, 2nd Ed. OSI.

Figure 8: Aerial imagery, 1995, OSI

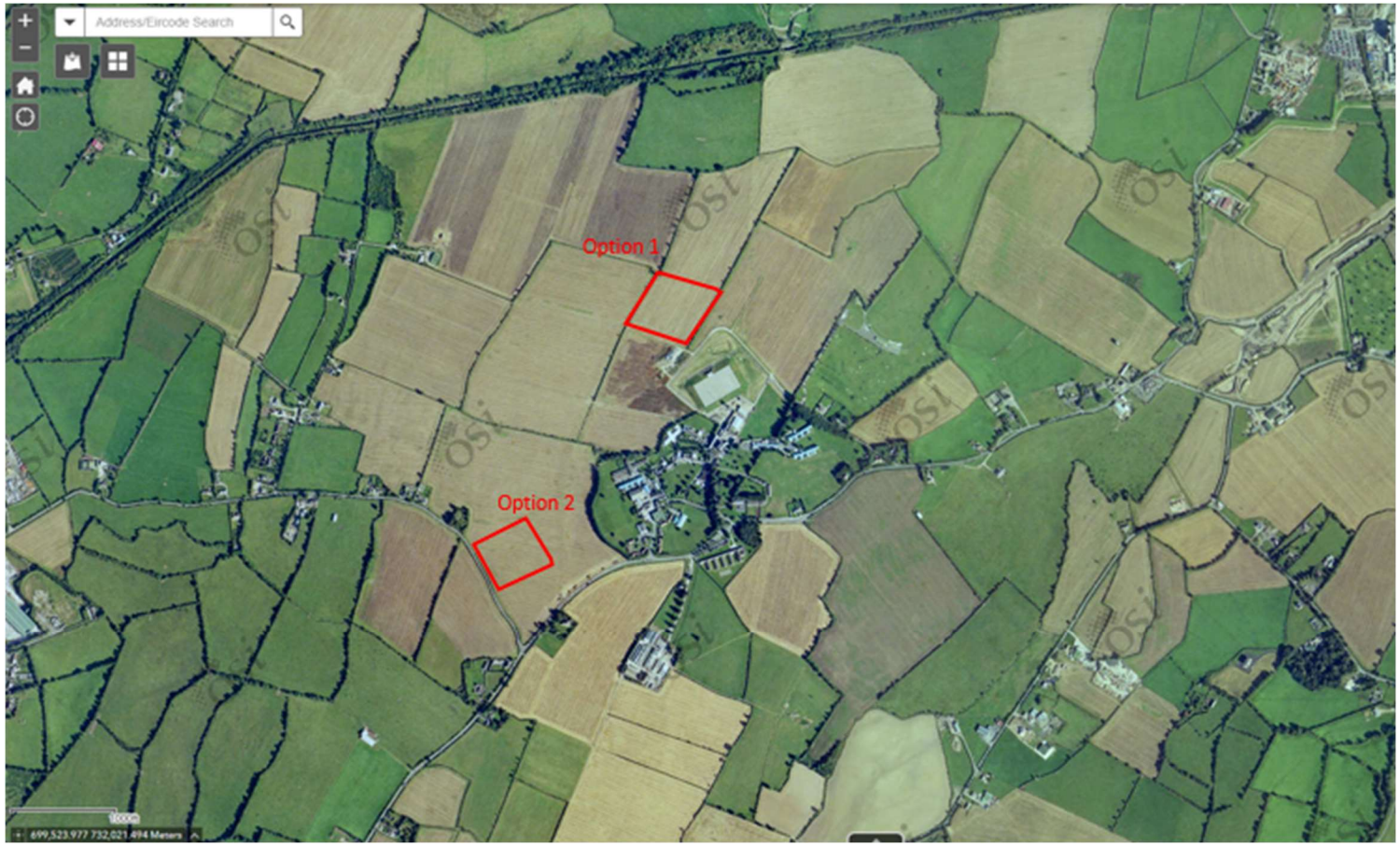


Figure 9: Aerial imagery, 2005-2012, OSI

Figure 10: Aerial Imagery, latest available, OSI

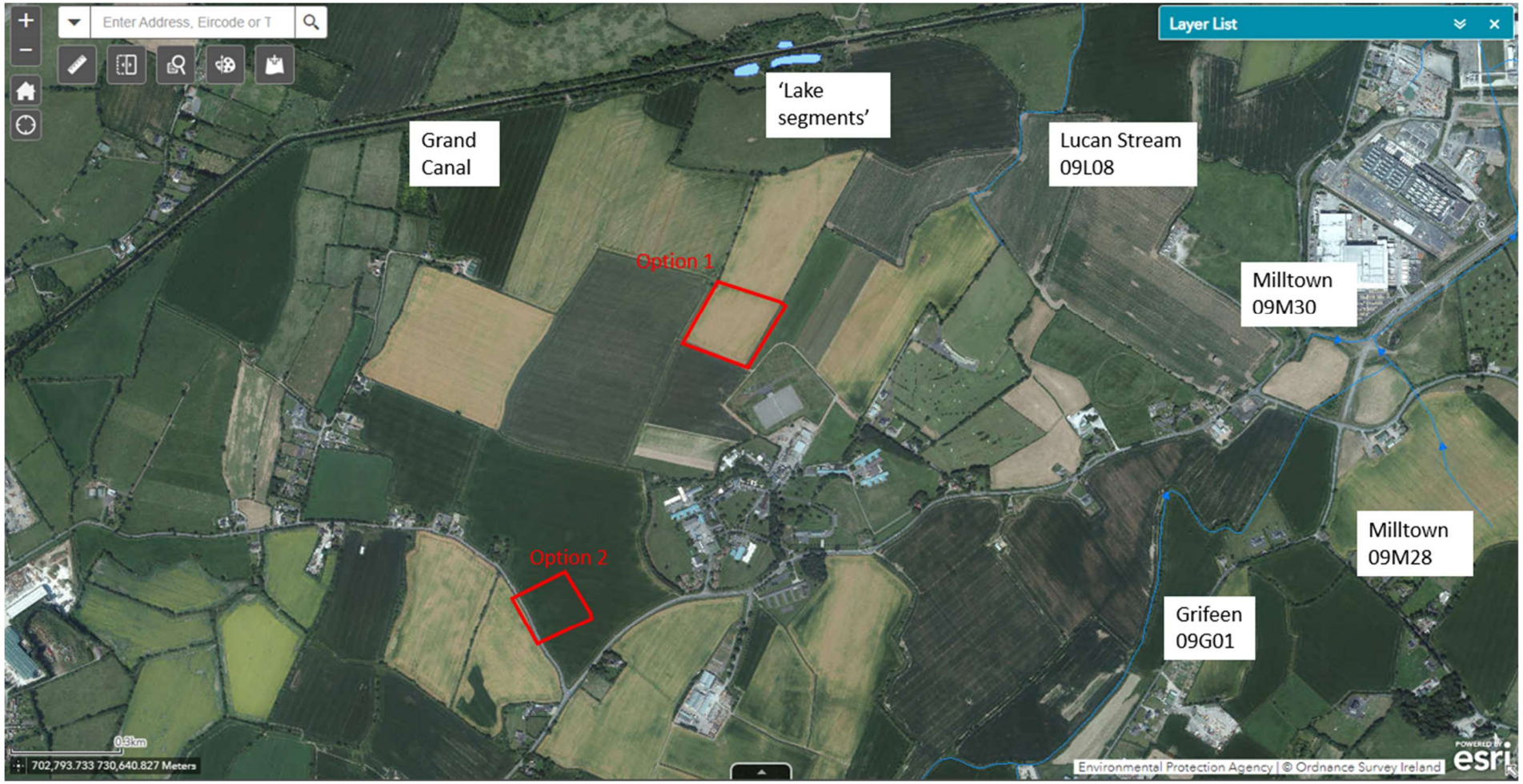


Figure 11: Watercourses, GSI

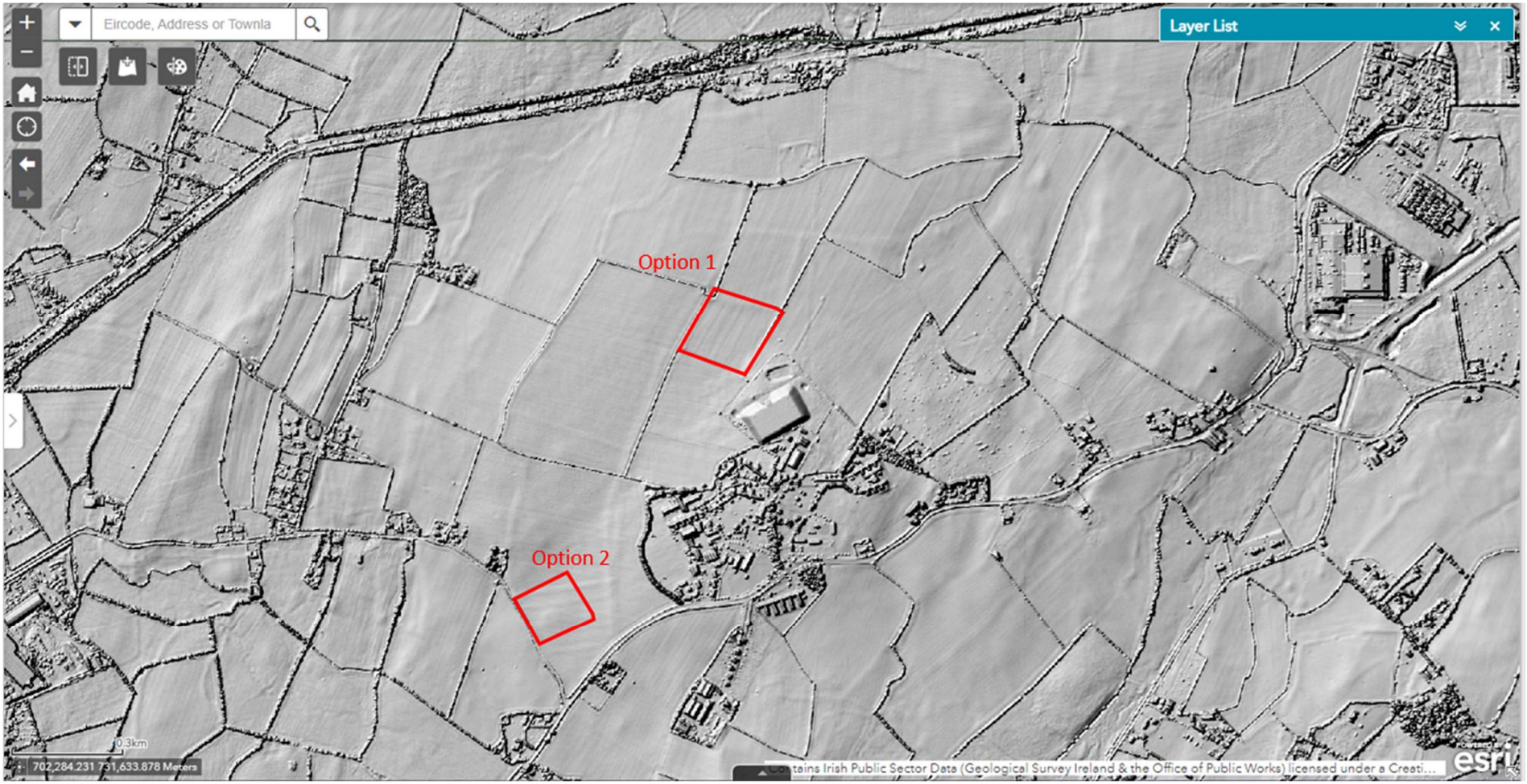


Figure 12: Lidar relief shading data, OSI

Figure 13: Site Walkover: Site Option 2

Figure 14: Site Walkover: Site Option 1

Appendix 2: Site Walkover Photographs

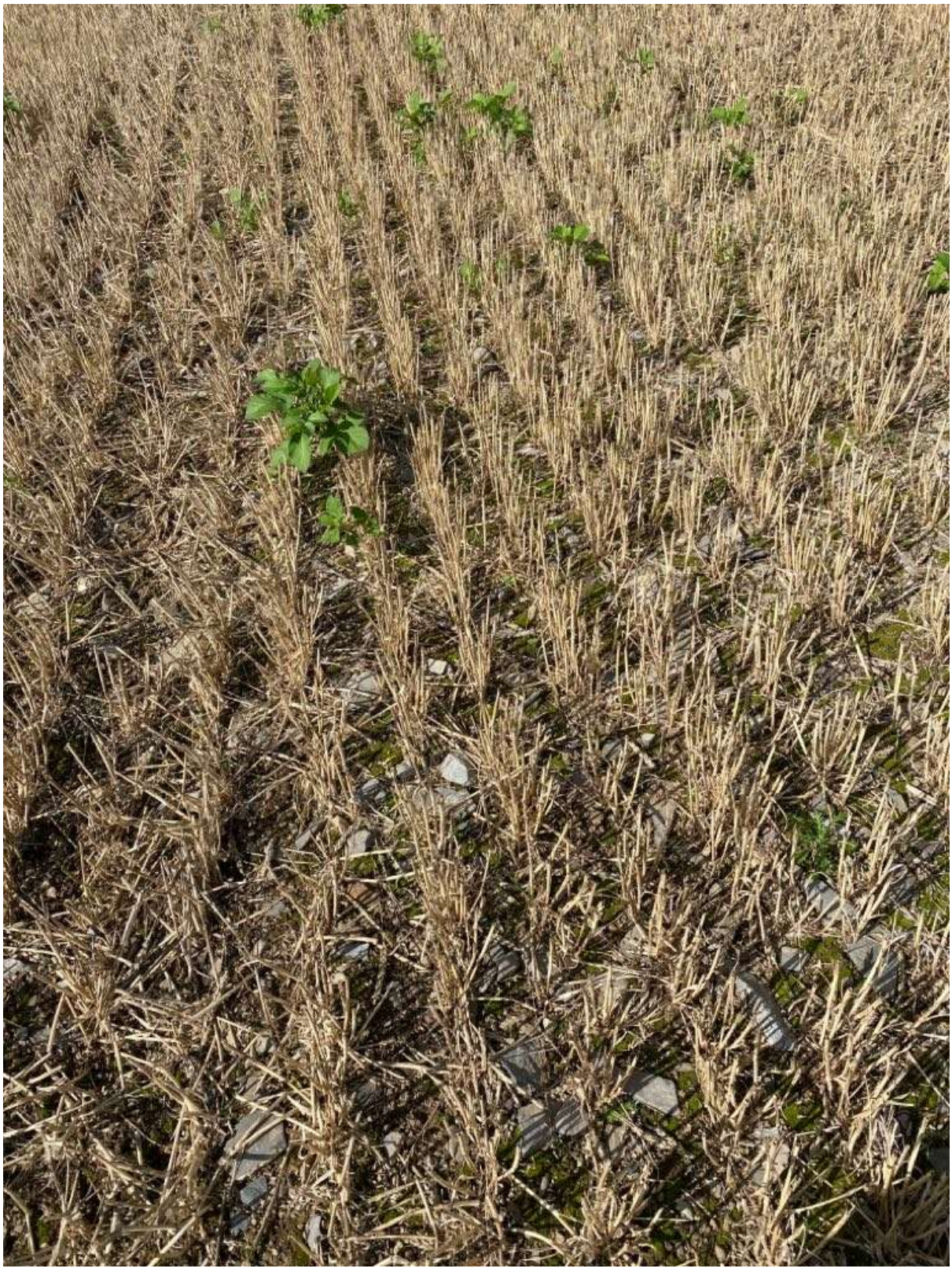
Photograph 1

Photograph 2

Photograph 3

Photograph 4

Photograph 5



Photograph 6

Photograph 7

Photograph 8

Photograph 9

Photograph 10

Photograph 11

Photograph 12

Photograph 13

Photograph 14

Photograph 15

Photograph 16

Photograph 17

Photograph 18

Photograph 19

Photograph 20

Photograph 21

Photograph 22

Photograph 23

Photograph 24

Appendix 3: Site Walkover Notes

Label	Note	Location (Geodetic)	
Note 1	Possible Outcrop	-6.481998	53.32045
Note 2	Angular limestone cobbles at surface	-6.489462	53.31515
Note 3	Probable outcrop	-6.483917	53.32141
Note 4	Overhead pole	-6.481245	53.32062
Note 5	Overhead pole terminal	-6.481381	53.32068
Note 6	Manhole/Chamber	-6.488722	53.31345
Note 6	Probable outcrop	-6.485412	53.31819
Note 7	Land drain or stream culverted, running N-S	-6.483943	53.32143
Note 8	Possible outcrop	-6.483772	53.32146
Note 9	AV Marker post	-6.485571	53.31802
SP	Borehole/Standpipe	-6.482594	53.31962
SP	Borehole/Standpipe	-6.482141	53.32048
SP	Borehole/Standpipe	-6.483616	53.3209
SP	Borehole/Standpipe	-6.484802	53.31987
SP	Borehole/Standpipe	-6.485455	53.31867
Photo 1		-6.48966	53.31413
Photo 2		-6.489659	53.31412
Photo 3		-6.488715	53.31345
Photo 4		-6.489238	53.31434
Photo 5		-6.489425	53.31466
Photo 6		-6.489465	53.31515
Photo 7		-6.488767	53.3158
Photo 8		-6.485607	53.31804
Photo 9		-6.485569	53.31803
Photo 10		-6.48263	53.31962
Photo 11		-6.48214	53.32048
Photo 12		-6.481999	53.32045
Photo 13		-6.481352	53.32063
Photo 14		-6.48121	53.32063
Photo 15		-6.481441	53.32076
Photo 16		-6.481568	53.32102
Photo 17		-6.483426	53.32143
Photo 18		-6.483426	53.32142
Photo 19		-6.483829	53.32145
Photo 20		-6.483918	53.32142
Photo 21		-6.483624	53.32091
Photo 22		-6.484802	53.31987
Photo 23		-6.484892	53.31935
Photo 24		-6.485457	53.31868
Photo 25		-6.487797	53.31685